KENYA CIVIL AVIATION AUTHORITY

Airspace Master Plan (2015 – 2030)

Strategic Environmental Assessment (SEA)

DRAFT SEA REPORT

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Activity: Strategic Environmental Assessment (SEA) for the Airspace Master Plan 2015 – 2030. This Report has been undertaken as a part of the Strategic Environment Assessment (SEA) on the Airspace Master Plan 2015 – 2030 for the Kenya Civil Aviation Authority (KCAA). Section 49 of EMCA (Amendment 2015) provides for introduction of Section 57A under EMCA, 1999 that requires all policies, plans and programmes be subjected to Strategic Environment Assessment (SEA).

Report Title: **Draft Strategic Environmental Assessment (SEA) Report**

Consultant: Aquaclean Services Limited is working with a multi-disciplinary team to address the key aspects of airspace management and constituted to enable focused identification and analysis of environmental and social issues associated with the Airspace Master Plan and providing appropriate 2-way mitigation measures.

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Acronyms

ACC	Area Control Centre
ADS	Automatic Dependent Surveillance
AFISO	Aerodrome Flight Information Service Officer
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publications
AIS	Aeronautical Information Services
AMAN	Arrival Management
AMSS	Aeronautical Message Switching System
ANS	Air Navigation System
ASBU	Aviation Systems Block Upgrade
ASL	Aquaclean Services Limited
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMs	Air Traffic Movements
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSEP	Air Traffic Safety Electronics Personnel
AWOS	Automatic Weather Observing System
CCO	Continuous Climb Operations
CDM	Collaborative Decision Making
DMAN	Departure Management
CDO	Continuous Descend Operation
CNS	Communication Navigation Surveillance
CNS	Communication, Navigation and Surveillance
COMESA	Common Market for East and South Africa
CPDLC	Controller Pilot Data Link Communication
DMAN	Departure Management
DME	Distance Measuring Equipment
EAC	East African Community
EASA	East Africa School of Aviation
EFS	Electronic Flight Strip
EHS	Environmental Health and Safety
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plans
ETS	Engineering and Telecommunication Services
FIR	Flight Information Region
FRA	Free Route Airspace
GANP	Global Air Navigation Plan
GNSS	Global Navigation Satellite System
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
JKIA	Jomo Kenyatta International Airport

KAA	Kenya Airport Authority
KAPU	Kenya Airport Police Unit
KCAA	Kenya Civil Aviation Authority
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KeTRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KMD	Kenya Metrological Department
KPLC	Kenya Power and Lighting Company
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
LTO	Landing – Take Off
NAVAID	Navigation Aid
NCA	National Construction Authority
NEMA	National Environmental Management Authority
NLC	National Land Commission
NMK	National Museums of Kenya
NOTAM	Notice to Airmen
OSHA	Occupational Safety and Health Act
PBN	Performance Based Navigation
PIAs	Performance Improvement Area
PSR	Primary Surveillance Radar
RPA	Remote Piloted Aircrafts
RWY	Runway
SARPS	Standards and Recommended Practices
SARS	Search and Rescue Services
SEA	Strategic Environmental Assessment
SMS	Safety Management Systems
SWIM	System-Wide Information Management
TMA	Tower Maneuvering Area
TWR	Aerodrome Control Tower
VHF	Very High Frequency
VOR	VHF Omnidirectional Range

Non-Technical Summary

About KCAA

The Kenya Civil Aviation Authority (KCAA) is a state corporation established under an Act of parliament enacted on the 24th of October 2002. The sole mandate of KCAA is to regulate the civil aviation industry and also provide civil aviation services. In order to achieve this mandate, KCAA is structured with 4No. Key directorates namely Aviation safety and security standards regulations, Air navigation services (ANS), East African School of Aviation (EASA) and Corporate services. Air navigation services (ANS) is in charge of the Kenyan Airspace and other delegated by ICAO for Traffic Services (ATS), Aeronautical Information Services (AIS) and Engineering and Telecommunication Services (ETS).

Kenyan Airspace

Conventionally, airspace is defined as that portion of atmosphere controlled by a state for aircrafts flying above its territory. It also covers areas of the oceans where the state is committed through international treaties to provide navigation services including air traffic control. Airspace comprises of controlled and uncontrolled categories described as follows;

(i) Controlled airspace is the extent where the air traffic control needs to have control over aircrafts flying in that airspace to maintain safety and separation between aircrafts. Civil aviation authorities prefer to keep this to a minimum.
(ii) Uncontrolled airspace is that where aircrafts flying through are free and unconstrained by the air traffic control unless on request.

According to the master plan, Kenyan airspace is one block covering the whole country known as Nairobi Flight Information Region (FIR). It extends into the ocean while a small part in northern Kenya falls under Khartoum FIR and Addis Ababa FIR to the north. Nairobi FIR is bordered by Dar es Salaam FIR on the south Entebbe FIR on the west, Mogadishu FIR to the east and ADS to the north. Vertically, the airspace has 2No. Levels with 2No. Sectors (area north and area south).

KCAA has capacity through their jurisdiction comprising of air traffic services, aeronautical information services, engineering, technical services and search and rescue. Capacity building (training is provided from East Africa School of Aviation). Aeronautical meteorology is provided from the meteorological department. ATS facilities are variously provided at airports depending on the site and nature, with JKIA and MIA being the best equipped. Controls are exercised on air traffic services (routing) Terminal Control Areas and Aerodrome Traffic Zones

The Airspace Master Plan

The Kenyan airspace is experiencing significant constraints arising from increasing traffic and hence airspace demand. The country has a notable responsibility from ICAO to control the entire Nairobi

flight information region extending from ground to unlimited as well as portions of the oceanic airspace and others illustrated on the figure below. Efficient planning and optimum utilization of the airspace requires a comprehensive policy guideline that addresses the local requirements and guidelines issued by ICAO. This management of airspace will also require integration with the neighboring flight information regions as required by the ICAO. Considering the integrated nature of aviation operation, order is very necessary in every action taken. This order is to be achieved through the airspace master plan.

The Kenya Civil Aviation Authority (KCAA) has developed a Kenyan Airspace Master Plan for the period 2015 – 2030. Investigations have shown the following areas requiring immediate to long term interventions;

(i) There is a notable increase in traffic at various airports (with JKIA and WAP experiencing the highest) arising from improved ground facilities and demand for air transport. Further growth in also anticipated in future, especially on cargo and international flights,
(ii) With the growth at JKIA and the anticipated progressive increase in Mombasa and other regional airports (Wilson, Kisumu and Eldoret), there is need to develop or improved the Aviation Navigation Services infrastructure to cope with the increase in aircraft movements and aircraft varieties,
(iii) There are regional initiatives towards seamless airspace corridors through individual States and regional economic blocks (East African Community, COMESA and African Indian Ocean Region (AFI). KCAA is guided by the forward looking Kenya Vision 2030 that target a strong growth in the aviation sector through modernization of JKIA to a regional aviation hub as well as upgrading other major airports.

The Master Plan 2015 – 2030 was published to facilitate KCAA plan and mobilize resources towards the evolution in the Air Navigation Systems (ANS) for the 15 years to achieve the above as well as meet the requirements established under the ICAO.

Airspace Master Plan Intervention Initiatives

Interventions on enhances KCAA plans initiatives geared towards sustained modernization of JKIA as a regional hub and upgrading infrastructure in other airports. These initiatives imply upgrading the Nairobi FIR within provisions of guidelines from ICAO to address the following;

(i) East Africa Community Civil Aviation Authorities Projects
(ii) East African Upper Airspace and Northern Corridor Initiative
(iii) COMESA Airspace Integration Project
(iv) African Indian Ocean Region

KCAA has undertaken to adopt ICAO Global Air Navigation Plan (GANP) Aviation System Block Upgrade (ASBU). These are project modules implemented to achieve specified measurable operational airspace improvements including improved aviation safety, modernized air traffic

management and improved technical expertise in satellite radio navigation. ICAO established the Global Air Navigation Plan (GANP) as a reference tool for States in the harmonized airspace planning and utilization. Under the GANP, ICAO has prepare Aviation Systems Block Upgrades (ASBUs) comprising of the following;

(i) Block 0 to be ready for implementation by the year 2013 with 18No. Modules,
(ii) Block 1 to be ready for implementation by the year 2019 with 17No. Modules
(iii) Block 2 to be ready for implementation by the year 2025 with 10No. Modules
(iv) Block 3 to be ready for implementation by the year 2030 and beyond with 6No. Modules

The ASBUs are to be implemented sequentially through the stated time schedule with each block addressing the following Performance Improvement Areas (PIAs);

(i) Airport Operations
(ii) Globally Interoperability systems and data
(iii) Optimum Capacity Flexible Flight
(iv) Efficient Flight Paths

Kenya has moved along with the African Indian Ocean Region with ASBU Block 0 and commitment to address improved aviation safety, modernization of ATM and the desired single African Airspace and improved technical skills. This is to be achieved through progressive implementation of the 18No. Modules under ASBU Block 0 and priorities as listed below;

The SEA Assignment

The airspace master plan developed has identified a series of intervention actions to be undertaken through the plan period 2015 – 2030. The actions proposed under the master plan are cross-cutting from environment, social, economic and safety in nature. The master plan intends to achieve efficient airport operations interoperability systems and data, capacity and flexible flights and efficient flight paths. The airspace operations have observed implications on environment, social economic and safety settings including among others;

(i) Safety at operations and public areas
(ii) Air quality through emissions
(iii) Noise from aircraft operations
(iv) Land use conflicts
(v) Social interactions
(vi) Influences of climatic conditions

In order to address these implications through the plan horizon period and beyond a comprehensive strategic environmental assessment (SEA) has been prepared to addressing these implications. The SEA will also go into complying with the provision of EMCA Amendment 2015. The airspace master plan, therefore, has been subjected to SEA study to ensure this compliance.

Aviation operations are associated with environmental and social aspects at the local and international levels. All the ASBU Models have a linkage to the environment and, therefore, important to establish the points of interaction for necessary intervention through the plan implementation. The Airspace Master Plan has appreciated the environmental conflicts of the airspace management with the key environmental aspects being;

(i) Climate change (an international issue) associated with emissions,
(ii) Air quality (local issues as well as international concern on Climate change) associated with air emissions
(iii) Noise associated with sensitive social and ecological areas arising from the nature of the aircraft and operations,
(iv) Safety issues for public, passengers and workers
(v) Implications of the land use patterns.

These are critical issues that require systematic and structured mechanisms for integration into the airspace master Plan implementation. It is on this basis that among the Master Plan Recommendation is the development of a Strategic Environment Assessment (SEA). Legally, the Environmental Management and Coordination Act 1999 (and the Environmental Management and Coordination (Amendment) Act, 2015 in its Section 57A states ***"…..All Policies, Plans and Programmes for implementation shall be subjected to a Strategic Environmental Assessment (SEA)……."*** . The Strategic Environment Assessment (SEA) is guided by the National Guidelines for Strategic Environmental Assessment in Kenya of 2011. The SEA is to be part of the Airspace Master Plan 2015 – 2030 documentation to be compliant with the laws of Kenyan.

General Findings

The Strategic Environmental Assessments (SEA) exercise has analyzed the Airspace Master Plan 2015 – 2030 to establish critical linkages and potential risks to the environment, social and economic issues. The master plan has already indicated noise and air quality as the main linkages associated with aircraft operations arising from running engines and aircraft mainframes during flight as well as fuel usage patterns. Key environment and social issues associated with aviation operations include the following;

(i) Compromised safety for the public, travelers and workers
(ii) Extensive delays with social and economic implications
(iii) Flight inefficiency arising from a number of factors,
(iv) Unnecessary fuel consumption associated with aircraft management
(v) Lack of inoperability due to communication challenges
(vi) Unacceptable noise levels

Preliminary observations have identified the following broad areas as relevant to the airspace master plan implementation.

Safety Aspects

Safety is the most important component in the aviation industry. It may be related to aircraft conditions, human elements, climatic conditions (weather), infrastructure conditions and even land use related aspects. Airspace, a shared resource for local and international users is also critical areas of safety considerations. It is the main reason that ICAO ensures order and harmony on its utilization through global, regional and national responsibilities clear defined.

Land Use

There is a high level interaction of airspace management and operations on the one hand and land use features on the other. With demand on land resources increasing for settlement, urban development, agriculture, institutional and conservation among other uses, there is also increasing encroachments into aviation areas including airports, flight corridors, holding areas and other aviation installations. The implications of this interaction is two way, i.e. land use risks to the aviation operations as well as risks to aviation operations to land use control and safety risks of the inhabitants. These aspects need to be appreciated and integrated in the airspace master plan implementation.

Operations Efficiency

Efficiency of aircraft and related functions has its limitation associated with the conditions of the aircrafts, aviation infrastructure, land use features around airports and along flight corridors (including forests and industrial premises) as well as climatic conditions. Inefficiency on aviation operations results to among other issues environmental pollution and social conflicts (e.g. noise and vibrations)

Environmental Aspects

Environmental linkages arises where the aviation operations are within neighbourhood of ecological features. Such linkages are associated with the following;

(i) Ecological functions sensitive to noise and vibrations such as wild life breeding areas or wildlife types sensitive to elevated noise levels,
(ii) Other ecological aspects are associated with interactions and conflicts with inevitable birds' migratory corridors and habitats,
(iii) Emissions from aircrafts (and other related equipment) especially of carbon dioxide (CO_2) other gases associated with fuel consumption. The implications of emissions including local air quality degradation as well as the global climate change issues.

Social Aspects

The above issues have direct and indirect and direct linkages to social settings. Social implications are manifested as follows;

(i) Conflicts with land use
(ii) Public safety risks
(iii) Health effects (noise and emissions)
(iv) Efficient travels and movements
(v) Global climate change effects.

Conclusions

Airspace Appreciation

(i) The Airspace Master Plan 2015 – 2030 do appreciate the environment component with respect to aircraft emissions and noise, especially with regard to climate change and health aspects. However, the plan has not established clearly the potential receptors and levels of impacts associated with the aircraft emissions and noise,

(ii) The Airspace Master Plan 2015 – 2030 has given clear illustration regarding cross-sectoral roles in its realization though without directly pointing to specific players other than aviation related actors. Implied non-aviation sectors include the County Governments, Health Sector, Security, Land Sector, Construction Sector and Environmental Sector,

Social Components

With the increasing air traffic in space and population across the country, direct linkages between the aviation operations and socio-economic activities is increasingly evident. While the Airspace Master Plan 2015 – 2030 is geared towards enhancing efficiency and safety of the airspace operations, it is a bit silent on social and economic components, especially with respect to public safety aspects. It, therefore, becomes difficult to draw the general stakeholder's attention on their roles and responsibilities on safe airspace management,

Emissions and Climate Change

(i) Significant work is being undertaken by KCAA, through programmes and projects, in its efforts to reduce CO_2 aircraft emissions within Kenyan airspace. The efforts include the voluntary development and submission to ICAO of a robust Action Plan for aviation CO_2 reduction. This is important as it allows Kenya to showcase its national mitigations measures to reduce CO_2 emissions from aviation as well as identify any assistance needs to implement such measures.

(ii) Kenya has also volunteered to participate in the CORSIA programme of ICAO. This means, though not obligated, that Kenya will participate the pilot phase (2021 – 2023), First Phase (2024 – 2026) and also the Second Phase (2027 – 2035) of the phased implementation of the CORSIA.

(iii) The aviation operations gives a mysterious outlook to the general public who may not be able to define means of dealing with the associated impacts including noise and vibrations. The public may consider aviation activities a nuisance to their social environment and livelihoods but lack clear avenues of reaching out to KCAA for grievances or concerns.

Land Use Conflicts

Demand for land for social and economic development has seen encroachments into aviation operations areas, including aerodromes, approach corridors, holding areas and other critical installations with serious conflicts. This important interactions between aviation and socio-economic land use practices and trends has not been addressed under the Airspace Master Plan 2015 – 2030 as an important area of conflicts for plan actions,

Ecological Interactions

The most notable and appreciated ecological interaction with aviation involves birds strikes that has serious safety implications to the aircrafts and passengers. However, the main cause of bird strikes is the conflict between birds' habitats and migration routes that have not been appreciated in the airspace management planning. The Kenyan airspace has been noted to be a major international migratory route influenced by the Rift Valley lakes, which in effects also constitute important birds' habits (also including Lake Victoria and the Indian Ocean coastlines).

AFI Planning and Implementation Regional Group (APIRG)

Within the APIRG Regional framework all the 18 modules of ASBU Block 0 have or are about to be implemented. Indeed, projects proposed by the Master Plan are focused all these modules. This will help ensure environmental gains and also that air traffic management improvement programmes are effectively harmonized and barriers to future aviation efficiency are removed at reasonable cost.

Air Traffic Control Officers (ATCOs)

Air Traffic Control Officers (ATCOs) have been appreciated by the Airspace Master Plan 2015 – 2030 as a critical section of KCAAs staff. For this reason, there is a dedicated effort to enhance their numbers and capacity through recruitment and training programmes

Recommendations

The following recommendations have been found appropriate;

Airspace Appreciation

While appreciating the recognition of the environmental aspects including emissions and noise levels, it would add more value to identify all environment issues and associated resources requirements alongside potential receptors. For instance, adequate financial resources will be paramount to the realization of fuel efficiency and hence aviation CO_2 emission reduction. This will enable KCAA adopt the mitigation actions under this Strategic Environmental Assessment Report.

Social Intervention

(i) The stakeholders listing under this SEA Report has brought out the need for KCAA to review the inventory of her operations Partnership including the general public. This review will work towards enhanced cross-sectoral collaborations at the various levels of airspace management with reduced conflicts and across board benefits. The key stakeholders should be sensitized on the Airspace Master Plan and in particular, the projects which impacts them in one way or the other. This will also better collaboration and networking between KCAA and specific stakeholders. Broader stakeholders support is needed for smooth implementation of the master plan and more so from the personnel who will play a key role in ensuring that the implementation was effective and efficient.

(ii) Open communication and cordial relationship needs to be cultivated to help build trust and friendly social environment within aviation operation areas. Initiatives to work with communities and considerations on how best to mitigate local social and environmental

impacts and building of mutual agreement. Purposive interactive and engagement initiatives with other key stakeholders should be a priority in both short and long term agenda of KCAA. This will help in leveling expectations, streamlining roles and responsibility, defining mandates, information sharing and awareness creation, especially among the neighboring communities and key actors. The communities should be engaged in regard to CSR projects or initiatives, which should be in line with the communities' localized needs.

Land Use Intervention

In order to create a harmony between airspace operations and management on the one hand and land use activities on the other, it is highly recommended that the Airspace Master Plan implementation process consider mapping the airspace plan and overlay the same on land use maps across the country. This will assist in collaborations with lands authorities in appropriate land use zoning around areas considered important for aviation operations including among others aerodromes, approach corridors, holding areas and other installation areas,

Ecological Intervention

Like land use mapping, aerial ecological setting has a critical interaction with airspace planning and management, with birds' strikes being the worst of all. For this reason, it is recommended that in collaboration with the Ornithology Department at the National Museums of Kenya, KCAA may consider overlaying the airspace plan on the important birds' migration routes and habitats. This will enable enhanced airspace safety and ecological compatibility.

Staff Welfare and Efficiency

It is recommended that part of programme involve stress management initiatives. Adequate sensation and awareness on environmental linkages should also be encouraged. The welfare of the aviation personnel should be prioritized and actioned on to address key concerns especially psychosocial concerns which could impact negatively on security and safety of the aviation industry.

ASBUs

(i) The Plan is almost silent on the implementation of Block 1, 2 and 3 Modules of the ASBU methodology. Thorough environmental analyses need to be undertaken on these modules in readiness for their implementation.

(ii) Dialogue, cooperation and coordination between KCAA and KMD need to be enhanced. This may help improve the understanding of how climate/weather will change in the vicinity and within local aerodromes.

Chapter 1: Introduction

1.1 About Kenya Civil Aviation Authority (KCAA)

The Kenya Civil Aviation Authority (KCAA) is a state corporation established under the Civil Aviation (Amendment) Act 2002 of 24th of October 2002. The Act was reviewed as a KCAA Act No. 21 of 2013 and amended under the KCAA (Amendment) Act 2016 incorporating the emergent ICAO Requirement. KCAA is an autonomous aviation agency providing effective oversight of the aviation industry and services delivery in line with ICAO Requirements. The sole mandate of KCAA is economically and efficiently plan, develop and manage as well as to operate, regulate safe civil aviation system in Kenya. In order to achieve this mandate, KCAA is structured with 4No. Key directorates.

1.2 KCAA Responsibilities

1.2.1 Air Navigation Services (ANS)

Air Navigation Services (ANS) is the key service provider under the sub-sector and is in charge of the Kenyan Airspace and other areas delegated by ICAO. This Directorate also provides air navigation services and training under the EASA. Specific services include the following;

(i) Air Traffic Services (ATS)
- ✓ Flight information services
- ✓ Approach control services
- ✓ Aeronautical control services

(ii) Aeronautical Information Services(AIS)
- ✓ Aeronautical data information and management
- ✓ Aeronautical Information Publications (AIP)
- ✓ NOTAM Management
- ✓ Pre-Flight and Post-Fight Information
- ✓ Aeronautical charts management

(iii) Engineering and Telecommunication Services (ETS) handling equipment and instruments including communication, landing navigation aids, surveillance radars and Air Traffic Control (ATC) systems,

(iv) Search and Rescue Services (SAR) for locating accidents areas and coordination of rescue actions by all involved parties.

Aeronautical meteorological services, though technically is a component of ANS, it is provided by the Kenya Meteorological Department (KMD) which is the designated meteorological Authority in the country in accordance with provisions of Annex 3 of ICAO.

1.2.2 Aviation Safety and Security Regulator (ASSR)

Aviation safety and security standards and regulations that serves as the Sub-Sectors Regulator Aviation Safety and Security Regulator (ASSR) is charged with the responsibility of regulating airspace operations for a vibrant and competitive air transport industry in Kenya. The main function of this directorate is to ensure compliance with the regulations by the industry through development and implementation of an effective aviation safety and security oversight system and carrying out economic regulation of the industry in Kenya. This function is discharged through six departments whose specific functions are listed below;

(i) **Flight Operations:** Responsible for issuance of Air Operators Certificate (AOC), in-charge of aircraft operation safety oversight, approval and monitoring of AOC holder training programmes, station facility inspections, evaluation/approval of Approved Training Organizations (ATOs) and flight training simulators and authorizations of Transport of Dangerous Goods by Air;

(ii) **Airworthiness:** Responsible for overseeing aircraft inspections, airworthiness of aircraft approvals, licensing of Aircraft Maintenance Organizations (AMOs) and Aircraft Maintenance Engineers (AMELs), and continual monitoring and surveillance of AMOs, AOCs, Aviation Training Organizations(ATOs) and AMELs;

(iii) **Personnel Licensing:** Responsible for aircraft registration, aviation personnel licensing, surveillance, ATO certification and oversight of aviation medical requirements;

(iv) **Aviation Security**: Responsible for Airport Aviation Security system audits, Operator Aviation Security Programmes approvals, Certification of cargo handlers, Management of the Kenya National Civil Aviation Security Programme, and continual monitoring and surveillance of operators' security programmes oversight of Transport of Dangerous Goods by Air;

(v) **Aerodrome, ANS and Aeronautical Meteorology:** Responsible for Licensing, certification and surveillance of aerodromes, ANS operations, buildings and structures and aeronautical meteorology;

(vi) **Air transport and Economic Regulation**: Responsible for economic regulation of the air transport sector, issuance of air service licenses, ad hoc clearances, aircraft lease approvals, and participation in Bilateral Air Service Agreements (BASAs).

1.2.3 East African School of Aviation (EASA)

The East African School of Aviation is structured into three departments namely;

(i) Academics,
(ii) Finance and Administration,
(iii) Business Development.

The academic department comprises of three units namely Air Navigation Services (ANS), Aviation Safety and Security (ASS) and Aviation Business Management (ABM). The functions of EASA include:-

(i) To provide competency based training for the Authority and aviation industry
(ii) To develop and implement standardized curricula for aviation professional programme
(iii) Establish and implement Training Policies that are relevant to the Approved Training Organization;
(iv) To establish & co-ordinate research and development
(v) Establish and implement training policies that meet the requirements of Technical and Vocational Education and Training (TVET)

1.2.4 Corporate Services

There are eight corporate departments that offer support services to the above three operational directorates. These are;

(i) Finance;
(ii) Human Resource & Administration;
(iii) Information Communications Technology (ICT);
(iv) Corporate Communication and Consumer Protection;
(v) Procurement;
(vi) Corporate Planning;
(vii) Internal Audit and Review; and
(viii) Corporation Secretary/Legal Services.

1.3 Airspace Master Plan

1.3.1 Airspace Master Plan Objective

The Kenyan airspace is experiencing significant constraints arising from increasing traffic and hence increased demand on navigation space services. The country has a notable responsibility from International Civil Aviation Organization (ICAO) to control the entire Nairobi Flight Information Region (FIR) extending from ground level to unlimited as well as portions of the Indian Oceanic airspace and other zones assigned by ICAO. Efficient planning and optimum utilization of the airspace requires a comprehensive policy guideline that addresses the local requirements, regional provisions and guidelines issued by ICAO.

1.3.2 Airspace Master Plan 2015 – 2030

The objective of the Airspace Master Plan 2015 – 2030 is to institute order through the airspace planning and management as a continuation of what had been proposed under the Airspace Master Plan 2005 – 2015. The success under the of the Airspace Master Plan 2005 – 2015 have not been

analyzed under the SEA Report, but the intended objectives of the Airspace Master Plan 2015 – 2030 is the subject of this Strategic Environment Assessment Report. The Plan is to integrate infrastructure, regulatory and guidelines, institutional capacity as well as regional and international harmony.

The Master Plan intends to achieve the following objectives for Kenya;

(i) Efficient airports operations
(ii) Interoperability systems and data between operations functions and the stakeholders
(iii) Capacity and flexible flights
(iv) Efficient flight paths within and outside the Kenyan Airspace implying management initiatives

The management of airspace will require integration with the neighboring Flight Information Regions (FIR) as required by the ICAO. For Nairobi FIR these would include Entebbe FIR, Dar-es-Salaam FIR, Mogadishu FIR, Addis Ababa FIR and Khartoum FIR. Considering the integrated nature of aviation operations, order is very necessary in every action taken.

1.4 The Strategic Environmental Assessment (SEA) Study

1.4.1 SEA Study Justification

The Environmental Management and Coordination Act 1999 (and the Environmental Management and Coordination (Amendment) Act, 2015 in its Section 57A states ***"…..All Policies, Plans and Programmes for implementation shall be subjected to a Strategic Environmental Assessment (SEA)……."***. The SEA Guidelines define Strategic Environmental Assessment (SEA) as a range of analytical and participatory approaches that aim to integrate environmental consideration into Policies, Plans, and Programs (PPP) and evaluate the inter-linkages with economic and social considerations. The Strategic Environment Assessment (SEA) is guided by the National Guidelines for Strategic Environmental Assessment in Kenya of 2011.

The Strategic Environmental Assessment (SEA) for the Airspace Master Plan was designed to take stock of the current airspace status and the anticipated issues arising from the implementation of the Master Plan. The Strategic Environmental Assessment (SEA) will be part of the Airspace Master Plan 2015 – 2030 documentation to be compliant with the laws of Kenyan.

Each of the projects proposed under the Master Plan will individually be subjected to ESIA studies and approval requirements at the point of respective Master Plan stages implementation. This will enable KCAA and the Sector in general to address the specific projects issues by developing integrated environmental and social management plans in the separate Environment and Social Impact Assessment (ESIA) studies.

1.4.2 SEA Study Objectives

The Airspace Master Plan 2015 – 2030 developed by KCAA has identified a series of intervention projects to be undertaken through the plan horizon period 2015 – 2030 with some of the activities carried over from the Airspace Master Plan 2005 – 2015. The intervention projects proposed in the Airspace Master Plan are anticipated to have short-term and long-term implications on the environment, social, economic and safety aspects including among others;

(i) Safety around operation zones including airports, approach flight corridors, holding areas, etc.,
(ii) Air quality associated with aircraft emissions and has local implications (at points of operations) as well as dispersal scenarios,
(iii) Noise and vibrations from aircraft operations with impacts to receptors on the low flight paths and around airports,
(iv) Land use conflicts involving aircraft operations and social and economic activities on the ground,
(v) Social linkages (also closely linked to land-use) associated to safety, noise and vibration as well as timely and efficient flights for airspace users,
(vi) Influences to climatic conditions (climate change) associated with CO_2 emissions from the aircrafts.
(vii) Meteorological linkages as relates to free flow of information and data relative to aviation operations.

1.4.3 Scope of SEA Study

In order to address these implications through the Airspace Master Plan horizon period and beyond a comprehensive strategic environmental action is necessary. The strategic environment action is established through an evaluation of the Airspace Master Plan with a view to identifying the key linkages to environment and social settings and identification of appropriate preventive measures. The Strategic Environmental Assessment (SEA) will ensure that the Master Plan is sensitive to matter of environment and social interest throughout the implementation period. It will integrate compliance with the local regulatory provisions, regional sustainable initiatives and guidelines from ICAO.

The scope of the SEA assignment was analyzed in the table below;

Table 1: Scope of the Assignment

	Scope of the SEA	Study Actions
1	Review of the available data on aviation operations to prepare a description of airspace information and data.	The review process provided the airspace status in order to identify gaps to be addressed during specific master plan projects implementation.
2	A review of the Aviation Policies and other regulatory framework relating to aviation operations and requirements for environmental assessment.	This enhanced an understanding of the current policies, regulations and practices in aviation.
3	A careful review of the Airspace Master Plan and all available relevant reports and other information.	To identify environmental and social linkages and opportunities for integration and mitigations.
4	Detailed consultations and discussions with the Client to provide insights on the level of importance and priorities given to aviation aspects.	Respective expertise and the Client contributed towards the SEA Output.
5	Consultations with a full range of stakeholders including relevant individuals, institutions and the general public.	Appropriate stakeholder analysis a consultations that ensured an all-inclusive SEA process
6	Preparation of the Strategic Environmental Assessment (SEA) Report.	SEA was the ultimate deliverable of the assignment

1.5 SEA Study Approach

1.5.1 SEA Study Focus

The SEA study focused on the following key aspects;

(i) The Airspace management concepts and utilization practices as outlined under the Airspace Master Plan and other reference available documents including the KCAA Strategic Plan 2015 – 2022,
(ii) Existing local and global initiatives towards sustainable management of airspace including ICAO guidelines and related annexes,
(iii) The Project areas and intervention projects proposed under the Airspace Master Plan for implementation,
(iv) Shared responsibilities by the local agencies as well the regional states,
(v) Environmental and social linkages associated with aviation operations and mitigation of the same.

1.5.2 SEA Study Concept

The SEA Study was based on the structure and clear definition of the Airspace Master Plan objectives and activities in addition to the relevant national policy and legislative framework as well as the

international safeguards (ICAO Guidelines). SEA process identified environmental and social issues and established opportunities for mitigation measures integration in the Airspace Master Plan implementation thus enhancing associated ESMPs and decision making for the specific projects under the master plan. This also enabled relevant sectors identify their responsibilities and how they relate to the master plan in the utilization of airspace and their respective development projects.

The purpose of SEA process is to ensure that environmental and social considerations are integrated through the Airspace Master Plan for strategic decision-making in support of environmentally sound and sustainable management of the airspace. SEA Report provides environmental and social management issues of the Airspace Master Plan and establish mitigation measures. The issues so addressed will guide on Environment and Social Impact (ESIAs) for the projects and components during their implementation. The SEA Report, therefore, sets a framework for individual assessments of the multiple projects which are individually subject to ESIA studies wherever applicable.

1.5.3 SEA Study Activities

Overall, the SEA study was undertaken in six distinct activities as outlined under the SEA Guidelines. The activity blocks are as follows;

(i) Preliminary documentary review, Client Interactions and Deliverables Review. Preparation and presentation of Inception Report,
(ii) A briefing meeting for NEMA on the intension to carry out a SEA on the Airspace Master Plan 2015 – 2030,
(iii) Preparation of a Scoping Report for submission to NEMA for review and further guidance,
(iv) Assessment and preparation of the Draft SEA,
(v) Stakeholders Engagement and Consultations,
(vi) Final SEA Reports submissions to the Client and subsequently to NEMA

In order to achieve the above, the following activities were undertaken;

Table 2: SEA Study Activities

SEA Activity	Specific Activities
Inception	Prepare the Inception Report addressing the following issue among others; ✓ Mobilization, ✓ Review of the Terms of Reference, ✓ The Airspace Master Plan Brief with defined projects outline, ✓ Recapture approach with the new insights of airspace operations, ✓ Reviewed work plan and realistic deliverable schedules, ✓ Client Discussions.
NEMA Briefing	✓ Statement of Intent NEMA. ✓ NEMA Briefing,
Scoping Report	✓ The Client provided information on the Kenya Airspace,.

SEA Activity	Specific Activities
	✓ Review of airspace management and environment and social linkages, ✓ Stakeholders briefing and sensitization
	Scoping Report providing among others; ✓ The anticipated SEA coverage, ✓ Key components of the Airspace Master Plan 2015 – 2030 ✓ Expected environmental and social linkages, ✓ Definition of anticipated impacts and benefits, ✓ An overview of benefits enhancements and impact mitigation, ✓ Indications of the responsibilities (KCAA, KAA, operators etc.) ✓ Global and regional responsibilities, ✓ Stakeholders identification and engagement plan
SEA Study Assessments	Review and evaluation of the Airspace Master Plan (2015 – 2030) covering; ✓ Understanding airspace management in Kenya, ✓ International airspace management, ✓ Master Plans Proposals, ✓ Challenges faced and proposed intervention measures, ✓ The role of environment and social sectors, ✓ Capacity for environment and social aspects of the Airspace Master Plan ✓ Guided field visits to sample aerodromes and aviation control locations
	Assessment of Environmental Issues ✓ Noise and vibrations ✓ Wake vortices ✓ Aerial emissions ✓ Ecological interactions ✓ Fuel usage and dumping ✓ Climate Change aspects (metrological issues)
	Assessment of Social/Cultural Issues ✓ Noise and vibrations ✓ Safety management (space and ground) ✓ Sensitive areas ✓ Land use conflicts ✓ Security aspects
Stakeholders Engagements	✓ Comprehensive Stakeholder Inventory. ✓ Rapid stakeholder interviews ✓ Convene a Stakeholder Workshops for presentations and Report validation ✓ Administer questionnaires for documented opinions and suggestions
Reports Submissions and Presentations	The following reports formed the key deliverables; ✓ Inception Report ✓ Progress Report (Scoping Report to NEMA for approval) ✓ Draft SEA Report (To NEMA for disclosure) ✓ Final SEA Report (To NEMA for validation and approval) ✓ Presentations (Power Point presentations and an Executive Summary)

1.6 Stakeholders Engagement Activities

Specific activities on the Stakeholder engagements undertaken are outlined in the sections below;

1.6.1 Stakeholders Inventory

Stakeholders in aviation operations varied from the general public (mostly with indirect linkages), Operators (mainly at aerodromes including KAA) and airlines operators. Others were public and private organizations and institutions. The following were the categories of the key stakeholders

1.6.1.1 Public and Institutions

(i) Sample of neighbourhoods along flight corridors and holding zones
(ii) Sample of neighbourhoods at aviation installations including airports
(iii) Sample workers from the airports (rapid interviews)
(iv) National Environment Management Authority (NEMA)
(v) Ministry of Environment
(vi) Kenya Metrological Department
(vii) Public Health Department
(viii) Department of Safety and Health (DOSH)
(ix) National Land Commission (NLC)
(x) Survey of Kenya
(xi) Kenya Forest Services (KFS)
(xii) National Museums of Kenya (NMK) – Ornithology Department
(xiii) Roads Authorities (KeNHA, KURA, KeRRA),
(xiv) Sample County Governments (Nairobi, Machakos, Mombasa, Kisumu, Nakuru)
(xv) Secretariat – Council of Governors
(xvi) Communication Agencies (Safaricom, Airtel, Telkom, etc.)
(xvii) Power Transmission Companies (KeTRACO, KPLC)
(xviii) National Construction Authority (NCA)

1.6.1.2 Key Airspace Users

(i) Kenya Airports Authority (GFS, Fire Rescue, Security, etc.)
(ii) Airport Managers (JKIA, Wilson Airport)
(iii) Kenya Air Force
(iv) Kenya Police Service (Air Wing)
(v) Sample travelers from the airports (rapid interviews)
(vi) Kenya Wildlife Services (KWS) – Scientists and Air Wing
(vii) Health Services Agencies (AMREF, Red Cross, etc.)
(viii) Humanitarian Agencies (UNHCR, WFP, UNICEF, UNEP)
(ix) East Africa School of Aviation (EASA)
(x) Drones Users

1.6.1.3 Key Airline Operators

(i) Kenya Airways
(ii) Other local Airline Operators (sampled at JKIA and Wilson Airport)
(iii) Sample International Airline Operators
(iv) Kenya Aircrafts Operators Association (including AOC)
(v) Selected Pilots and support staff

1.6.1.4 Key Aviation Regulators

(i) Kenya Civil Aviation Authority (KCAA)
(ii) International Civil Aviation Organization (ICAO) (Nairobi Office)
(iii) IATA (Nairobi Office)

1.6.2 Stakeholders Engagement Tools

For purposes of stakeholders' engagement, separate rapid interviews were done at their respective premises or areas of operations giving the stakeholders opportunities to either engage on face-to-face short discussions or provide written submissions (questionnaires or other documentation) depending on their convenience. The interviews were followed by a Stakeholders Briefing Workshop convened by the Client. The Workshop comprised of the following components among others;

(i) Presentations of the Airspace Master Plan analysis and identified issues with mitigation measures,
(ii) Provisions of notes and extracts from the Airspace Master Plan and the draft SEA Report,
(iii) Questionnaires for capturing opinions
(iv) Interactive sessions (questions and answers)
(v) Attendance Registers

1.6.3 Stakeholders Meetings

This was an important component of this assignment that enabled appreciation of the dynamics of airspace management by the stakeholders and at the same time seek views and opinions on improving the proposed actions under the Airspace Master Plan 2015 – 2030. 2No. Stakeholders Workshops were held as follows;

(i) Rapid interactions involving one-on-one meetings at their respective premises,
(ii) Workshop No. 1 to brief and sensitize the stakeholders on the Master Plan and the scope of the SEA. This enriched the scope of the study through positive contribution by the stakeholders,
(iii) Workshop No. 2 for presentation of the SEA Report for a harmonized appreciation of the final SEA Report version for validation.

1.6.4 Stakeholders Engagement Schedule

Stakeholders' engagement activities were scheduled as follows;

Table 3: Schedule of Stakeholders Engagement

Stakeholders Engagement and Relative Timelines	Engagement Activity	Remarks
National Environment Management Authority (NEMA) During Scoping process	✓ Briefing and notification for Intent to undertake SEA Study ✓ Scoping report submission and guidance from NEMA	✓ Appreciation of the Airspace Master Plan by NEMA, ✓ Discussion on the scope of the SEA
Stakeholders Inventory process and initial interactions During Scoping process	Listing and analysis	✓ Desk work and Client Liaison as well ✓ Preliminary interactions
Stakeholders Workshop No. 1 **At the Scoping Stage (3rd September 2019)**	**To brief and sensitize stakeholders on the Airspace Master Plan and Scope of the SEA Study**	**This enabled Stakeholder comprehensively contribute towards the Scoping Report**
Stakeholders interactions and interviews at scoping and through SEA Report preparation ▪ Key Government Ministries and Agencies ▪ Air Operators ▪ Community Representatives	Visits for interviews Interviews with the Relevant carders of personnel and Heads of Departments	Individuals and institutional interactions Rapid interviews (of key officials in the target stakeholders organizations
Sites visits and public interactions in the areas	Supplementary interviews and filling gaps	To establish perceived and real issues relating to aviation installations and public
Draft SEA Report submission of the final SEA Report to KCAA and submission to NEMA for disclosure (website and print media)	As per the SEA Guidelines	For acceptance of the SEA Report for integration into the Air Space Master Plan
Stakeholders' Workshop No. 2 **Final SEA Report**	**Presentation of the Final SEA Report for Validation**	**Stakeholder Review and Validation**

1.7 The Consultant

Aquaclean Services Limited (ASL) is an independent consulting company was incorporated in 2009. Aquaclean Services Limited provides consulting services and sustainable solutions for environmental integration in development projects. Aquaclean Services Limited is also registered with the National Environmental Management Authority (NEMA) of Kenya as a 'Firm of Experts' to carry out Environmental and Social Impact Assessment (ESIA) Studies, preparation of Environment and Social

Management Plans (ESMPs), Environmental Audits (EA), Strategic Environment Assessments (SEA) and Training Programmes.

The Strategic Environmental Assessment (SEA) Study Team under Aquaclean Services Limited comprises of 6No. Key staff drawn from different disciplines to address the key aspects of airspace management. This professional mix was constituted to enable focused identification and analysis of environmental and social issues associated with the Airspace Master Plan and providing an appropriate 2-way mitigation measures (i.e. effects from the Master Plan to the environment and social impacts to the Airspace from social settings qualification of the experts are in annex for reference as required by the SEA Guidelines.

In addition support staff have been assigned to assist in information gathering, fieldwork and additional minor inputs such as a legal analysis, economical issues, architectural and GIS aspects as the situation will require. In order to facilitate harmonious and effective sharing of notes and experiences with the Client, a Technical Desk will need to be established at the Client end.

1.8 Study Outputs

Strategic Environment Assessment is a tool for determining the overall implications of plans, policies and programmes with a view to providing global mitigation actions for integration and adoption through the implementation process. The SEA report will be developed through the following serial deliverables;

(i) Inception Report
(ii) Scoping Report
(iii) Draft Strategic Environment Assessment (SEA) Report
(iv) Final Strategic Environment Assessment (SEA) Report

Chapter 2: The Airspace Master Plan

2.1 KCAA Strategic Plan 2018 – 2022

2.1.1 Strategic Issues

The KCAA Strategic Plan 2018 – 2022 was necessitated by among other factors giving the Authority its strategic direction, linking to the National Development Agenda (the Kenya Vision 2013 and the Big 4 Agenda), delivery of results and services to the citizens as well as align with the Airspace Master Plan 2015 – 2030.

The Strategic Plan is guided by among other values integrity with key principles being professionalism, honesty and commitment to moral principles (including environmental and social considerations). It is on these principles that environment, listed as no. 7 of the 14 strategic issues addressed by the Strategic Plan 2018 – 2022. The **Environmental Strategy States** as follows;

Box 1: Environmental Strategic Statement

> ***……..The operation of civil aviation contributes to the degradation of the environment. The major areas of concern relate to aircraft emissions and noise around the airports. There is need to ensure that the operators observe the provisions of the regulations on environmental protection in view of the importance of environment in the modern world and importance placed by ICAO on this. The 39th Session of ICAO Assembly addressed the establishment of a Global market – based Measure (GMBM) scheme, which will add new compliance requirements for Member States to contribute to the mitigation of CO_2 emissions from international Aviation through Annex 16 Vol. IV……..***

Other related Strategic Issues include the following;

(i) **Governance and Risk Management:** The Government has been laying a lot of emphasis on the need to enhance corporate governance as one of the key strategies to improve delivery of service in the public sector. During the Plan period the Authority will focus on training the Board and management to ensure proper utilization of resources and establishment of strong accountability systems. Also to be pursued is the restructuring of the Authority based on the recommendations of the study for the establishment of a framework for separation of the regulatory function from the service provision function,

(ii) **International and regional obligations:** Kenya was elected to the ICAO Council in 2013 and this will require more support for effective representation on behalf of the region. The establishment of Regional Safety and Security Oversight Agency and the East African Community Unified Upper Flight Information Region will result into transfer of some functions currently performed by KCAA to the regional office. Any potential adverse effects

arising thereof especially on people and KCAA's revenue base will be proactively addressed in this plan,

(iii) **Legal and regulatory framework:** There is a need for a robust legal and regulatory framework, which should be continuously and expeditiously reviewed on a need basis.

(iv) **Human capital development:** The Authority has continued to face a challenge of attracting and retaining skilled and competent workforce in key technical areas, thus impacting negatively on its ability to deliver quality services. In addition, organization structure is a major issue that can impede against proper implementation of the strategic plan. KCAA is a technical organization that does not exist elsewhere in government and a different approach to handle the structure is required in order to get it right,

(v) **Capacity, Efficiency, Safety and Security of Air Navigation:** In order to ensure optimal capacity, improved efficiency, enhanced safety and security of air navigation, there is need to provide an enabling infrastructure in terms of communication, navigation, surveillance, auxiliary facilities and equipment, while securing the systems to ensure resilient to service disruption and effective maintenance to achieve availability and reliability. In addition, the Air Navigation Services Directorate will need to implement a performance management process for the modernization of air Navigation systems and the implementation of performance improvements within the ASBU framework,

(vi) **Research and Development:** In Kenya, there is lack of a serious R&D taking place even at the airline level, hence the need for establishment of an R&D function at the Authority. The function will conduct research and development for future aviation equipment, systems and services and recommend suitable technologies and operational improvement for implementation. This will require development of guidelines for R & D activities in KCAA.

2.1.2 Strategic Goals and Objectives

Strategic Goals No. 2 and 8 focuses on efficiency, safety, security, environment and risks management. These goals are closely related and directly linked to the environment protection component under the Airspace Master Plan. Strategic Goal No. 2 provides for Aviation Navigation Services modernization and performance improvement in line with the ASBUs Block 0 and while Strategic Goal No. 8 provides for governance aspects that goes a long way into environmental protection at local and global levels. Strategic Goals No. 2 and 8, therefore, forms a strong basis for the implementation of SEA Recommendations through the Airspace Master Plan.

The table below presents a self-explanatory outline of the 8No. Strategic Goals that KCAA has defined to achieve the Strategic Issues above. This forms the overall focus of the Strategic Direction for KCAA.

Table 4: KCAA Strategic Goals

Goal No.	Strategic Goal	Strategic Objectives
Strategic Goal 1:	Grow the air transport system and attain a sustainable safety and security oversight function.	Establish and maintain an effective safety and security oversight system
		Enhance compliance with legal and regulatory framework
		Develop a vibrant air transport system in Kenya
		Active participation in influencing national, regional and global aviation development.
Strategic Goal 2:	Improve Capacity, Efficiency, Safety and Security of Air Navigation	Maintain and Modernize Air Navigation Systems
		Develop and implement Operational Performance Management System.
Strategic Goal 3:	Improved business processes and systems	Undertake Business Processes Re-engineering
		Raise the level of brand resonance and recognition
		To enhance knowledge of emerging issues and best practices in the Aviation Industry
Strategic Goal 4:	Financial Sustainability and Efficiency in Supply Chain Management	Achieve an annual growth rate of 5% in revenue during the plan period.
		Set debt portfolio ceiling at 35% of revenue during the plan period
		Ensure optimum utilization of assets
		Limit operational expenditure to 70% of annual total expenditure
		Efficiency in supply chain management
Strategic Goal 5:	Build adequate and competent human capital	Review and implement the organizational structure
		Attract, manage and retain professional employees
Strategic Goal 6:	Enhanced Customer Service	Protect consumer rights and interests.
		Improve quality of customer service
Strategic Goal 7	Develop capacity to deliver quality training	Build EASA capacity to provide global aviation training.
Strategic Goal 8:	Environmental Protection, Governance and Risk Management	Transform into a risk intelligent Authority
		Upgrade governance structures
		Improve Internal Audit to be a high performing assurance and compliant Function
		Minimize adverse effects of aviation activities on environment

2.2 The Airspace Jurisdictions

2.2.1 Air Traffic Control Levels

Conventionally, aviation airspace is defined as that portion of atmosphere controlled by a state for aircrafts flying above its territory. It also covers areas of the oceans where the state is committed through international treaties to provide navigation services including air traffic control. Airspace comprises of controlled and uncontrolled categories defined as follows;

(iii) Controlled airspace is the extent where the air traffic control have control over aircrafts flying in that airspace to maintain safety and separation between aircrafts. This zone is referred to as Flight Information Region (FIR) where information and alerting services are provided. Civil aviation authorities prefer to keep controlled airspace to a minimum.

(iv) Uncontrolled airspace is the extent where aircrafts flying through are free and unconstrained by the air traffic control unless on request. None or minimal FIR services is required.

2.2.2 The Kenyan Airspace

According to the Airspace Master Plan, Kenyan airspace is one block covering the whole country known as Nairobi Flight Information Region (FIR). It extends into the Indian Ocean while a small part in northern Kenya falls under Khartoum FIR and Addis Ababa FIR to the north. Nairobi FIR is bordered by Dar-es-Salaam FIR on the south Entebbe FIR on the west, Mogadishu FIR to the east and Addis Ababa and Khartoum to the north. The Kenya Airspace has 2No. Levels with 2No. Sectors (Area North and Area South) comprising of;

(i) Upper airspace ranges between flight levels of pressure elevations at 24,500ft (FL245) to unlimited (i.e. into uncontrolled airspace) over Nairobi and Mombasa.

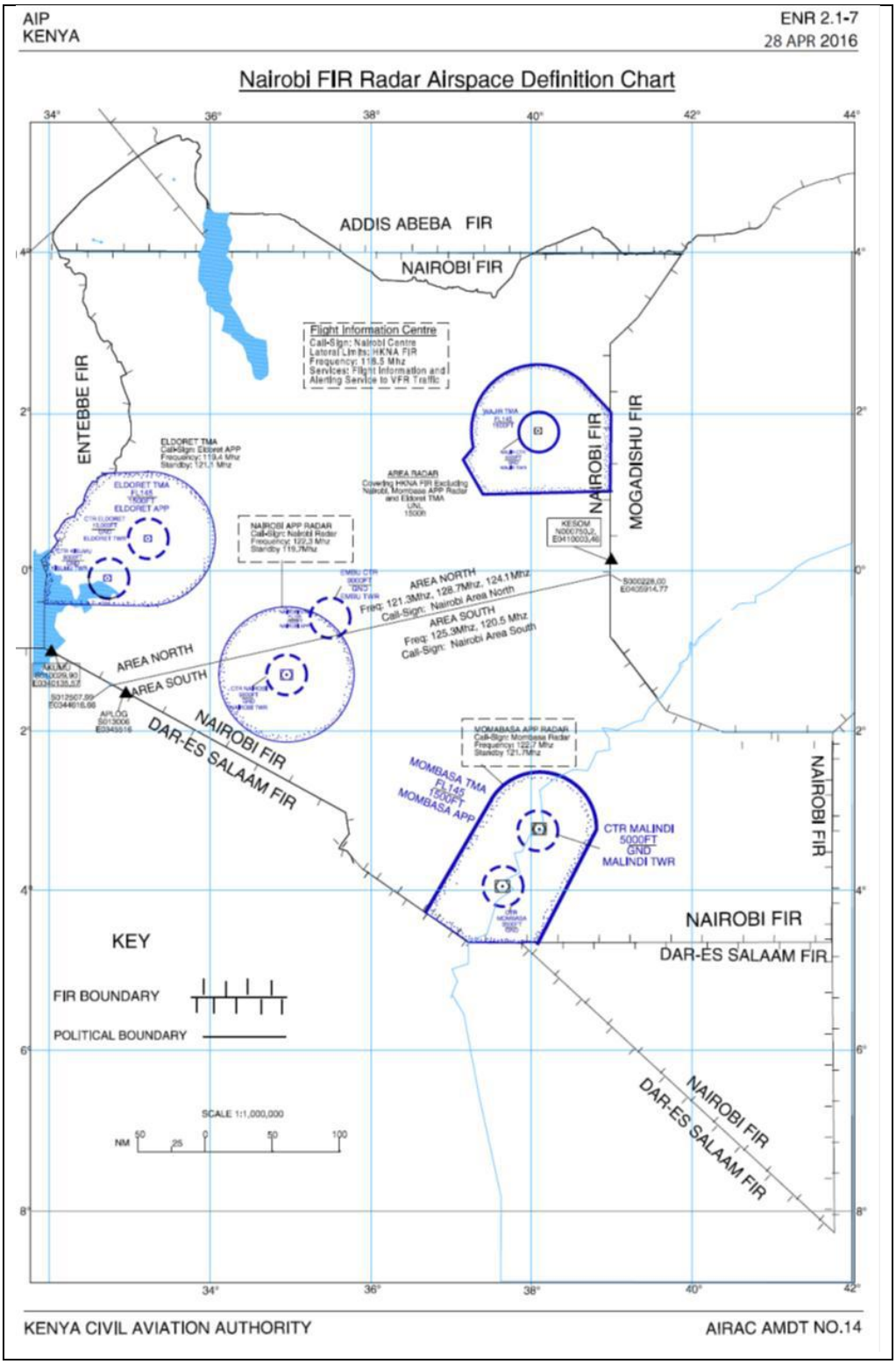
(ii) Lower airspace ranging from ground (1,500ft) to flight levels of pressure elevations at 24,500ft (FL245)

(iii) Air Traffic Services (ATS) comprising of hard and soft navigation services, installed equipment and software as well as an air traffic service routes.

(iv) Airports constitute the links of the airspace to the ground with the key airports comprising of international airports (JKIA, MIA, EIA, KIA, Malindi Airport, Wilson Airport, Wajir International Airport) and domestic airports (Lokichoggio Airport, Manda Airport, Nanyuki Airstrip, Ukunda Airstrip, Kakamega Airstrip, Busia Airstrip, Kitale Airstrip, Lodwar Airport, etc.) and a host of other aerodromes and airstrips around the country.

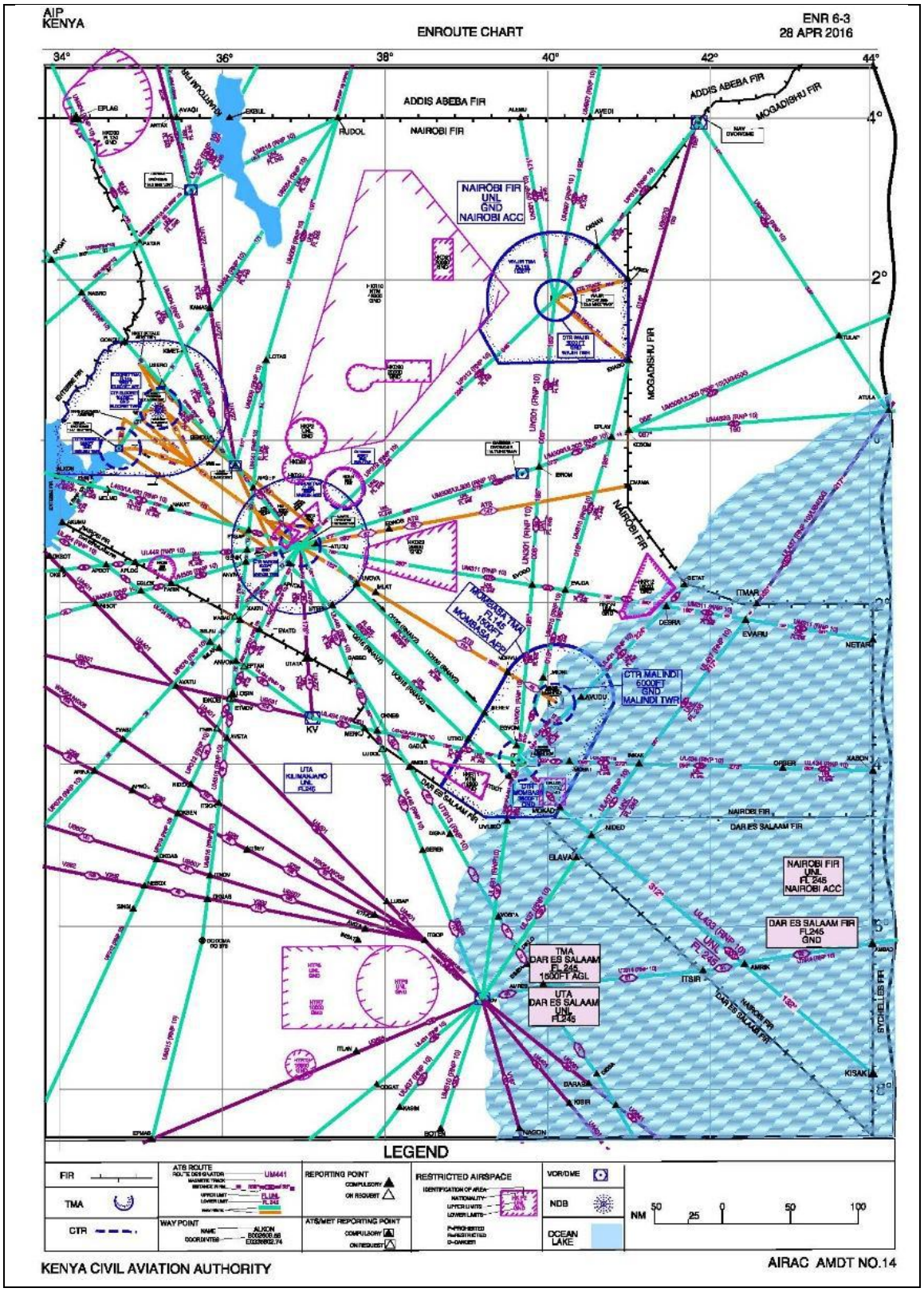
The Kenya Airspace boundary and flight tracks are illustrated in Figure 1 and 2 below.

Figure 1: Kenya Airspace Boundaries



Source: The Airspace Master Plan, 2015 – 2030

Figure 2: Established ATS Routes



Source: Air Space Master Plan 2015 – 2030

2.3 Kenya Airspace Constraints

2.3.1 Air Traffic Trends

The air traffic is divided into the Aircraft Movements (ATMs) consisting of Passenger and Freight. The excerpts from the Master Plan reports indicate as follows: There has been a steady increase in traffic (domestic flights, international flights and flights traversing the airspace) in the Kenyan airspace for the last 2 decades. Records from KCAA illustrates a traffic evolution of from 142,147 Air Traffic Movements (ATMs) in 1995 to 226,405ATMs in 2014 (60%) increase 315,081ATMs in 2018). Jomo Kenyatta International Airport (JKIA) and Wilson Airport seems to take much of the traffic volume where the trends rose from 40,634ATMs and 50,083ATMs in 1995 to 99,725ATMs and 91,315ATMs in 2014 respectively and reported at 114,201ATMs and 99,891ATMs respectively for the year 2018.

The traffic is also projected to rise from a total of 234,757ATMs in 2015 to 411,516 ATMs in 2030 (75% increase) with JKIA alone experiencing about 108% increase. The short term projection based on the current conditions is shows a total of 343,076ATMs by the year 2022. This has necessitated the need for improving and developing ANS infrastructure to cope with the situation.

The air traffic is divided into the Aircraft Movements (ATMs) consisting of Passenger and Freight. Traffic data was obtained from the Kenya Civil Aviation Authority covering the period June 2004 to June 2019 for various airports in Kenya. This data has been divided into Aircraft Movements, Passenger Traffic and Freight accordingly. For purposes of the strategic assessment, the data had been projected by following the best fit to the year 2030. The traffic data assessment has been split into:

(i) Overall Airports Air Traffic in Kenya
(ii) Air Traffic for Jomo Kenyatta International Airport
(iii) Air Traffic for Moi International Airport – Mombasa
(iv) Air Traffic for Eldoret International Airport
(v) Air Traffic for Kisumu International Airport
(vi) Air Traffic for Malindi International Airport
(vii) Air Traffic for Wilson Airport

From the general assessment of the data, it is evident that the overall data is a good representative of the other individual airports. Therefore, as this assignment is not intended for detailed assessment but presentation of the facts, the explanations in the overall Airports Air Traffic for Kenya will be sufficient and the data for individual airports is provided for validation of the inferences. The following sections summarizes the details of the data to give a more factual situation for each of the air traffic above

2.3.2 Overall Air Traffic in Kenya

This covers the traffic as provided by Kenya Civil Aviation as the summary of all landings and take offs (aircraft movements, passenger and freight) from all the Kenya's airports and main airstrips.

2.3.2.1 Aircraft Movements (ATMs)

The Table below summarizes the Aircraft movements in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

Table 5: Aircraft Movements for all the Kenya Airports

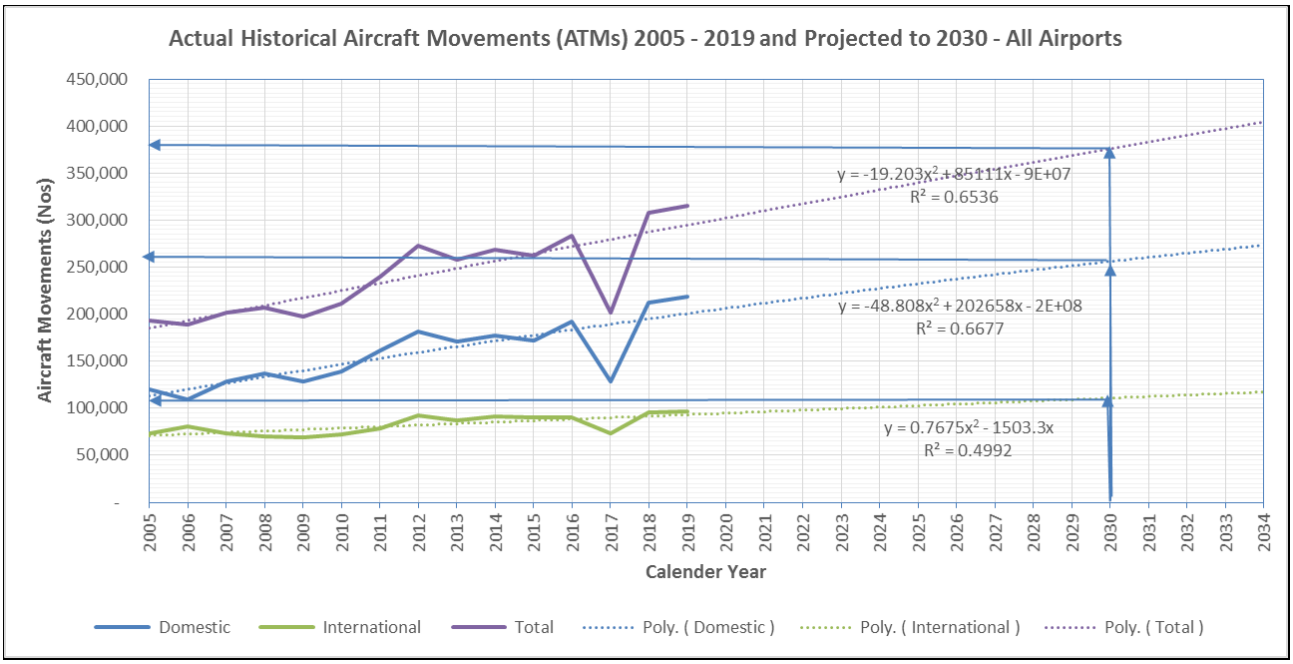
Year	Aircraft Movements - All Airports					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	119,907		73,646		193,553	
2006	108,930	-9.15%	80,341	9.09%	189,271	-2.21%
2007	128,245	17.73%	73,044	-9.08%	201,289	6.35%
2008	137,136	6.93%	69,714	-4.56%	206,850	2.76%
2009	128,500	-6.30%	68,637	-1.54%	197,137	-4.70%
2010	139,452	8.52%	71,782	4.58%	211,234	7.15%
2011	160,833	15.33%	78,901	9.92%	239,734	13.49%
2012	181,385	12.78%	91,884	16.45%	273,269	13.99%
2013	170,485	-6.01%	87,445	-4.83%	257,930	-5.61%
2014	177,467	4.10%	91,201	4.30%	268,668	4.16%
2015	171,912	-3.13%	89,782	-1.56%	261,694	-2.60%
2016	192,637	12.06%	90,674	0.99%	283,311	8.26%
2017	128,245	17.73%	73,044	-9.08%	201,289	-28.95%
2018	212,276	1.14%	95,568	3.87%	307,844	52.94%
2019	218,905	3.12%	96,176	0.64%	315,081	2.35%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Thus the air traffic movements in the country grew from 193,553ATMs in year 2005 to 315,081ATMs in year 2019. For this period, the year to year growth rates were mainly positive upto a maximum of 52.94%. For the same period, there were notable negative year to year growth rates which are attributable negative effects of diverse drivers of air transport growth. These include the heightened anxiety in the country usually encountered around the period of Political General elections that were held in 2007, 2013 and 2017; as well as the different scares occasioned by incidents of the deadly Ebola virus in East and Central Africa and other areas in the region; among other factors. The general trends enumerated from the traffic data provide the projected traffic in order to predict future traffic up to the year 2030.

Figure 3 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master plan horizon. From the figure, the year 2030 Aircraft Movements is estimated as 265,000ATMs and 115,000ATMs (total 380,000ATMs) for Domestic and International respectively.

Figure 3: Aircraft Movements for all Kenya's Airports and projected to Year 2030



2.3.2.2 Passenger Traffic

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

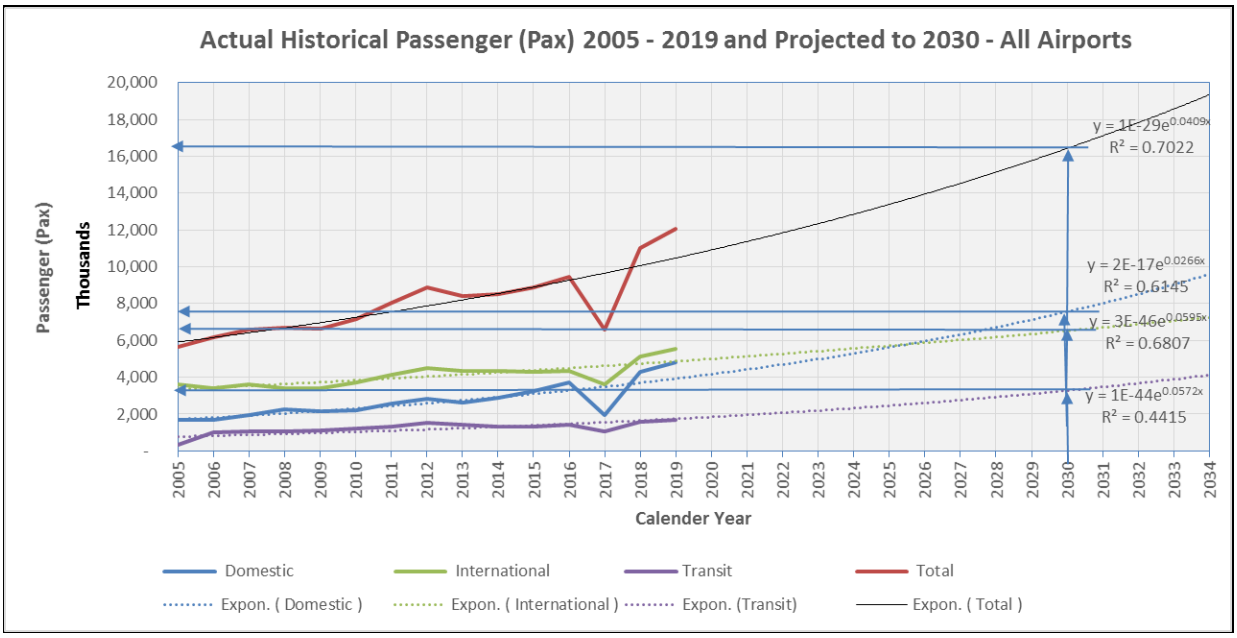
Table 6: Passenger Traffic for all the Kenya Airports

Year	Passengers - All Airports						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	1,702,420		3,628,076	0.00%	330,183	5,660,679	
2006	1,709,325	0.41%	3,426,004	-5.57%	1,015,055	6,150,384	8.65%
2007	1,926,213	12.69%	3,603,629	5.18%	1,059,632	6,589,474	7.14%
2008	2,233,951	15.98%	3,385,234	-6.06%	1,074,042	6,693,227	1.57%
2009	2,152,586	-3.64%	3,387,261	0.06%	1,094,679	6,634,526	-0.88%
2010	2,206,612	2.51%	3,717,506	9.75%	1,241,089	7,165,207	8.00%
2011	2,587,006	17.24%	4,140,437	11.38%	1,332,789	8,060,232	12.49%
2012	2,856,033	10.40%	4,491,225	8.47%	1,507,224	8,854,482	9.85%
2013	2,611,453	-8.56%	4,342,697	-3.31%	1,436,181	8,390,331	-5.24%
2014	2,867,891	9.82%	4,321,046	-0.50%	1,312,586	8,501,523	1.33%
2015	3,263,766	13.80%	4,279,659	-0.96%	1,345,744	8,889,169	4.56%
2016	3,695,582	13.23%	4,338,509	1.38%	1,430,738	9,464,829	6.48%
2017	1,926,213	12.69%	3,603,629	5.18%	1,059,632	6,589,474	-30.38%
2018	4,308,548	4.93%	5,145,238	9.85%	1,567,663	11,021,449	67.26%
2019	4,837,278	12.27%	5,538,277	7.64%	1,696,607	12,072,162	9.53%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Thus the Passenger traffic grew from 1,702,420pax to 4,837,278pax and 3,628,076pax to 5,538,277pax for Domestic and International Passengers in the period while the Transit Passengers from 330,183pax to 1,696,607pax giving a total from 5,660,679pax 12,072,162pax that is more than doubled in the period. Assuming a best fit assumption, prediction of the year 2030 traffic is estimated as; 7,200,000pax, 6,200,000pax and 3,150,000pax for Domestic, International and Transit respectively (with a total of 16,550,000pax). Figure 4 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 4: Passenger Traffic for all Kenya's Airports and projected to Year 2030



Particular interest is on the fact that the projected Domestic passengers will overtake International by the year 2027/28.

2.3.2.3 Freight Traffic

The Table below summarizes the Freight traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019). From the data, the Freight traffic growth rate has generally remained suppressed. The domestic Freight reduced for both Cargo and Mail by 3,362.7 metric tons (64.4%) and 256.7 metric tons (99%) respectively. That is a net reduction of 3,619.5 metric tons (66%) in the period. However in the period, International Freight Cargo and Main grew by 118,350.2 metric tons (47.9%) and 151.5 metric tons (21.94%) respectively.

For purpose of projection, the expected freight in the year 2030 is 2,200 metric tons, 507,800 metric tons for Domestic and International respectively (Total 510,000 metric tons). Thus from the trends, the Freight is expected to be predominantly International with Mail being minimal to nil as there are now other cheaper electronic mail options.

Table 7: Freight Traffic for all the Kenya Airports

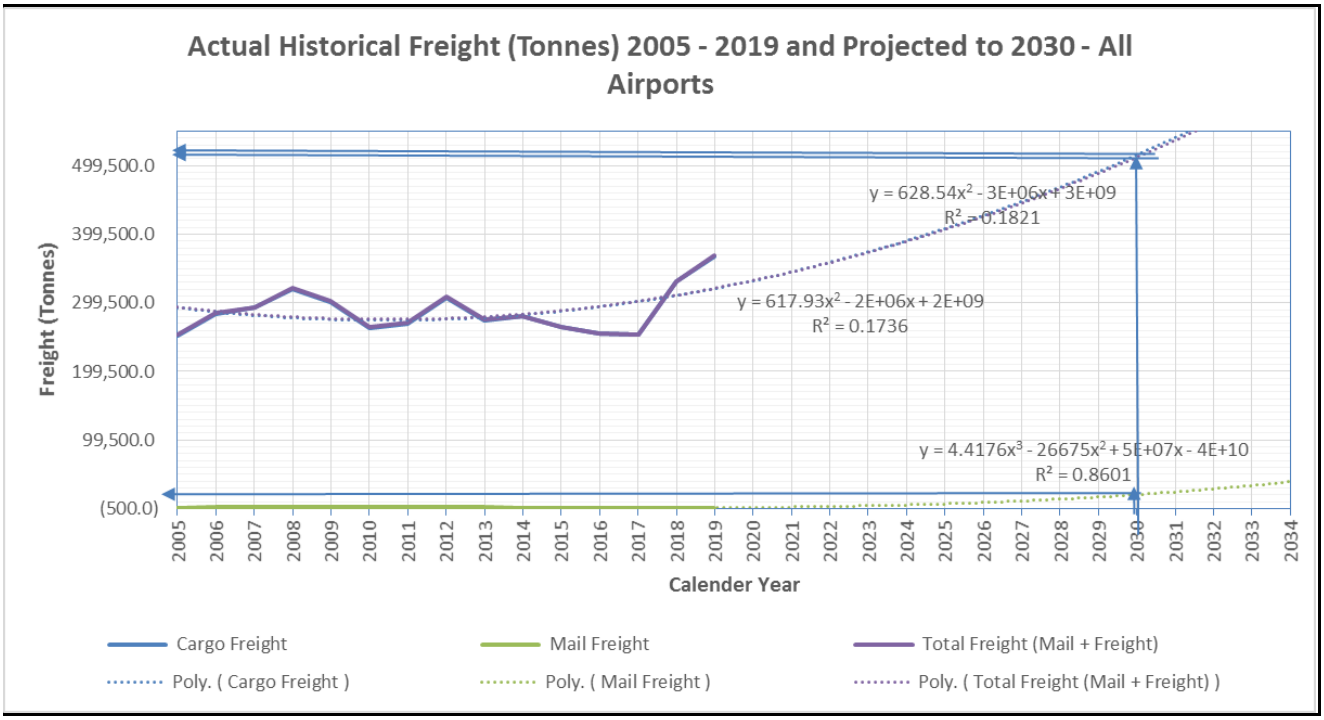
Year	Cargo Freight - All Airports						Mail Freight - All Airports						Total Freight (Mail + Freight)					
	Domestic		International		Total Freight		Domestic		International		Total Mail		Domestic		International		Grand Total Freigt	
	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %	Tons	Growth %
2005	5,223.7		247,072.6		252,296.4		0.3		690.5		690.7		5,224.0		247,763.1		252,987.1	
2006	5,664.2	8.43%	277,880.4	12.47%	283,544.6	12.39%	241.4	-6.85%	1,077.1	55.99%	1,318.5	90.88%	5,905.6	13.05%	278,957.5	12.59%	284,863.1	12.60%
2007	3,713.5	-34.44%	288,446.5	3.80%	292,160.0	3.04%	174.7	-27.63%	1,189.2	10.41%	1,363.8	3.44%	3,888.2	-34.16%	289,635.7	3.83%	293,523.8	3.04%
2008	8,609.6	131.85%	310,576.8	7.67%	319,186.4	9.25%	116.6	-33.26%	1,244.5	4.65%	1,361.0	-0.21%	8,726.2	124.43%	311,821.2	7.66%	320,547.4	9.21%
2009	2,645.1	-69.28%	297,735.8	-4.13%	300,380.9	-5.89%	92.4	-20.71%	1,459.5	17.28%	1,551.9	14.03%	2,737.6	-68.63%	299,195.3	-4.05%	301,932.8	-5.81%
2010	2,186.7	-17.33%	261,149.4	-12.29%	263,336.2	-12.33%	56.0	-39.42%	1,684.4	15.41%	1,740.4	12.14%	2,242.7	-18.08%	262,833.8	-12.15%	265,076.5	-12.21%
2011	1,953.5	-10.66%	267,219.6	2.32%	269,173.2	2.22%	29.6	-47.07%	1,567.7	-6.93%	1,597.3	-8.22%	1,983.2	-11.57%	268,787.3	2.27%	270,770.5	2.15%
2012	2,326.8	19.11%	305,372.2	14.28%	307,699.0	14.31%	30.9	4.36%	1,365.7	-12.88%	1,396.6	-12.56%	2,357.7	18.89%	306,737.9	14.12%	309,095.6	14.15%
2013	1,744.4	-25.03%	272,737.7	-10.69%	274,482.1	-10.80%	26.1	-15.50%	1,344.8	-1.53%	1,370.9	-1.84%	1,770.6	-24.90%	274,082.5	-10.65%	275,853.0	-10.75%
2014	3,225.3	84.89%	276,661.0	1.44%	279,886.2	1.97%	18.9	-27.86%	571.9	-57.47%	590.8	-56.91%	3,244.1	83.23%	277,232.9	1.15%	280,477.0	1.68%
2015	3,641.8	12.91%	260,076.1	-5.99%	263,717.9	-5.78%	22.7	20.16%	476.4	-16.71%	499.0	-15.54%	3,664.5	12.96%	260,552.4	-6.02%	264,216.9	-5.80%
2016	3,612.4	-0.81%	250,671.4	-3.62%	254,283.8	-3.58%	19.1	-15.50%	542.8	13.96%	562.0	12.62%	3,631.6	-0.90%	251,214.2	-3.58%	254,845.8	-3.55%
2017	1,198.7	-66.82%	251,667.1	0.40%	252,865.8	-0.56%	1.9	-90.24%	465.8	-14.20%	467.6	-16.79%	1,200.6	-66.94%	252,132.9	0.37%	253,333.5	-0.59%
2018	1,564.6	30.53%	329,020.5	30.74%	330,585.1	30.74%	2.2	18.74%	741.0	59.09%	743.2	58.92%	1,566.8	30.51%	329,761.4	30.79%	331,328.3	30.79%
2019	1,861.0	18.94%	365,422.9	11.06%	367,283.9	11.10%	2.4	6.90%	841.9	13.62%	844.3	13.60%	1,863.4	18.93%	366,264.8	11.07%	368,128.2	11.11%

Summary of the Freight Traffic and Projection for the Year 2030							
Year	Cargo Freight (tons)		Mail Freight (tons)		Total Freight (tons)		
	Domestic	International	Domestic	International	Domestic	International	Total
2005	5,223.7	247,072.6	0.3	690.5	**5,224.0**	**247,763.1**	**252,987.1**
2019	1,861.0	365,422.9	2.4	841.9	**1,863.4**	**366,264.8**	**368,128.2**
2030					**2,200.0**	**507,800.0**	**510,000.0**

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 5 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 5: Freight Traffic for all Kenya's Airports and projected to Year 2030



Freight Traffic were recorded only in Jomo Kenyatta International Airport, Moi International Airport, Eldoret International Airport and Wilson Airport.

2.3.2.4 Air Traffic for Jomo Kenyatta International Airport

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Jomo Kenyatta International Airport for the Period June 2004 to June 2019.

Aircraft Movements (ATMs) – JKIA

The Table below summarizes the Aircraft movements at Jomo Kenyatta International Airport for the period June 2004 (read year 2005) to June 2019 (read year 2019).

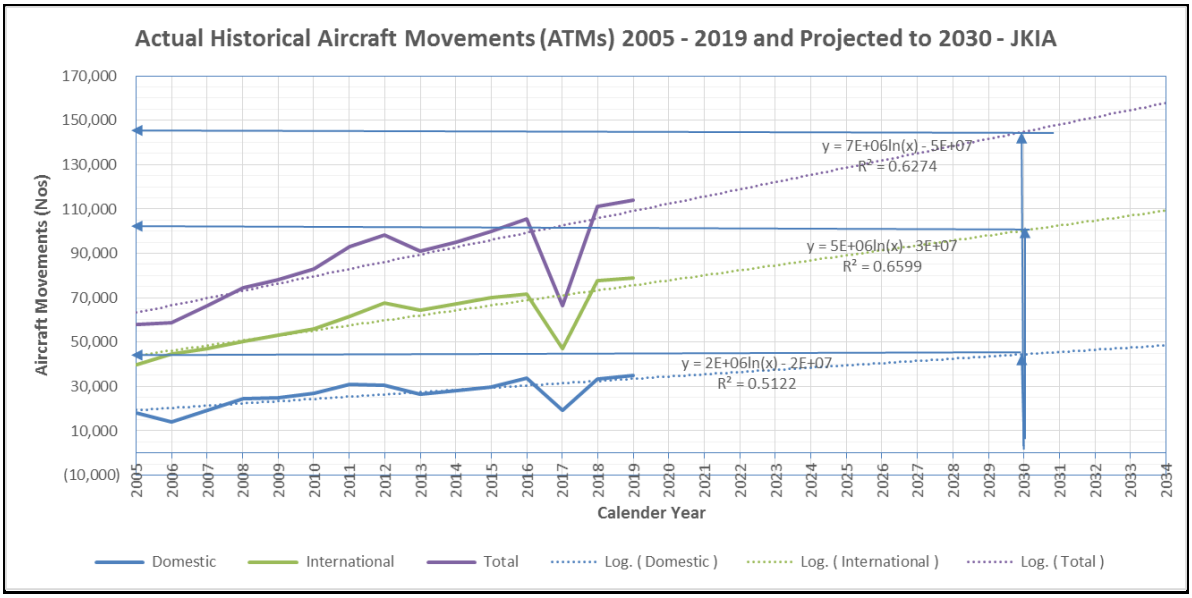
Table 8: Aircraft Movements for Jomo Kenyatta International Airport

Year	Aircraft Movements - JKIA					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	18,244		39,898		58,142	
2006	14,185	-22.25%	44,600	11.79%	58,785	1.11%
2007	19,299	36.05%	47,059	5.51%	66,358	12.88%
2008	24,472	26.80%	50,167	6.60%	74,639	12.48%
2009	25,065	2.42%	53,186	6.02%	78,251	4.84%
2010	26,978	7.63%	55,925	5.15%	82,903	5.94%
2011	31,110	15.32%	61,754	10.42%	92,864	12.02%
2012	30,758	-1.13%	67,518	9.33%	98,276	5.83%
2013	26,660	-13.32%	64,333	-4.72%	90,993	-7.41%
2014	28,108	5.43%	67,077	4.27%	95,185	4.61%
2015	29,781	5.95%	69,935	4.26%	99,716	4.76%
2016	33,856	13.68%	71,497	2.23%	105,353	5.65%
2017	19,299	36.05%	47,059	5.51%	66,358	-37.01%
2018	33,456	-4.36%	77,670	6.06%	111,126	67.46%
2019	35,083	4.86%	79,118	1.86%	114,201	2.77%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 6 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 6: Aircraft Movements for JKIA projected to Year 2030



Passenger Traffic – JKIA

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

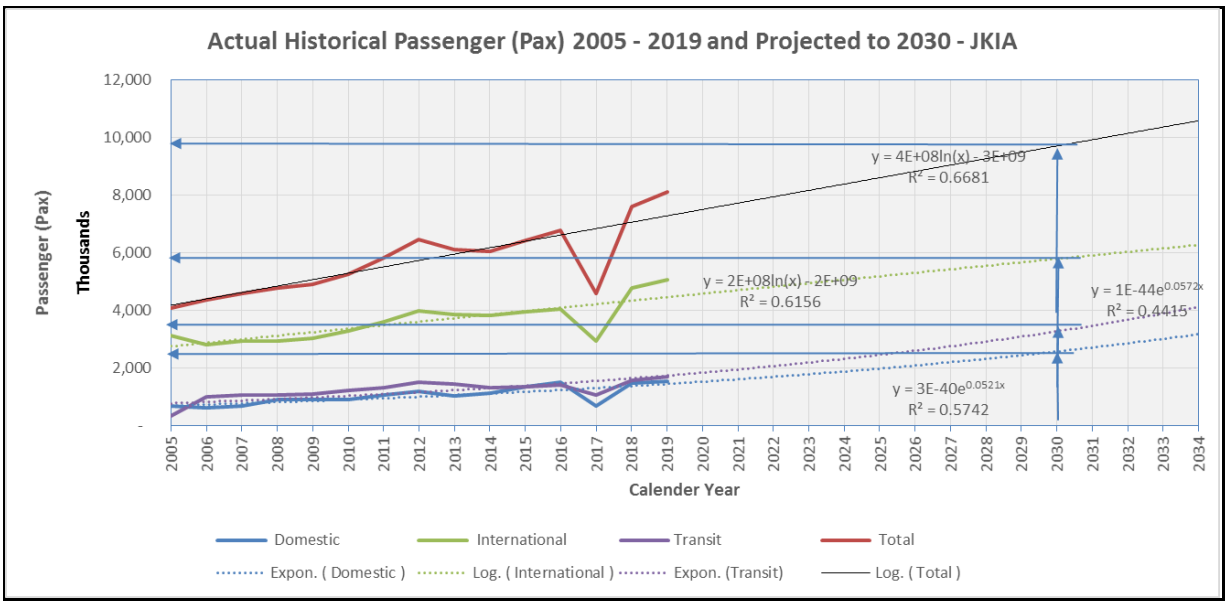
Table 9: Passenger Traffic for JKIA

Year	Passengers - JKIA						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	686,516		3,126,387	0.00%	272,718	4,085,621	
2006	631,531	-8.01%	2,807,563	-10.20%	936,200	4,375,294	7.09%
2007	698,488	10.60%	2,943,930	4.86%	943,557	4,585,975	4.82%
2008	897,716	28.52%	2,932,888	-0.38%	953,943	4,784,547	4.33%
2009	917,150	2.16%	3,040,266	3.66%	965,125	4,922,541	2.88%
2010	905,563	-1.26%	3,279,922	7.88%	1,068,200	5,253,685	6.73%
2011	1,081,786	19.46%	3,597,468	9.68%	1,158,004	5,837,258	11.11%
2012	1,213,296	12.16%	3,976,397	10.53%	1,272,476	6,462,169	10.71%
2013	1,044,080	-13.95%	3,871,460	-2.64%	1,213,685	6,129,225	-5.15%
2014	1,141,870	9.37%	3,835,009	-0.94%	1,089,255	6,066,134	-1.03%
2015	1,362,147	19.29%	3,943,930	2.84%	1,122,522	6,428,599	5.98%
2016	1,515,293	11.24%	4,065,713	3.09%	1,187,249	6,768,255	5.28%
2017	698,488	10.60%	2,943,930	4.86%	943,557	4,585,975	-32.24%
2018	1,496,089	-7.25%	4,774,539	9.17%	1,338,837	7,609,465	65.93%
2019	1,549,967	3.60%	5,076,091	6.32%	1,497,633	8,123,691	6.76%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 4 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 7: Passenger Traffic for JKIA and projected to Year 2030



Freight Traffic – JKIA

The Table below summarizes the Freight traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

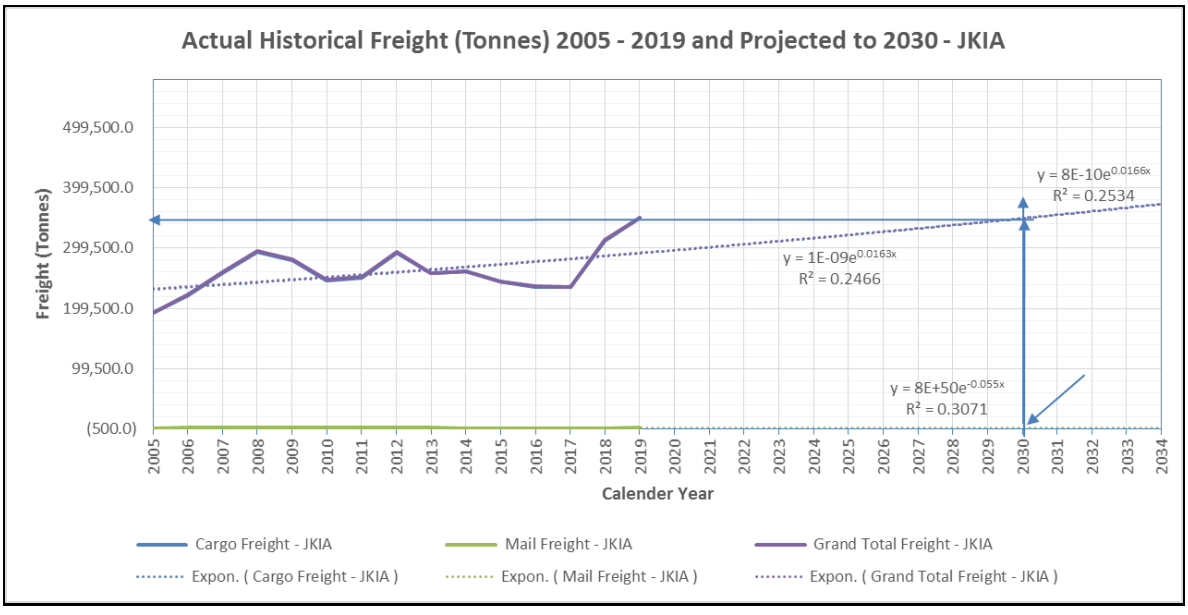
Table 10: Freight Traffic for JKIA

Year	Cargo Freight - JKIA						Mail Freight - JKIA						Grand Total Freight - JKIA					
	Domestic		International		Total Freight		Domestic		International		Total Mail		Domestic		International		Grand Total Freigt	
	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %
2005	2,526.0		189,066.2		191,592.2		47.7		680.3		727.9		2,573.7		189,746.4		192,320.1	
2006	3,048.3	20.68%	218,689.5	15.67%	221,737.8	15.73%	81.7	71.33%	1,073.9	57.86%	1,155.5	58.74%	3,129.9	21.61%	219,763.3	15.82%	222,893.3	15.90%
2007	1,568.6	-48.54%	256,068.1	17.09%	257,636.7	16.19%	105.1	28.62%	1,185.3	10.38%	1,290.4	11.67%	1,673.6	-46.53%	257,253.5	17.06%	258,927.1	16.17%
2008	6,812.3	334.30%	287,164.9	12.14%	293,977.1	14.11%	56.8	-45.94%	1,243.3	4.89%	1,300.1	0.75%	6,869.1	310.43%	288,408.2	12.11%	295,277.2	14.04%
2009	1,196.1	-82.44%	278,263.4	-3.10%	279,459.5	-4.94%	40.4	-28.92%	1,459.5	17.39%	1,499.9	15.37%	1,236.5	-82.00%	279,722.9	-3.01%	280,959.4	-4.85%
2010	1,211.6	1.29%	244,063.7	-12.29%	245,275.3	-12.23%	25.0	-38.16%	1,684.4	15.41%	1,709.3	13.96%	1,236.6	0.00%	245,748.1	-12.15%	246,984.6	-12.09%
2011	1,507.2	24.40%	248,302.7	1.74%	249,809.9	1.85%	6.4	-74.44%	1,559.4	-7.42%	1,565.7	-8.40%	1,513.6	22.40%	249,862.1	1.67%	251,375.6	1.78%
2012	1,725.6	14.49%	290,163.1	16.86%	291,888.7	16.84%	5.0	-21.23%	1,363.0	-12.59%	1,368.0	-12.63%	1,730.6	14.34%	291,526.1	16.67%	293,256.7	16.66%
2013	1,085.9	-37.07%	256,121.1	-11.73%	257,207.0	-11.88%	7.5	48.56%	1,344.5	-1.35%	1,352.0	-1.17%	1,093.4	-36.82%	257,465.6	-11.68%	258,559.0	-11.83%
2014	2,720.2	150.50%	258,355.9	0.87%	261,076.1	1.50%	3.5	-52.99%	567.7	-57.78%	571.2	-57.75%	2,723.7	149.11%	258,923.6	0.57%	261,647.3	1.19%
2015	3,142.8	15.54%	240,372.6	-6.96%	243,515.4	-6.73%	111.9	3090.31%	476.2	-16.12%	588.2	2.97%	3,254.7	19.50%	240,848.8	-6.98%	244,103.6	-6.71%
2016	2,076.5	-33.93%	233,270.0	-2.95%	235,346.5	-3.35%	5.5	-95.08%	538.2	13.01%	543.7	-7.57%	2,082.0	-36.03%	233,808.2	-2.92%	235,890.2	-3.36%
2017	580.1	-72.06%	233,585.0	0.14%	234,165.1	-0.50%	0.8	-85.81%	465.1	-13.57%	465.9	-14.30%	580.9	-72.10%	234,050.1	0.10%	234,631.0	-0.53%
2018	705.6	21.63%	311,627.3	33.41%	312,332.9	33.38%	1.1	42.71%	740.5	59.20%	741.6	59.18%	706.7	21.66%	312,367.8	33.46%	313,074.5	33.43%
2019	851.4	20.66%	349,124.2	12.03%	349,975.6	12.05%	1.4	23.12%	841.9	13.70%	843.3	13.71%	852.8	20.67%	349,966.1	12.04%	350,818.9	12.06%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 8 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 8: Freight Traffic for JKIA and projected to Year 2030



2.3.2.5 Air Traffic for Moi International Airport – Mombasa

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Moi International Airport for the Period June 2004 to June 2019.

Aircraft Movements (ATMs) – MIA

The Table below summarizes the Aircraft movements at Moi International Airport (Mombasa) for the period June 2004 (read year 2005) to June 2019 (read year 2019).

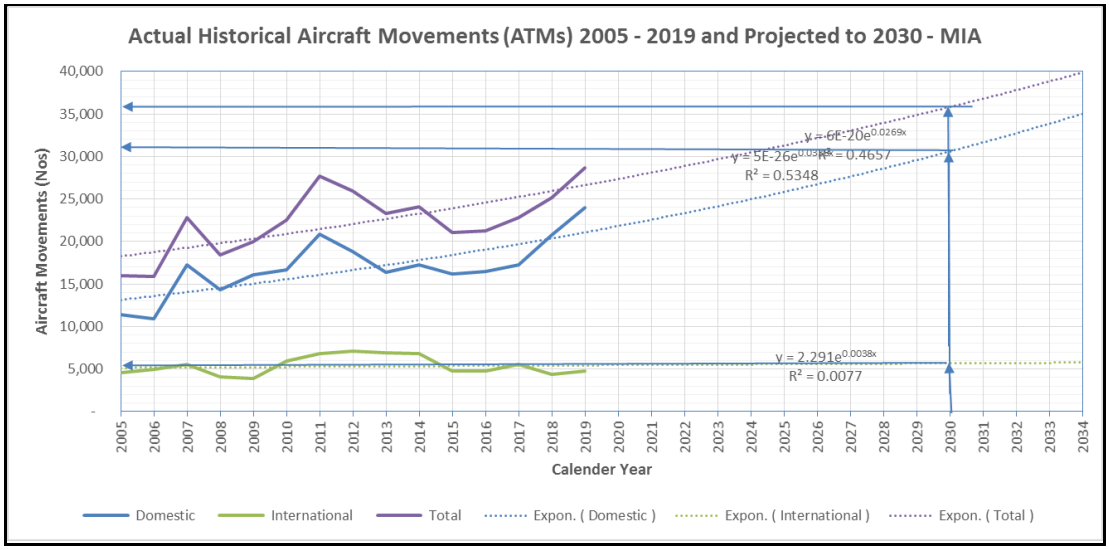
Table 11: Aircraft Movements for Moi International Airport

Year	Aircraft Movements - MIA					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	11,434		4,569		16,003	
2006	10,902	-4.65%	4,941	8.14%	15,843	-1.00%
2007	17,247	58.20%	5,567	12.67%	22,814	44.00%
2008	14,288	-17.16%	4,125	-25.90%	18,413	-19.29%
2009	16,098	12.67%	3,928	-4.78%	20,026	8.76%
2010	16,631	3.31%	5,895	50.08%	22,526	12.48%
2011	20,886	25.58%	6,815	15.61%	27,701	22.97%
2012	18,828	-9.85%	7,078	3.86%	25,906	-6.48%
2013	16,391	-12.94%	6,925	-2.16%	23,316	-10.00%
2014	17,269	5.36%	6,781	-2.08%	24,050	3.15%
2015	16,210	-6.13%	4,808	-29.10%	21,018	-12.61%
2016	16,441	1.43%	4,766	-0.87%	21,207	0.90%
2017	17,247	58.20%	5,567	12.67%	22,814	7.58%
2018	20,780	16.13%	4,418	-5.78%	25,198	10.45%
2019	23,964	15.32%	4,748	7.47%	28,712	13.95%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 6 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 9: Aircraft Movements for MIA projected to Year 2030



Passenger Traffic – MIA

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

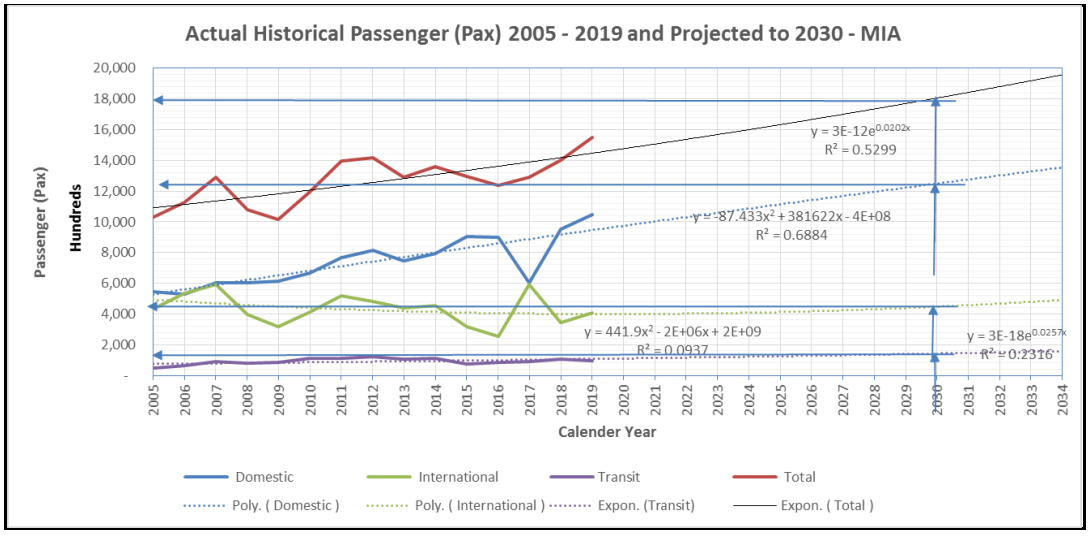
Table 12: Passenger Traffic for MIA

Year	Passengers - MIA						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	546,999		432,898	0.00%	49,673	1,029,570	
2006	529,664	-3.17%	532,757	23.07%	64,211	1,126,632	9.43%
2007	604,927	14.21%	594,312	11.55%	90,777	1,290,016	14.50%
2008	603,744	-0.20%	395,436	-33.46%	80,398	1,079,578	-16.31%
2009	613,090	1.55%	316,794	-19.89%	83,219	1,013,103	-6.16%
2010	667,408	8.86%	413,402	30.50%	112,746	1,193,556	17.81%
2011	767,615	15.01%	517,767	25.25%	111,883	1,397,265	17.07%
2012	817,231	6.46%	480,367	-7.22%	120,356	1,417,954	1.48%
2013	743,965	-8.97%	439,319	-8.55%	107,152	1,290,436	-8.99%
2014	794,917	6.85%	453,775	3.29%	109,838	1,358,530	5.28%
2015	906,691	14.06%	315,421	-30.49%	74,312	1,296,424	-4.57%
2016	898,968	-0.85%	254,685	-19.26%	85,880	1,239,533	-4.39%
2017	604,927	14.21%	594,312	11.55%	90,777	1,290,016	4.07%
2018	953,748	-4.38%	343,285	18.87%	104,173	1,401,206	8.62%
2019	1,047,612	9.84%	409,388	19.26%	94,154	1,551,154	10.70%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 10 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 10: Passenger Traffic for MIA and projected to Year 2030



Freight Traffic – MIA

The Table below summarizes the Freight traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

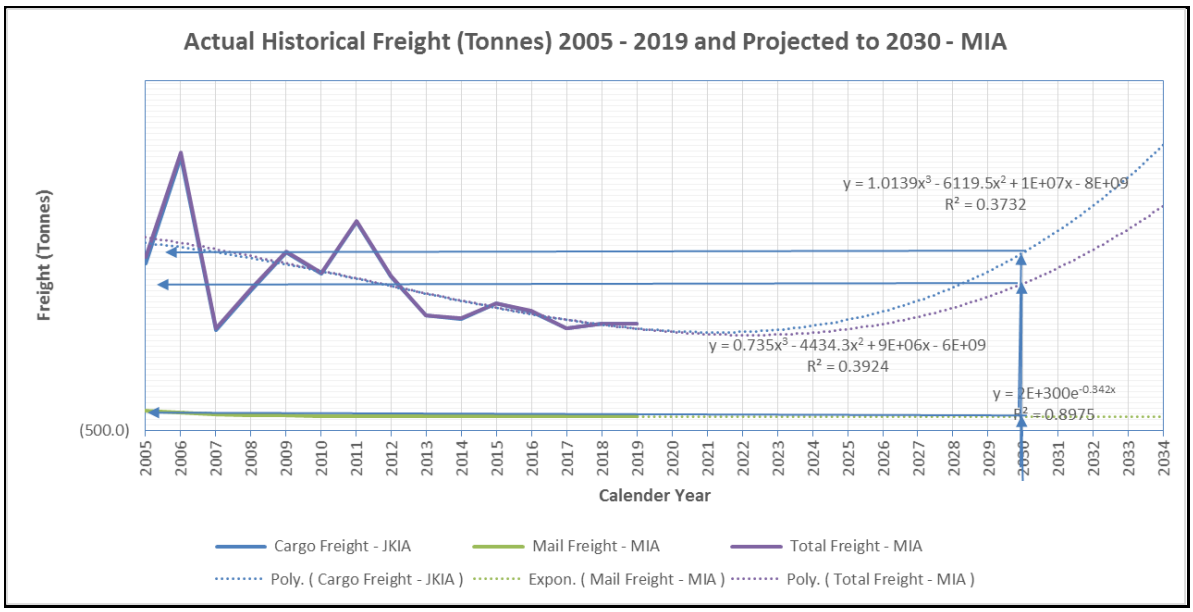
Table 13: Freight Traffic for MIA

Year	Cargo Freight - MIA						Mail Freight - MIA						Total Freight - MIA					
	Domestic		International		Total Freight		Domestic		International		Total Mail		Domestic		International		Grand Total Freigt	
	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %
2005	1,606.1		3,874.2		5,480.3		207.9		10.2		218.1		1,814.0		3,884.4		5,698.4	
2006	1,994.0	24.15%	7,294.8	88.29%	9,288.8	69.50%	159.7	-23.19%	3.2	-68.45%	162.9	-25.30%	2,153.7	18.73%	7,298.0	87.88%	9,451.8	65.87%
2007	1,311.2	-34.25%	1,770.2	-75.73%	3,081.4	-66.83%	69.6	-56.40%	3.8	18.42%	73.4	-54.92%	1,380.8	-35.89%	1,774.0	-75.69%	3,154.8	-66.62%
2008	866.5	-33.91%	3,635.5	105.38%	4,502.1	46.11%	59.8	-14.13%	1.1	-70.23%	60.9	-17.05%	926.3	-32.91%	3,636.7	105.00%	4,563.0	44.64%
2009	886.8	2.34%	4,965.1	36.57%	5,851.9	29.98%	52.1	-12.91%	-	-100.00%	52.1	-14.53%	938.9	1.36%	4,965.1	36.53%	5,904.0	29.39%
2010	592.1	-33.23%	4,521.5	-8.93%	5,113.7	-12.62%	31.0	-40.40%	-		31.0	-40.40%	623.2	-33.63%	4,521.5	-8.93%	5,144.7	-12.86%
2011	290.4	-50.96%	6,679.7	47.73%	6,970.1	36.30%	23.3	-25.05%	8.3		31.6	1.70%	313.6	-49.67%	6,688.0	47.92%	7,001.7	36.09%
2012	247.8	-14.67%	4,752.5	-28.85%	5,000.3	-28.26%	25.9	11.37%	2.7	-66.96%	28.6	-9.23%	273.7	-12.74%	4,755.3	-28.90%	5,029.0	-28.17%
2013	459.8	85.56%	3,150.3	-33.71%	3,610.1	-27.80%	18.7	-27.93%	0.3	-90.70%	18.9	-33.94%	478.5	74.82%	3,150.5	-33.75%	3,629.0	-27.84%
2014	326.7	-28.95%	3,172.1	0.69%	3,498.8	-3.08%	15.3	-17.81%	4.2	1560.39%	19.6	3.45%	342.0	-28.52%	3,176.4	0.82%	3,518.4	-3.05%
2015	335.9	2.83%	3,705.3	16.81%	4,041.2	15.50%	8.4	-45.57%	0.1	-96.84%	8.5	-56.66%	344.3	0.66%	3,705.4	16.66%	4,049.7	15.10%
2016	1,314.1	291.16%	2,443.8	-34.05%	3,757.8	-7.01%	13.6	63.23%	4.7	3396.27%	18.3	115.86%	1,327.7	285.63%	2,448.5	-33.92%	3,776.2	-6.75%
2017	409.8	-68.81%	2,733.3	11.85%	3,143.1	-16.36%	1.1	-92.03%	0.7	-85.85%	1.7	-90.45%	410.9	-69.05%	2,734.0	11.66%	3,144.8	-16.72%
2018	575.2	40.36%	2,759.3	0.95%	3,334.5	6.09%	1.1	1.47%	0.5	-23.98%	1.6	-8.18%	576.3	40.26%	2,759.8	0.94%	3,336.1	6.08%
2019	783.7	36.25%	2,548.2	-7.65%	3,331.9	-0.08%	1.0	-9.53%	-	-100.00%	1.0	-37.92%	784.7	36.16%	2,548.2	-7.67%	3,332.9	-0.10%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 11 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 11: Freight Traffic for MIA and projected to Year 2030



2.3.2.6 Air Traffic for Eldoret International Airport

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Eldoret International Airport (EIA) for the Period June 2004 to June 2019.

Aircraft Movements (ATMs) – EIA

The Table below summarizes the Aircraft movements at Eldoret International Airport for the period June 2004 (read year 2005) to June 2019 (read year 2019).

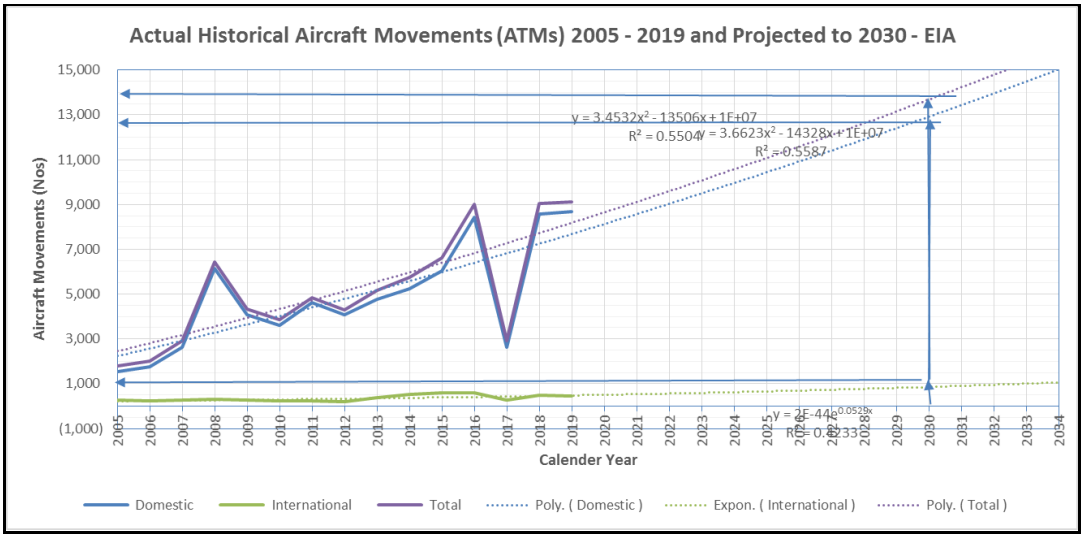
Table 14: Aircraft Movements for Eldoret International Airport (EIA)

Year	Aircraft Movements - EIA					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	1,545		254		1,799	
2006	1,772	14.69%	249	-1.97%	2,021	12.34%
2007	2,629	48.36%	281	12.85%	2,910	43.99%
2008	6,127	133.05%	310	10.32%	6,437	121.20%
2009	4,067	-33.62%	263	-15.16%	4,330	-32.73%
2010	3,612	-11.19%	241	-8.37%	3,853	-11.02%
2011	4,612	27.69%	220	-8.71%	4,832	25.41%
2012	4,094	-11.23%	208	-5.45%	4,302	-10.97%
2013	4,780	16.76%	376	80.77%	5,156	19.85%
2014	5,224	9.29%	531	41.22%	5,755	11.62%
2015	6,034	15.51%	590	11.11%	6,624	15.10%
2016	8,413	39.43%	580	-1.69%	8,993	35.76%
2017	2,629	48.36%	281	12.85%	2,910	-67.64%
2018	8,565	-1.90%	480	-5.51%	9,045	210.82%
2019	8,679	1.33%	439	-8.54%	9,118	0.81%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 12 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 12: Aircraft Movements for Eldoret projected to Year 2030



Passenger Traffic – EIA

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

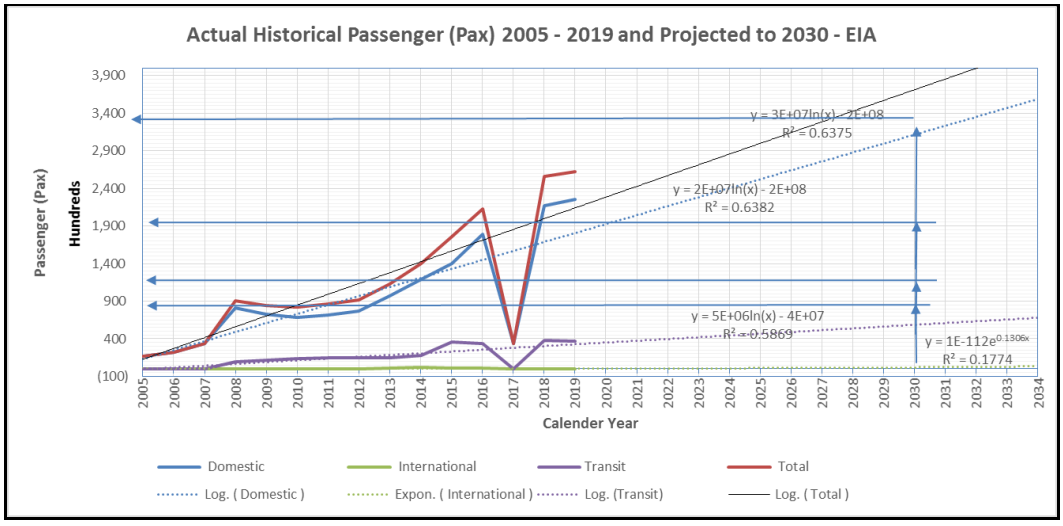
Table 15: Passenger Traffic for EIA

Year	Passengers - EIA						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	16,789		161	0.00%	127	17,077	
2006	21,965	30.83%	166	3.11%	190	22,321	30.71%
2007	33,522	52.62%	71	-57.23%	385	33,978	52.22%
2008	81,490	143.09%	143	101.41%	9,078	90,711	166.97%
2009	72,408	-11.14%	8	-94.41%	11,673	84,089	-7.30%
2010	68,500	-5.40%	58	625.00%	13,310	81,868	-2.64%
2011	71,497	4.38%	129	122.41%	14,725	86,351	5.48%
2012	77,011	7.71%	131	1.55%	14,256	91,398	5.84%
2013	96,844	25.75%	1,229	838.17%	14,995	113,068	23.71%
2014	119,526	23.42%	2,304	87.47%	18,221	140,051	23.86%
2015	139,805	16.97%	819	-64.45%	35,443	176,067	25.72%
2016	178,925	27.98%	471	-42.49%	33,382	212,778	20.85%
2017	33,522	52.62%	71	-57.23%	385	33,978	-84.03%
2018	217,573	13.01%	293	-37.92%	38,094	255,960	653.31%
2019	225,399	3.60%	324	10.58%	36,939	262,662	2.62%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 13 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 13: Passenger Traffic for EIA and projected to Year 2030



Freight Traffic – EIA

The Table below summarizes the Freight traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

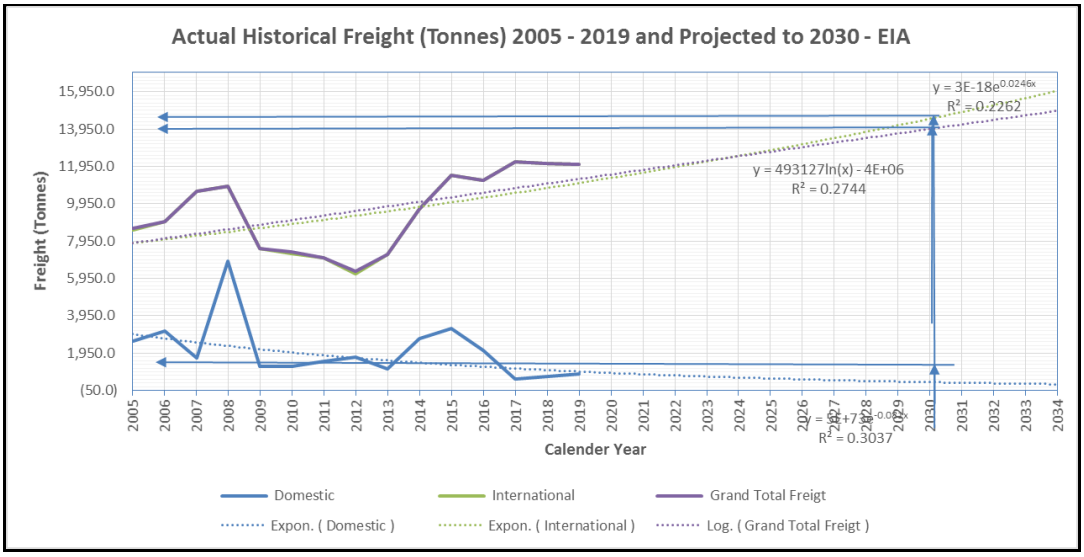
Table 16: Freight Traffic for EIA

Year	Freight Freight - EIA					
	Domestic		International		Total Freight	
	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %
2005	91.1		8,548.1		8,639.3	
2006	-	-100.00%	8,989.0	5.16%	8,989.0	4.05%
2007	2.6	-	10,607.2	18.00%	10,609.8	18.03%
2008	13.0	409.80%	10,883.4	2.60%	10,896.4	2.70%
2009	-	-100.00%	7,550.2	-30.63%	7,550.2	-30.71%
2010	73.7	-	7,303.6	-3.27%	7,377.4	-2.29%
2011	-	-100.00%	7,053.3	-3.43%	7,053.3	-4.39%
2012	120.0	-	6,209.9	-11.96%	6,329.9	-10.26%
2013	-	-100.00%	7,241.3	16.61%	7,241.3	14.40%
2014	-	-	9,673.6	33.59%	9,673.6	33.59%
2015	-	-	11,495.1	18.83%	11,495.1	18.83%
2016	-	-	11,224.5	-2.35%	11,224.5	-2.35%
2017	-	-	12,185.5	8.56%	12,185.5	8.56%
2018	-	-	12,123.5	-0.51%	12,123.5	-0.51%
2019	-	-	12,079.5	-0.36%	12,079.5	-0.36%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 14 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 14: Freight Traffic for EIA and projected to Year 2030



2.3.2.7 Air Traffic for Kisumu International Airport

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Kisumu International Airport (KIA) for the Period June 2004 to June 2019. There is no Freight traffic for KIA.

Aircraft Movements (ATMs) – KIA

The Table below summarizes the Aircraft movements at Kisumu International Airport for the period June 2004 (read year 2005) to June 2019 (read year 2019).

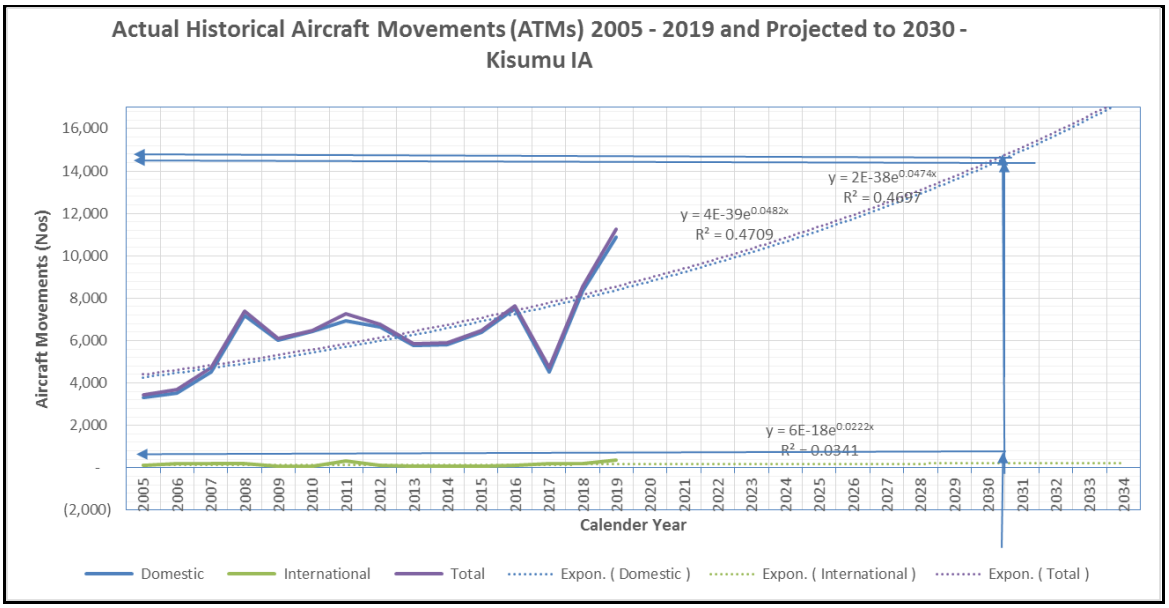
Table 17: Aircraft Movements for Kisumu International Airport (KIA)

Year	Aircraft Movements - Kisumu					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	3,319		120		3,439	
2006	3,507	5.66%	184	53.33%	3,691	7.33%
2007	4,537	29.37%	180	-2.17%	4,717	27.80%
2008	7,194	58.56%	180	0.00%	7,374	56.33%
2009	6,003	-16.56%	90	-50.00%	6,093	-17.37%
2010	6,416	6.88%	67	-25.56%	6,483	6.40%
2011	6,914	7.76%	337	402.99%	7,251	11.85%
2012	6,643	-3.92%	113	-66.47%	6,756	-6.83%
2013	5,775	-13.07%	76	-32.74%	5,851	-13.40%
2014	5,826	0.88%	77	1.32%	5,903	0.89%
2015	6,406	9.96%	79	2.60%	6,485	9.86%
2016	7,521	17.41%	137	73.42%	7,658	18.09%
2017	4,537	29.37%	180	-2.17%	4,717	-38.40%
2018	8,329	11.37%	219	2.82%	8,548	81.22%
2019	10,886	30.70%	369	68.49%	11,255	31.67%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 15 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 15: Aircraft Movements for KIA projected to Year 2030



Passenger Traffic – KIA

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

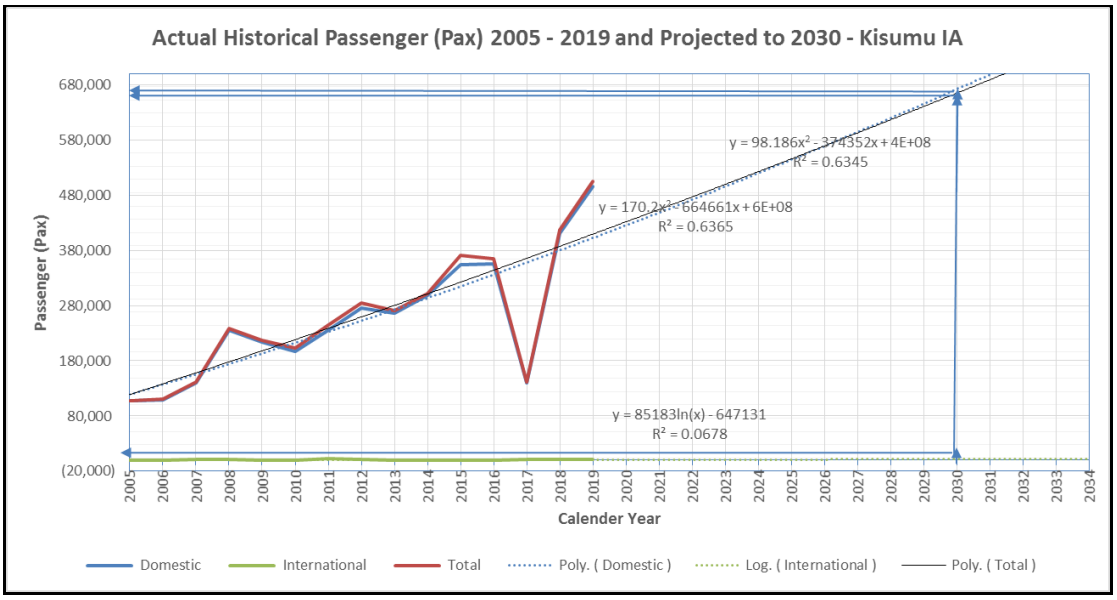
Table 18: Passenger Traffic for KIA

Year	Passengers - Kisumu						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	107,156		404	0.00%	194	107,754	
2006	109,338	2.04%	561	38.86%	731	110,630	2.67%
2007	139,311	27.41%	709	26.38%	957	140,977	27.43%
2008	235,034	68.71%	1,092	54.02%	1,800	237,926	68.77%
2009	213,994	-8.95%	499	-54.30%	2,570	217,063	-8.77%
2010	196,879	-8.00%	128	-74.35%	5,690	202,697	-6.62%
2011	235,443	19.59%	2,655	1974.22%	6,707	244,805	20.77%
2012	276,158	17.29%	964	-63.69%	7,973	285,095	16.46%
2013	265,635	-3.81%	379	-60.68%	4,208	270,222	-5.22%
2014	299,256	12.66%	420	10.82%	1,930	301,606	11.61%
2015	354,102	18.33%	281	-33.10%	16,935	371,318	23.11%
2016	356,197	0.59%	265	-5.69%	7,867	364,329	-1.88%
2017	139,311	27.41%	709	26.38%	957	140,977	-61.31%
2018	410,564	10.20%	1,455	6.67%	4,671	416,690	195.57%
2019	495,418	20.67%	2,140	47.08%	7,540	505,098	21.22%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 16 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 16: Passenger Traffic for KIA and projected to Year 2030



2.3.2.8 Air Traffic for Malindi International Airport

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Malindi International Airport for the Period June 2004 to June 2019. There is no Freight traffic for KIA.

Aircraft Movements (ATMs) – Malindi Airport

The Table below summarizes the Aircraft movements at Malindi International Airport for the period June 2004 (read year 2005) to June 2019 (read year 2019).

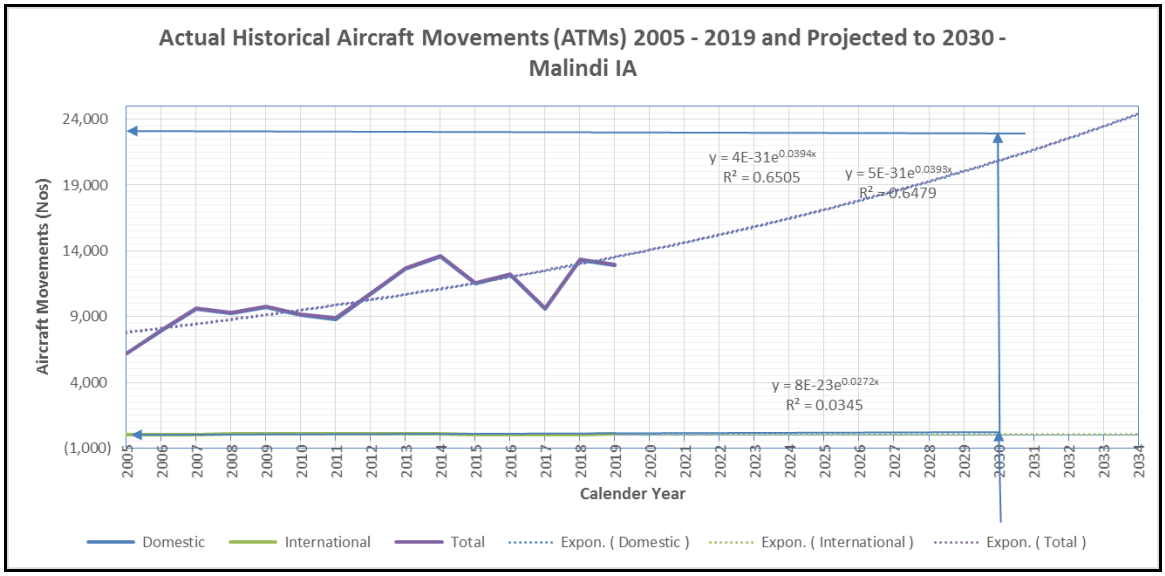
Table 19: Aircraft Movements for Malindi International Airport (KIA)

Year	Aircraft Movements - Malindi					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	6,203		6		6,209	
2006	7,942	28.03%	54	800.00%	7,996	28.78%
2007	9,608	20.98%	49	-9.26%	9,657	20.77%
2008	9,221	-4.03%	64	30.61%	9,285	-3.85%
2009	9,692	5.11%	67	4.69%	9,759	5.11%
2010	9,088	-6.23%	75	11.94%	9,163	-6.11%
2011	8,809	-3.07%	74	-1.33%	8,883	-3.06%
2012	10,707	21.55%	55	-25.68%	10,762	21.15%
2013	12,652	18.17%	68	23.64%	12,720	18.19%
2014	13,576	7.30%	69	1.47%	13,645	7.27%
2015	11,529	-15.08%	35	-49.28%	11,564	-15.25%
2016	12,170	5.56%	42	20.00%	12,212	5.60%
2017	9,608	20.98%	49	-9.26%	9,657	-20.92%
2018	13,314	-7.18%	22	-51.11%	13,336	38.10%
2019	12,914	-3.00%	67	204.55%	12,981	-2.66%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 17 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 17: Aircraft Movements for Malindi International Airport projected to Year 2030



Passenger Traffic – Malindi International Airport

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

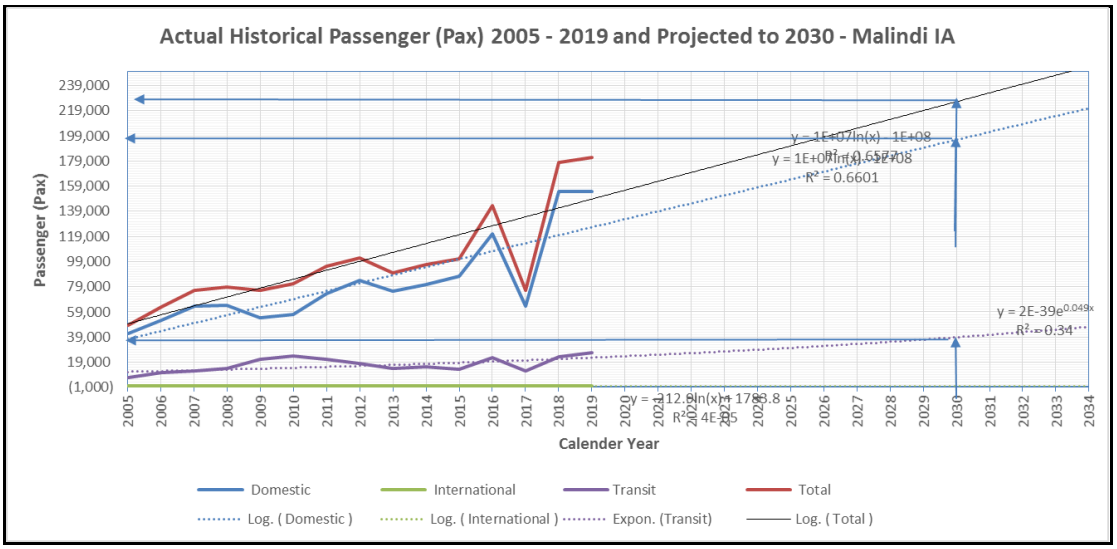
Table 20: Passenger Traffic for Malindi International Airport

Year	Passengers - Malindi						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	41,874		19	0.00%	6,696	48,589	
2006	52,280	24.85%	102	436.84%	10,603	62,985	29.63%
2007	63,401	21.27%	147	44.12%	12,392	75,940	20.57%
2008	64,599	1.89%	265	80.27%	13,852	78,716	3.66%
2009	54,381	-15.82%	175	-33.96%	21,387	75,943	-3.52%
2010	57,290	5.35%	250	42.86%	23,643	81,183	6.90%
2011	73,364	28.06%	211	-15.60%	21,551	95,126	17.17%
2012	83,876	14.33%	178	-15.64%	17,946	102,000	7.23%
2013	75,765	-9.67%	245	37.64%	14,044	90,054	-11.71%
2014	80,668	6.47%	278	13.47%	15,643	96,589	7.26%
2015	87,564	8.55%	118	-57.55%	13,621	101,303	4.88%
2016	121,030	38.22%	119	0.85%	22,719	143,868	42.02%
2017	63,401	21.27%	147	44.12%	12,392	75,940	-47.22%
2018	154,604	20.41%	86	-31.20%	23,359	178,049	134.46%
2019	155,065	0.30%	123	43.02%	26,472	181,660	2.03%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 18 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 18: Passenger Traffic for Malindi International Airport and projected to Year 2030



2.3.2.9 Air Traffic for Wilson Airport

This covers the traffic as provided by Kenya Civil Aviation as the summary of all aircraft movements, passenger and freight at Wilson Airport (WA) for the Period June 2004 to June 2019.

Wilson Airport (WA) Aircraft Movements (ATMs) – Wilson Airport (WA)

The Table below summarizes the Aircraft movements at Wilson Airport (WA) for the period June 2004 (read year 2005) to June 2019 (read year 2019).

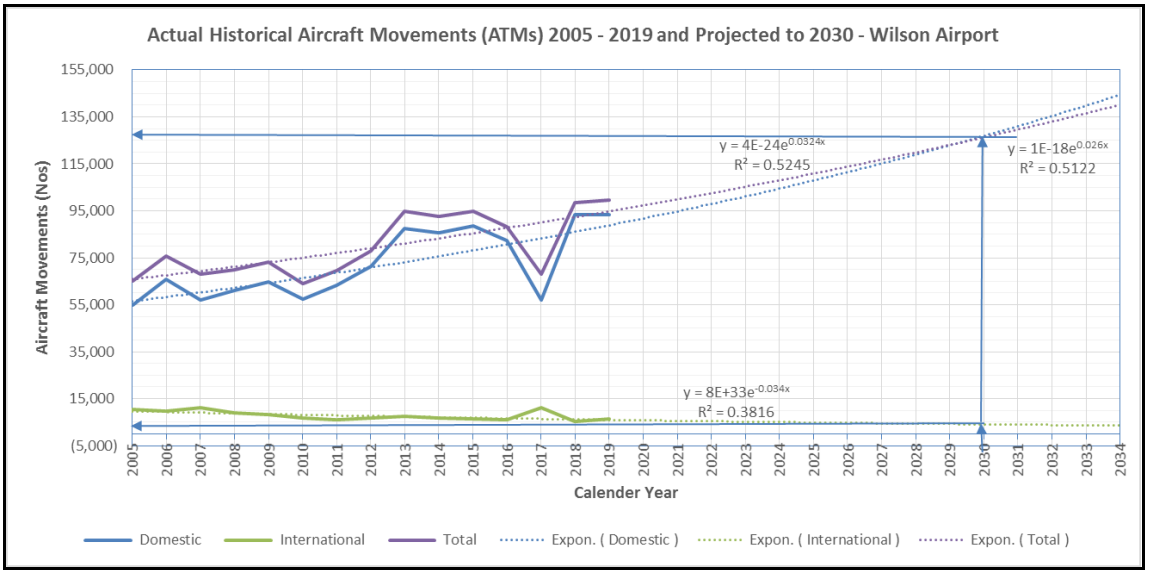
Table 21: Aircraft Movements for Wilson Airport (WA)

Year	Aircraft Movements - Wilson					
	Domestic		International		Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Growth %
2005	54,817		10,396		65,213	
2006	66,011	20.42%	9,886	-4.91%	75,897	16.38%
2007	56,909	-13.79%	11,236	13.66%	68,145	-10.21%
2008	60,959	7.12%	8,957	-20.28%	69,916	2.60%
2009	64,687	6.12%	8,324	-7.07%	73,011	4.43%
2010	57,337	-11.36%	6,807	-18.22%	64,144	-12.14%
2011	63,230	10.28%	6,095	-10.46%	69,325	8.08%
2012	71,231	12.65%	6,792	11.44%	78,023	12.55%
2013	87,380	22.67%	7,497	10.38%	94,877	21.60%
2014	85,802	-1.81%	6,710	-10.50%	92,512	-2.49%
2015	88,646	3.31%	6,322	-5.78%	94,968	2.65%
2016	82,439	-7.00%	5,881	-6.98%	88,320	-7.00%
2017	56,909	-13.79%	11,236	13.66%	68,145	-22.84%
2018	93,205	8.07%	5,281	-6.42%	98,486	44.52%
2019	93,163	-0.05%	6,282	18.95%	99,445	0.97%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 19 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 19: Aircraft Movements for Wilson Airport (WA) projected to Year 2030



Passenger Traffic – Wilson Airport (WA)

The Table below summarizes the Passenger traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

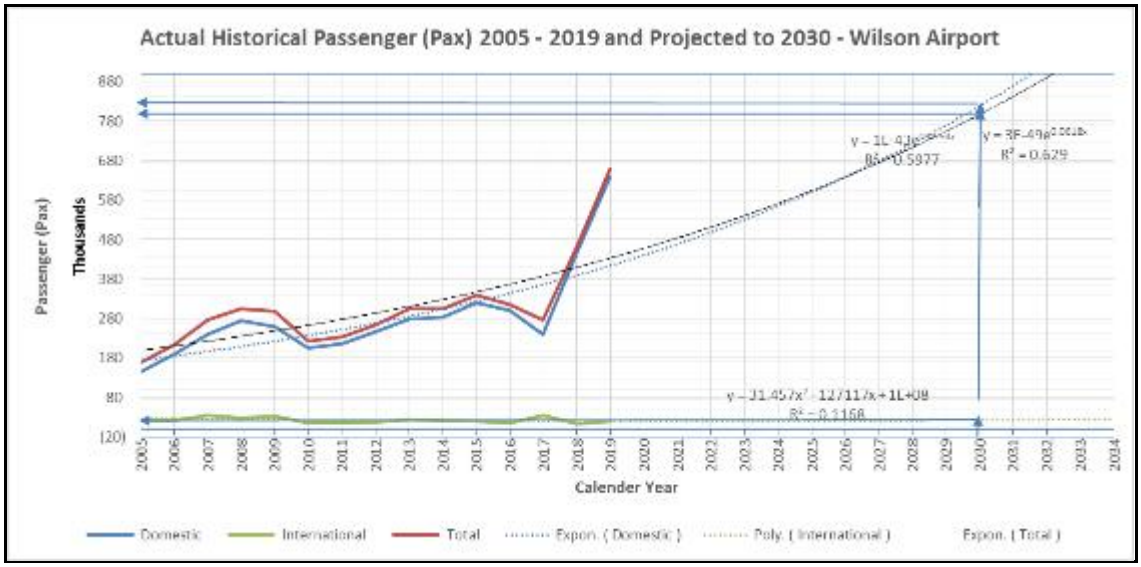
Table 22: Passenger Traffic for EIA

Year	Passengers - Wilson						
	Domestic		International		Transit	Total	
	Units (No)	Growth %	Units (No)	Growth %	Units (No)	Units (No)	Growth %
2005	145,516		22,800	0.00%	1,123	169,439	
2006	191,411	31.54%	23,249	1.97%	775	215,435	27.15%
2007	240,507	25.65%	35,671	53.43%	-	276,178	28.20%
2008	275,595	14.59%	29,303	-17.85%	383	305,281	10.54%
2009	260,704	-5.40%	33,147	13.12%	4,977	298,828	-2.11%
2010	206,263	-20.88%	16,804	-49.30%	-	223,067	-25.35%
2011	217,029	5.22%	16,694	-0.65%	-	233,723	4.78%
2012	245,784	13.25%	18,195	8.99%	-	263,979	12.95%
2013	279,630	13.77%	24,526	34.80%	-	304,156	15.22%
2014	282,936	1.18%	21,911	-10.66%	-	304,847	0.23%
2015	319,372	12.88%	20,342	-7.16%	-	339,714	11.44%
2016	300,893	-5.79%	15,262	-24.97%	-	316,155	-6.93%
2017	240,507	25.65%	35,671	53.43%	-	276,178	-12.64%
2018	447,608	26.49%	14,514	2.54%	-	462,122	67.33%
2019	640,208	43.03%	19,891	37.05%	-	660,099	42.84%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 20 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 20: Passenger Traffic for Wilson Airport (WA) and projected to Year 2030



Freight Traffic – Wilson Airport (WA)

The Table below summarizes the Freight traffic in the country for the period June 2004 (read year 2005) to June 2019 (read year 2019).

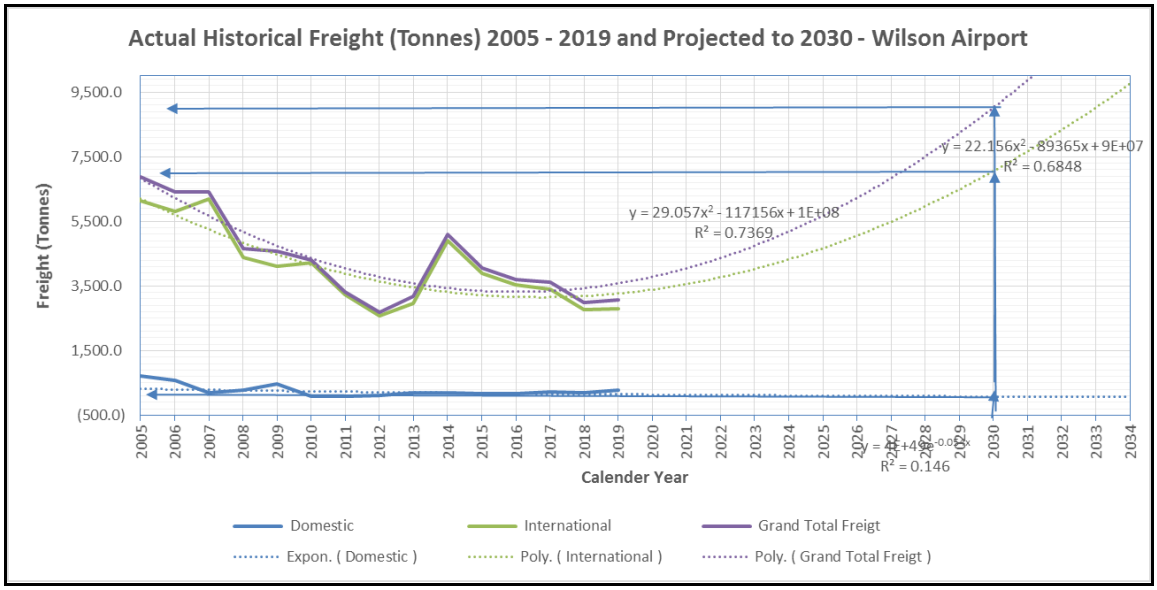
Table 23: Freight Traffic for Wilson Airport (WA)

Year	Freight - Wilson					
	Domestic		International		Total Freight	
	Tonnes	Growth %	Tonnes	Growth %	Tonnes	Growth %
2005	729.6		6,148.3		6,877.9	
2006	587.2	-19.52%	5,811.4	-5.48%	6,398.6	-6.97%
2007	198.5	-66.20%	6,202.1	6.72%	6,400.5	0.03%
2008	282.6	42.37%	4,387.6	-29.26%	4,670.1	-27.04%
2009	465.9	64.88%	4,111.1	-6.30%	4,577.0	-1.99%
2010	80.8	-82.67%	4,216.5	2.56%	4,297.3	-6.11%
2011	87.2	7.94%	3,235.3	-23.27%	3,322.5	-22.68%
2012	114.3	31.12%	2,565.6	-20.70%	2,679.9	-19.34%
2013	209.1	82.92%	2,975.8	15.99%	3,184.8	18.84%
2014	193.4	-7.49%	4,894.3	64.47%	5,087.7	59.75%
2015	167.6	-13.32%	3,880.7	-20.71%	4,048.3	-20.43%
2016	157.4	-6.10%	3,534.7	-8.92%	3,692.1	-8.80%
2017	220.6	40.15%	3,395.8	-3.93%	3,616.4	-2.05%
2018	206.7	-6.32%	2,783.9	-18.02%	2,990.6	-17.31%
2019	283.8	37.31%	2,794.2	0.37%	3,077.9	2.92%

Source: KCAA data June 2004 – June 2019 and self-assessment for presentation

Figure 21 provides a graphical representation of the data and provides a projection to the year 2030 which is the Master Plan horizon.

Figure 21: Freight Traffic for Wilson Airport (WA) and projected to Year 2030



The Freight for Wilson Airport has been in a declining trend. However, it is expected with the stability of Somalia which is the predominant destination, this will substantially improve to recover the lost traffic.

2.3.3 Implications of Air Traffic Trends on Airspace Management

Based on the above analysis, the traffic trend indicates that for the airspace master plan period up to the year 2030 there will be a general increase in traffic in the air space which will continue to strain the existing air space management facilities and also require increased staffing levels to manage the work load which might impact on the safety aspects of air space management. The increase in traffic implies more fuel burn hence more carbon emissions will be expected. There is also an expected increase in noise pollution levels on areas with intensive aviation activities and human settlements and social activities. It is therefore important that mitigation measures are put in place to counter these negative effects expected.

2.4 Airspace Status

The Airspace Master Plan has analyzed this traffic trends and the airspace status summarized as in the table below:

Table 24: Airspace Status Outline

Key Focus	Specific Issue	Status
KCAA Organization Current Airspace Infrastructure	Air Navigation Services (ANS)	✈ Safety Management System (SMS) is not fully implemented, no training plan on Safety Management Systems and incident investigations are inconsistent. ✈ The Airspace Master Plan 2005 – 2015 was not formally reviewed during its horizon period.
	Air Traffic Management (ATM), En-route Operations (ENR)	✈ The military prevent civil airspace users to have direct routes resulting to longer flight routes and hence high fuel consumption and higher emissions, ✈ Low application of surveillance mechanisms to check on the deficiencies in VHF and HF in the oceanic areas under KCAA's responsibility and to enable the use of navigation performance specifications. ✈ The two distant choke points requires attention
	ATM – Approach & Tower Operations	✈ The Nairobi approach is highly congested. ✈ There are risks associated to incorrect vehicles management on the maneuvering area with the use of separate frequencies for vehicles and aircraft. ✈ Some operational issues related to the coordination between the control tower (KCAA) and the Apron (KAA) need to be addressed
	Aeronautical Information Services (AIS)	The necessary systems and software for the functions are to be replaced; ✈ Aeronautical data and aeronautical information management, ✈ Aeronautical Information Publication (AIP), ✈ NOTAM management, ✈ Provision of pre-flight and post-flight information, ✈ Aeronautical Charts Management (as per ICAO Annex 4), ✈ Flight plan Management for air traffic systems Reporting Offices, ✈ Instrument Flight Procedure Design.
	Search and Rescue (SAR)	✈ All search and rescue activities are currently manual and require a lot of time for location accident sites, ✈ Lack of a dedicated frequency for communication with the search aircraft, away from the operational frequencies.
	Communications	✈ The communication equipment supporting the proposed short term ATM evolutions need to be backed up. ✈ There are concerns on the frequency for search and rescue operations, ✈ Various interventions on communication improvements for major airports and airstrips across the country, especially Mombasa, Malindi, Wilson and Kisumu airports.
	Navigation (equipment)	✈ There is lack of remote control and spare parts for some conventional facilities. ✈ There is insufficient implementation of satellite-based operations.
	Surveillance	✈ There is lack of spare parts for maintenance of radars. It is noted that a maintenance agreement has since been concluded. ✈ There is insufficient surveillance system available at JKIA.
	ATC Systems	✈ Technological transition is slow ✈ Safety management systems are still not operational due to a lack of surveillance and technology. ✈ Lack of automated weather observatory display.
	Auxiliary equipment	✈ The main findings are discrepancies with the air-conditioning and electrical power supply.

Key Focus	Specific Issue	Status
	Training	✈ On-the-job training instructors is inadequate ✈ Discrepancies between the international best practices and the operational and continuation training organization in the various unit training. ✈ Training programs are inadequate.
	Human Resources (HR)	✈ Staff shortage in most stations for the three main categories of personnel. ✈ Additional staff will be required to man the new positions in support of the recommended ATM improvements.
Institutional, Legal And Regulatory Issues	Operator and the Regulator	✈ It is noted that the air navigation services provider and the regulator are one and the same requiring legal intervention.
	Crimes, offences and Safety Management	✈ The Civil Aviation Act, 2013 provides very few offences related to unlawful acts against civil aviation and none against air navigation services and facilities. ✈ Safety Management Systems deficiencies in the implementation of the SMS by the aviation navigation systems
	Collaboration with neighboring states	✈ KCAA wishes to play a role at the regional level in the provision of aviation navigation systems. ✈ Provision of services for/with other States could include: air traffic control and aeronautical information.
	Apron Management Service	There is no clear definition of responsibilities and related tasks between KCAA and KAA at the airport grounds
	Air Navigation Service Charges	There are no regulatory provisions on aviation navigation systems charges. The existing regulations do not constitute an appropriate regulatory framework since they are restricted to the definition of the criteria on which the implementation of charges is based (such as distance flown or maximum take-off mass for the en route charges)
	Search and Rescue	KCAA aviation navigation system is fully responsible of the Search & Rescue (SAR) in Kenya. However it lacks appropriate instrumentation and communication back-up.
	Meteorological services for Air Navigation	The provision of aeronautical meteorology is not part of KCAA. Kenya has chosen the financing of all or part of the service provision by tax payers through the general State budget
	Implementation of Surveillance System	KCAA aims at moving from surveillance radars as sole means of ground surveillance (in some parts of the airspace).
	Airport Collaborative Decision Making	✈ The implementation of communication has been identified as a means to improve approach and tower operations in JKIA ✈ The efficiency of the communication process implies the involvement of all stakeholders at the concerned airport: airlines, air navigation service provider, airport operator, ground handlers, MET office and others (fire, police, customs, fuel, etc.).
	Training, License and Certificate	Discrepancies between the current training situation and the international recommendations and best practices regarding the training have been identified

Source: Airspace Master Plan 2015 – 2030

2.5 Emergent Areas of Conflicts with Airspace Operations

2.5.1 Environmental Aspects

2.5.1.1 Ecological Linkages

Ecological (biodiversity and ecosystems) and conservation zones. Conservation areas overflown by aircrafts have not been well researched. Observations by the Kenya Wildlife Services (KWS) suggest that some wildlife species along the approach corridor into JKIA seems disturbed in their grazing during a flight event. However, there has not been scientific studies to provide adequate evidence to determine whether there are ecological effects on breeding habitats and migratory routes,

According to the Ornithology Department at the National Museums of Kenya, migratory routes for birds both at the international and regional levels varies in height and orientation with some reported to fly as high as 40,000ft a.s.l. This scenario has a potential direct conflicts with aircraft movement corridors in space. On the other hand, aviation development and operations in close proximity to birds' habitats and breeding areas may also have direct impacts especially to new airport developments.

2.5.1.2 Aerial Emissions

Emissions from aircrafts have a double effects associated with localized air quality (especially within airports and low flying corridor). Among the emissions in this regard include particulate matter (PM), carbon dioxide (CO_2), sulphur oxides (SO_X), nitrogen oxides (NO_X) and hydrocarbons (HC). Effects on air quality are notable within the lower atmosphere.

The emissions are also associated with climate change arising from CO_2 in both the lower and upper airspace. According to the Airspace Master Plan, air craft emissions are estimated to account for about 2% of the global CO_2 within the atmosphere.

2.5.1.3 Meteorological issues

This issue will be viewed from part of the impacts associated with institutional and system capacity in the generation, integration and sharing of data and information on weather. This will imply working the relationship between the KCAA and the Kenya Meteorological Department (KMD)

The master plan has not listed aeronautical meteorological service as a component of Air Navigation Service as provided by Article 28 of the ICAO Convention. It does however recognize that aeronautical meteorological service, in Kenya, is provided by the Kenya Meteorological Department (KMD). It is indicated in the Kenya Aeronautical Information Publication (AIP), as well as the ICAO Directory of Civil Aviation Authorities that Kenya Meteorological Department is the designated Meteorological Authority for Kenya.

The Plan further indicates that Kenya has chosen the financing of all or part of the service by tax payers.

This status may change in future in the event that KMD de links from the main stream Civil Service. In the delinked environment, KMD is likely to establish cost recovery mechanism that may include recovery some costs from air navigation charges as stipulated in Article 15 of the ICAO Convection and guidance materials from both ICAO and the World Meteorological Organization WMO. The proposed Projects in the SEA Master plan has been inspected as shows the following linkages with MET.

2.5.1.4 Noise and Vibrations

Noise and vibrations from aircrafts is more significant from aviation operations within the lower airspace with receptors being the social and economic land use activities on the ground. This situation brings into light one most important land use strategic aspects that should be integrated into the Airspace Master Plan considerations.

2.5.2 Social Aspects

2.5.2.1 Land Use Planning Conflicts

As alluded above, land use is an important aspect to the harmonization of the Airspace Master Plan to the social and economic issues. According to the national and WHO noise guidelines, noise levels are considered in terms of the acceptability to various receptors that in turn are driven by the land use practices. Residential areas, learning facilities, religious areas, health facilities, recreation areas, working areas, etc. have different exposure levels and hence varying incompatibility.

Encroachments arising from uncontrolled land use, social and economic activities moving into aviation operation areas effectively conflicts such as safety and security. The adequacy of engagement policies on land use approval processes within aviation operation areas. Other actors manifested in areas of approval of structures and land use practices within aviation areas of interest,

Airports create employment opportunities, thereby making areas around airports major industrial compounds that increase the local rate of employment. Businesses that rely upon the aviation industry are established better employment opportunities attract people toward airports. A large number of people want to live as close as possible to their place of employment, thus minimizing their time commuting to work. This leads to more residents near the airport and, in turn, the construction of schools, hospitals, shopping centers, churches, and other community facilities.

Often there is prime land located near the airport attracting real estate developers, resulting in higher development of those areas. However, the increased population also results in increased air traffic. It becomes absolutely essential to ensure compatible land use around airports. Airport land-use

planning and noise management are challenges faced by airports around the world thus Safety and efficient operation of aircrafts should be considered in planning land use abutting the airports.

2.5.2.2 Public Safety and Security

Health issues arises from conflicts between aviation operations and land use, especially residential features. Among these include loss of sleep, trauma hearing impairment, etc. Safety and security – due to various factors including weather conditions, coordination of scheduled flights (takeoff and landing) and human activities within the aviation operation areas. Health issues may arise from conflicts between aviation operations and land use, especially residential features, institutional premises, religious institutions, health facilities. Among these include loss of sleep, trauma, hearing impairment, etc.

Collaboration on awareness and sensitization to the communities and other public actors on search and rescue mechanisms in cases of emergencies. Potential Socio-economic disruptions that may arise from aviation related activities to both individuals and institutions within the vicinity of aviation operation areas. The disruptions include noise and vibrations (especially for offices, schools, other institutions along flight paths) and safety risks.

2.5.2.3 Restricted and Controlled Areas

There is a notable consideration of national security by securing high security areas from access by civilian fights. Such areas include protected public areas (e.g. state houses and military operations), controlled areas (over city centers and high population zones) and zones with dangerous terrains. One such area is the northern Kenya zone (HKR10) secured for Kenya Defense Forces operations and no civilian aircraft is allowed to overfly the area.

2.5.2.4 Flights Efficiency

Flight efficiency occasioned by coordination between the various aviation actors, weather conditions, security and safety alerts, human error, air travel distance among others.

2.5.2.5 Cross Sectoral Interactions

Interactions of sectors such as Aerodrome operators (KAA), Environmental sector (KWS, KFS) Maritime (KMA), Defense (KAF), Security (Kenya Police Air Wing), Tourism, Agriculture (Desert Locust), Humanitarian Organizations (WFP, UNHCR), Communications (GSM, FM stations), Power generation and transmission (KETRACO, KENGEN) County governments, medical rescue (AMREF) etc

With technology advancement, sectors including land survey work, entertainment (photography), medical services, agriculture and investigative services are increasing demanding use of drones. It is also noted that at the time of this SEA process, KCAA had not developed guidelines on the use of

drones in the Kenyan Airspace implying potential risks to security, public privacy and a myriad of other social conflicts.

Hot air balloons are often used in the tourisms areas including national parks. Like drones, they ar also not regulated posing risks to security and airspace safety conflicts, especially with regard to the usage of the airstrips in the national parks.

2.5.2.6 Workers Welfare

Personnel capacity challenges may lead to high workloads, long working hours, among other factors with risks of staff stress and hence potential compromise on safety. Staff cadres likely to be affected include the air traffic control officers (ATCOs) and others working in critical aviation installations.

2.6 Regional Airspace Intervention Initiatives

In order to address the increase in Air Traffic Movements (ATMs) and changes in aircraft types as well as aviation technology, KCAA proposed initiatives towards sustained modernization of ANS focused mainly on JKIA as a regional hub and also upgrading navigation infrastructure in other airports around the country. The initiatives are also to upgrade the Nairobi FIR systems within the provisions of guidelines set by ICAO and integration with other regional initiatives. Specifically, the interventions are to address the following areas;

2.6.1 East Africa Community Civil Aviation Authorities' Projects

The East African Community (EAC) Treaty was entered into force on 7th July 2000, following its ratification by the East African Partner States including Kenya, Uganda and Tanzania while Rwanda and Burundi joined the EAC in July 2007. Kenya being part of the East African Community is committed to the implementation of the projects formulated for civil aviation including;

(i) Proposed Unified Flight Information Region (FIR) and developing a single seamless upper airspace (>24,500ft above mean sea level) over East Africa while individual states remain responsible of the lower airspace (i.e. below 24,500ft above mean sea level),

(ii) Global Navigation Satellite System (GNSS), a pilot study project driven by the EAC but to be implemented by the individual states. The goal of this project is to develop GNSS procedures for identified three airports in each Partner State in order to bring the existing airports in the region in line with ICAO Standard and Recommended Practices (SARPs). The project is coordinated by the EAC Secretariat and implemented by the Partner States through their national budgets,

(iii) EAC developed a project proposal for rehabilitation of the aviation schools in the region including the East African School of Aviation (Kenya), Civil Aviation Training Centre (Tanzania) and East African Civil Aviation Academy (Uganda). Development of regional civil aviation schools in addition to East African School of Aviation (EASA) in Nairobi.

2.6.2 East African Upper Airspace and Northern Corridor Initiative

The initiative was formulated to assist the East African Community states harmonize the airspace and reduce operational costs and intra-regional air travel costs as well as encourage modernization of ANS facilities. Kenya is participating to several regional initiatives, which contribute actively to the development of aviation in the country. The main ones are listed below.

(i) East African Community (EAC) with the following projects for implementation by the EAC Civil Aviation Authorities;
- ✓ Establishment and Operationalization of the EAC Unified Flight Information Region (UFIR) creating a single block of upper airspace leading to a seamless airspace for the region,
- ✓ Implementation of the Recommendations of the Global Navigation Surveillance Systems (GNSS) Pilot Study intended to bringing up the regional states to standards and recommended systems;
- ✓ East African Aviation Training Organizations Rehabilitation Project in backing up the current East African School of Aviation (EASA) in Nairobi,

(ii) East African Upper Airspace and Northern Corridor Initiative,

2.6.3 COMESA Airspace Integration Project

COMESA launched an Airspace Integration project in order to reinforce regional integration through the creation of a Unified Single Airspace control framework in the COMESA Region. This project started in 2011 and is on-going. This project includes, among several activities, the evaluation of the technical and financial feasibility to enable the relevant countries to determine the requirements for implementing a cost-effective regional Communication Navigation Surveillance (CNS) and Air Traffic Management (ATM) systems.

2.6.4 African Indian Ocean Region (AFI)

The African Indian Ocean Information Region (AFI) Planning and Implementation Regional Group (APIRG) was set up by the Council of ICAO in 1980 as recommended by the Sixth AFI Regional Air Navigation Meeting in 1979. The APIRG is primarily responsible for the development and maintenance of the AFI Air Navigation Plan (ANP, ICAO Doc 7474), as well as the identification and resolution of air navigation deficiencies. ICAO Doc 7474 is a planning document for AFI region in terms of air navigation facilities and services. AFI air navigation plan (ICAO Doc 7474) is derived from the Global Air Navigation Plan (GANP Doc 9750) for domestication at the regional level. GANP initiative is briefly discussed in the next section.

Kenya, by virtue of being located in Africa, is member of the AFI-Regional Group. The purpose of the group is basically planning and facilitating the follow-up of implementation of the required air navigation services and facilities in Africa.

2.7 Global Intervention Initiatives

2.7.1 Global Air Navigation Plan (GANP)

The 4th edition of air navigation plan (ICAO Doc 9750), and the Aviation System Block Upgrades (ASBU) strategy proposes that future improvements are organized and based on a consultative approach that coordinate specific global performance capabilities and flexible upgrade timelines associated with each component. The GANP leverages existing technologies and anticipates future developments based on state/industry agreed operational objectives

GANP was established as a strategy for addressing risks to the air safety associated with the overwhelmed regulatory and infrastructural capacity. The plan provided Member States with capacity to achieve safe, sustained growth, increased efficiency and responsible environmental stewardship. This lead to the Aviation Systems Block Upgrade (ASBU) initiative, a global system engineering approach to enable states advance their air navigation capacity suitable to their respective operational requirements.

2.7.2 Performance Improvement Areas (PIAs),

The Aviation Systems Block Upgrades (ASBUs) initiatives were designed to be implemented sequentially through defined time schedules with each block having a number of modules addressing a set of 4No. Performance Improvement Areas (PIAs). The performance areas are defined as follows;

2.7.2.1 Airport Operations

Aerodromes constitutes the link between the airspace and the ground. Systems, therefore should be put in place to ensure appropriate aircraft control through the entire Landing-Take-Off (LTO) cycles This Performance Improvement Area (PIA) is aimed at improving this function as follows;

(i) Airport accessibility (approach corridors)
(ii) Wake turbulence separation (has a link to aircraft approach sequencing)
(iii) Runway sequencing for optimum utilization by ensuring minimum residence time.
(iv) Surface operations including vehicle movements within the apron areas,
(v) Airport Collaborative Decision Making (CDM) that involves participation by all key stakeholders,
(vi) Remote Air Traffic Systems (ATS)

2.7.2.2 Globally Interoperability Systems and Data

Information and data is critical for safe and efficient aircraft operations. Information and data required for operation is held by different stakeholders in various formats and for varying needs. It is, therefore, necessary that appropriate platforms are established to facilitate information and data sharing and

achieve efficiency and safe aviation operations with mutual benefits among the stakeholders. This Performance Improvement Area (PIA) is intended to improve this function as follows;

(i) Flexible Fight Information Center
(ii) Digital Air Traffic Management (ATM) and Information
(iii) System-wide information management (SWIM)
(iv) Advance meteorological information and data sharing

2.7.2.3 Optimum Capacity Flexible Flight

GANP appreciates that flight operations within and across state requires to be harmonized to ensure equitable convenience and safety across the international airspace. Global collaboration on air traffic management, therefore is critical and this Performance Improvement Area (PIA) was designed to achieve this objective;

(i) Free route operations
(ii) Network operations
(iii) Alternative surveillance
(iv) Airborne separation (horizontal, vertical and time)
(v) Optimum flight levels
(vi) Airborne collision avoidance systems
(vii) Safety nets

2.7.2.4 Efficient Flight Paths

It is notable that flight routing and trajectories have a high link to fuel consumption and flight times. This also has a direct link to costs, higher fuel consumption, higher emissions and potential flight delays. In order to address this aspect, it is necessary to consider improved flight routes and this Performance Improvement Area (PIA) addresses this function as follows;

(i) Continuous descent operations resulting to reduced fuel consumption and effectively lower emissions. This has direct benefits to improved air quality and climate change mitigation as well as lower noise to the receptors on the ground.
(ii) Trajectories based operations
(iii) Like the continuous descent procedure, continuous climb operations will ensure uniform emission and noise throughout the take-off process but also lower safety risks,
(iv) Remotely piloted aircraft systems.

2.7.3 Aviation Systems Block Upgrades (ASBUs)

Aviation System Block Upgrades (ASBU) designates a set of improvements that can be implemented globally from a defined point in time to enhance the performance of the ATM System. A module is a deployable ASBU package (performance) or capability. A module will offer an understandable

performance benefit, related to a change in operations, supported by procedures, technology, regulation/standards as necessary, and a business case. A module is also characterized by the operating environment within which it may be applied.

A block is made up of modules that when combined enable significant improvements and provide access to benefits. The blocks are linked by a thread of dependent Modules across consecutive Blocks is therefore considered to represent a coherent transition 'Thread' in time, from basic to more advanced capability and associated performance. Modules are therefore identified by both a Block number and a Thread acronym. Each Thread describes the evolution of a given capability through the successive Block timelines as each Module is implemented realizing a performance capability.

KCAA has undertaken to adopt ICAO Global Air Navigation Plan (GANP), for both regional and national levels which addresses required solutions by introducing the Aviation System Block Upgrades (ASBUs) initiative. Implementation of the Aviation System Block Upgrades (ASBUs) initiatives informs the Airspace Master Plan 2015 – 2030 and subsequently this SEA Study Report. The ASBUs will enhance harmonization, increased capacity, environmental efficiency and enhance airspace planning and sustainable utilization. There are 4No. Blocks under the ASBUs for sequential implementation in 2013, 2019, 2023 and 2025 to achieve the four Performance Improvement Areas (PIAs). The ASBUs Blocks are briefly outlined below;

2.7.3.1 ASBU Block 0

This is the baseline Block Upgrade. It includes things that are available now and don't require any infrastructure or avionics investment. Within Block 0, all the necessary procedures, compliance needs and business cases have been identified. APIRG, in its 19th meeting, considered all the 18 modules in the Block and categorized them for implementation. Only 7 were given priority 1 as it covers all the AFI States. The remaining are priority 2 and applies to only specific State(s) of AFI region.

ICAO Member States are encouraged to implement ASBU Block 0 Modules applicable to their specific operational needs and within their capability. Kenya has moved along with other States in the African Indian Ocean (AFI) Region with ASBU Block 0 and commitment to address capacity and efficiency improved aviation safety, modernization of air traffic management, the desired single African Airspace and improved technical skills. ASBU Block 0 is composed of 18No. Modules containing technologies and capabilities which are already being developed.

ASBU Block 0 was to be implemented from the year 2013 to 2019 with 18No. Modules through progressive implementation of the 18No. Modules scheduled as Priority 1 by APIRG (for immediate implementation) and Priority 2 (for recommended implementation – medium to long term) as listed in the table below;

Table 25: Overview of the ASBU Block 0 Modules, PIA and Priorities

Performance Improvement Areas	Priority 1 ASBU Block 0 Modules	Priority 2 ASBU Block 0 Modules
PIA 1 Airport Operations	Optimization of Approach Procedures including vertical guidance	Improve Traffic flow through Runway Sequencing
	Improved Airport Operations through Airport	Increased Runway Throughput through optimized Wake Turbulence Separation
	-	Safety and Efficiency of Surface Operations
PIA 2 Globally-interoperable systems and data	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration	-
	Service Improvement through Digital Aeronautical Information Management	-
	Meteorological information supporting enhanced operational efficiency and safety	-
PIA 3 Optimum capacity and flexible flights	Improved Operations through Enhanced En-Route Trajectories	Improved Flow Performance through Planning based on a Network-Wide view
	Aircraft Communication Addressing and Reporting System Improvements	Initial capability for ground surveillance
	-	Air Traffic Situational Awareness
	-	Improved access to Optimum Flight Levels through Climb/Descent Procedures
	-	Increased Effectiveness of Ground-Based Safety Nets
PIA 4 Efficient Flight Paths	Improved Flexibility and Efficiency in Descent Profiles (CDO)	Improved Safety and Efficiency through the initial application of Data Link En-Route
	Improved Flexibility and Efficiency Departure Profiles - Continuous Climb Operations (CCO)	-

Source: Master Plan 2015 – 2030

2.7.3.2 ASBU Block 1

The ASBU Block 1 Modules introduces new concepts and capabilities supporting the future Air Navigation System, namely;

(i) Flight and Flow Information for a Collaborative Environment;
(ii) Trajectory-based operations;
(iii) System-Wide Information Management
(iv) Integration of remotely piloted aircraft (RPA) into non-segregated airspace.

Block 1 represents the primary ICAO technical work programme on air navigation and efficiency for the next triennium and will, therefore, require collaboration with industry and regulators, in order to provide a coherent globally harmonized set of operational improvements in the proposed time frame. ASBU Block 1 is to be implemented by the year 2019 with 17No. Modules.

It is anticipated that APIRG will provide regional guidance by categorizing and prioritizing the modules, as was the case with Block o, pending further domestication by States within the region including Kenya.

2.7.3.3 ASBU Block 2

The Modules comprising Block 2 are intended to be available in 2025 and must either represent a natural progression from the preceding Module in Block 1 OR be supportive of the requirements of the operating environment in 2025. ASBU Block 2 is to be implemented by the year 2025 with 10No. Modules. It is anticipated that APIRG will provide regional guidance by categorizing and prioritizing the modules, pending further domestication by States within the region including Kenya.

2.7.3.4 ASBU Block 3

The Modules comprising Block 3 are intended to be available for implementation in 2031 and must either represent a natural progression from the preceding Module in Block 2, support the requirements of the operating environment in 2031 or represent an end-state as envisaged in the Global Air Traffic Management (ATM) Operational Concept. ASBU Block 3 will be implemented by the year 2030 and beyond with 6No. Modules. It is anticipated that APIRG will provide regional guidance by categorizing and prioritizing the modules, pending further domestication by States within the region including Kenya.

2.8 Focus of the Airspace Master Plan 2015 – 2030

2.8.1 Airspace Master Plan 2005 – 2015

The Airspace Master Pan 2005 – 2015 was prepared to assist Kenya in the implementation of the new aviation technologies and defining related investments strategies. The technologies and strategies were designed to address the increasing problems of air traffic control bad communication and traffic congestion.

Future air navigation systems (FANS) established by ICAO appreciated restrictions from the convectional systems to effective ATM hat required interventions. The Communication Navigation Surveillance (CNS) concept was established to overcome the traditional air traffic practices through advanced technology and improved air traffic services procedures. This would be achieved through implementation of recommendations from the Aviation System Block Upgrades (ASBUs) modules from the year 2013. The Master Plan, therefore, was drawn to address these needs and achieve the following;

(i) Regional requirements and trends,
(ii) Induced airspace re-organization (sectorization)

(iii) Harmonized implementation of the Communication Navigation Surveillance (CNS) and Air Traffic Management (ATM) systems for Kenyan airspace and with adjacent regions (VFR at JKIA for the entire FIR)
(iv) Progressive withdrawal of conventional CNS systems,
(v) Better efficiency in controller voice communication.

These objectives could not be achieved through the airspace Master Plan 2005 – 2015. It is expected that this would be achieved under the Airspace Master Plan 2015 – 2030 through implementation of recommendations from the ASBUs modules from the year 2013.

2.8.2 Airspace Master Plan 2015 – 2030

The airspace status Investigations under the Airspace have shown the following areas requiring immediate and long term interventions;

(iv) There is a notable increase in Air Traffic Movements (ATMs) into the Kenyan airports (with JKIA and Wilson Airport experiencing the highest growth) arising from improved ground facilities, runways and demand for air transport locally and international. Further growth is also anticipated in future, especially on cargo and international flights into JKIA and Moi International Airport,
(v) With the growth at JKIA and the anticipated progressive increase in Mombasa and other national airports (Wilson, Kisumu and Eldoret), there is need to develop or improve the Aviation Navigation Services (ANS) infrastructure to cope with the anticipated increase in aircraft movements and changing types of aircraft,
(vi) There are regional initiatives towards seamless airspace corridors through efforts of individual States and regional economic blocks (East African Community, COMESA and African Indian Ocean Region (AFI). KCAA is guided in this regard by the forward looking Kenya Vision 2030 that target a strong growth in the aviation sector through modernization of JKIA to a regional aviation hub as well as upgrading other major airports in the country.

As observed in the previous chapter, intervention projects are lined up for implementation under the Master Plan at the national and international level to address the above challenges. The Master Plan 2015 – 2030 (an update of the Master Plan 2005 – 2015) was published to facilitate KCAA's plan and mobilize resources towards the evolution in the Air Navigation Systems (ANS) for the 15 years action period to achieve the above as well as meet the requirements established under the ICAO. The Master Plan, therefore, takes stock of the identified challenges and consolidates the intervention actions.

The Airspace Master Plan 2015 – 2030 has offered an opportunity to integration of environment and social considerations into the airspace operations in accordance with the global trend toward improved environmental performance through technologies and operational improvements focusing on efficiency and better air traffic management. The Master Plan has focus on four key areas of the airspace management, namely;

(i) Organizational review and airspace infrastructure analysis that will involve airspace designs and management systems
(ii) Preliminary environmental impacts and benefits assessments addressing emissions and noise aspects with respect to internal and external receptors,
(iii) Institutional, legal and regulatory issues providing brief policies, regulatory and guidelines governing the aviation activities in Kenya,
(iv) Impact assessment and project implementation laying a basis for the identification of linkages and implications of the Airspace Master Plan to the environment and social settings

2.8.3 Proposed Master Plan Projects

Aviation operations have varying impacts on environment and social settings both at the international level and on the domestic situation through noise and vibrations, air quality, safety aspects and ecological interactions among others. The KCAA recognizes that the environmental and social issues must be considered for sustainable utilization and management of the airspace. The Airspace Master Plan 2015 – 2030 has proposed a total of 73 projects to be implemented through the horizon period.

Table 26: Schedule of Airspace Master Plan Projects

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
1	Air Navigation Services (ANS) Projects with 3No. Projects	1	Safety Management System (SMS) **Scheduled in the Short-Term (2016 – 2019)**	✓ Information collaboration and safety procedures management ✓ Enhanced response and rescue efficiencies (see also the Search and Rescue initiatives) ✓ Involvements and participation by stakeholders and partners for improved coordination of operations (see also the A-CDM Project) ***PIA 1 Priority 1 of ASBU Block 0*** ***Project Ongoing***
		2	ANS Planning Projects **Scheduled within the short term (2016 – 2020)**	✓ Improved efficiency in aircraft movements and so are people and goods, ✓ Skills capacity building for KCAA staff (tied to Training Projects) ✓ Ensure all proposed master plan projects are efficiently implemented within reasonable timeframes. ***PIA 1 Priority 2 of ASBU Block 0*** ***Project Commenced***
		3	Air Traffic Management (ATM) and Security Management **Scheduled in the medium-term (2022 – 2025)**	✓ Provide platforms for participation by Air Operators and other Services Providers, ✓ Linkage with security agencies and related players (domestic and international) ***PIA 3 Priority 1 of ASBU Block 0*** ***Project Commenced***
2	Air Traffic Management (ATM) En-route Operations	4	Flexible Use of Airspace (FUA) extension into HKR10 (review of flight tracks to include Controlled Routes (CDRs) and increase ATC Capacity)	✓ Allows shorter efficient aircraft routes with direct implications on reduced travel time, less fuel consumption and lower safety risks, ✓ Improved traveler comfort and satisfaction (social benefit)

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
	Projects with 8No. Projects		**Short-Term to Medium-Term (2016 – 2023)**	✓ Reduced emissions (including climate change risks) ✓ Noise effects distribution over wide land areas ***PIA 3 Priority 1 of ASBU Block 0*** ***Extension into HKR10 and CDRs not commenced***
		5	Operational use of Automatic Dependent Surveillance – Contract (ADS-C) and Controller Pilot Data Link Communication (CPDLC). **Scheduled for Short-Term (2016 – 2018)**	✓ This is a soft intervention ✓ Operationalization of the ADS-C and CPDLC (communication equipment in place) and decommissioning of the HF system will enhance efficient communication in the oceanic areas. ✓ Ultimate replacement of convectional Radar Systems ✓ Direct benefit is enhanced safety and efficiency, especially in the oceanic areas. ***PIA 3 Priority 1 of ASBU Block 0*** ***Significant number of aircrafts operating Kenya Airspace yet to equip for ADS-C*** ***ADS-B installed in JKIA, Wilson Airport and MIA but not fully commissioned***
		6	Development of Performance-Based Navigation (PBN) routes network providing capacity to cope with increasing traffic. **Short-Term – Medium-Term (2016 – 2021) but also generally running through master plan period.**	✓ Allows more discretion and decisions for the pilots, ✓ Expansion of routes allowing aircrafts fly at optimum levels reducing delays on approach routes ✓ Reduced fuel burn arising from optimization of flight routes and hence low emissions ✓ Improved airspace safety from effective separation between aircrafts and capacity of the airspace including review of the AIP. ***PIA 1 Priority 1 & 2 of ASBU Block 0*** ***Project already being implemented***

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
		7	Implementation of Free Route Airspace (FRA) concept for airlines **Oceanic Free Routes in the Short-Term (2019 – 2020), Free Routes over the continental airspace in the Medium-Term (2023 – 2025) and Free Route in the regional levels in the long-Term (2026 – 2030)**	✓ Freedom for airlines to plan and choose their routes with possible shorter travel distances, ✓ Potential for fuel consumption and hence emissions reduction ***PIA 1 Priority 1 & 2 of ASBU Block 0*** ***Project already being implemented***
		8	Air Traffic Flow Management (ATFM) involving centralized flight planning database that will enable verification of flight plans and routes. Key focus on JKIA operations management. **Scheduled for the Short-Term (2016 – 2018) or local focus and in the Long-Term (2026 – 2030) for the regional level.**	✓ Efficient flights with reduced airborne delays and low fuel usage. This has linkage to social satisfaction and emissions ✓ Systems will reduce pressure on the control workers and hence reduced stress. This also addresses workers welfare without comrpoms9ng on aircraft safety, ✓ The interventions involves software upgrading and has no physical works. ***PIA 1 Priority 1 & 2 of ASBU Block 0*** ***Project already being implemented***
		9	Operational use of ATS Interfaculty Data Communications (AIDC) **Medium-Term for Nairobi – Mombasa route (2019 – 2020) and Medium-Term to Long-Terms for Nairobi – Seychelles route (2023 – 2027)**	✓ To increase the interoperability, efficiency and capacity for ground-ground integration, ✓ Enhance low error risks as coordination will be automated. This implies improved safety ✓ Low workload and stress related health issues to the workers and hence efficiency and focus on welfare. ***PIA 2 Priority 1 of ASBU Block 0*** ***Partially implemented at JKIA***
		10	ATM-ENR Sectorisation	✓ This is a soft intervention diving the Approach communication

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
			Scheduled for the Medium-Term (2020 – 2022)	✓ This is a development of North and South en-route Sectors that will enhance capacity as well as safety. It will also contribute to less stress on the ATCOs (addressing stress management on the operators). ✓ The intervention entails, ▪ Design of the sectorization and related procedures ▪ Training of Air Traffic Control Officers, ▪ Upgrade of the ATC systems and voice communication systems, ▪ Updating the AIP accordingly. ***PIA 3 Priority 1 of ASBU Block 0*** ***Sectorization already achieved (North and South Sectors)***
		11	New Area Control Centre (ACC) **Scheduled for the Medium-Term (2020 – 2022)**	✓ Physical project involving civil works ✓ This will involve civil works and construction of the new Area Control Centre (ACC) in Athi River ✓ Installation of equipment. ✓ Improved disaster recovery system (upon shifting to the new ACC) ***Target to address ASBU Block 0*** ***Project not commenced***
3	Air Traffic Management (ATM) Approach and Tower Operations with 13 No. Projects	12	JKIA – Sectorization **Scheduled for Short-Term (2018 – 2020)**	✓ This involves splitting the Approach sectors and tower management to effectively handle the peak traffic without compromising on safety and efficiency. ✓ Intervention on the workload on the Approach controllers and hence dealing with stress and potential safety from excessive pressure on the operators, ✓ Increase capacity to cope with high traffic volumes at peak periods

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
				PIA 4 Priority 1 of ASBU Block 0 ***Already achieved for JKIA (and MIA)***
		13	JKIA – Arrival Management (AMAN) and Departure Management (DMAN) **Scheduled for Short-Term (2016 – 2019)**	✓ This will involve enhanced management of the approach and departure for JKIA following the sectorization process with focus on the following; ▪ Holding stacking, ▪ Holding time, and ▪ Number of aircrafts on hold. ✓ Anticipated linkages will include; ▪ Flight efficiency, reduced taxi time on the runway ▪ Fuel saving (low costs and emissions) ▪ Less workload on the Controllers and hence less stress, enhanced safety and welfare improvements ***PIA 4 Priority 1 of ASBU Block 0*** ***Already achieved for JKIA (and MIA)***
		14	JKIA – Development of Airport Collaborative Decision Making (A-CDM) **Scheduled for Short-Term (2017 – 2020)**	✓ Operations systems operations, ✓ This intervention will address the need for collaboration between the key stakeholders (KAA, ATC, airlines, ground operators) to enhance efficiency and transparency and improvement of operations, ✓ A-CDM will contribute towards a common database and information/data sharing as well effective implementation of departure and arrival management (DMAN/AMAN), ***PIA 1 Priority 1 of ASBU Block 0*** ***Already formalized for JKIA (and MIA but still informal at KIA, Eldoret and other smaller airports)***
		15	JKIA – Implementation of Point Merge concept	✓ The Point of Merger, defined as a Standard Terminal Arrival Route (STAR), is to be established to facilitate traffic flow with pre-determined sequence.

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
			Scheduled for Mid-Terms (2018 – 2020)	✓ New STAR will reduce the workload on the operators and hence enhanced safety through the operations ✓ The intervention will also enhance capacity to manage high traffic at JKIA, fuel saving (cost and emissions) ***PIA 1 and PIA 3 Priority 1 of ASBU Block 0*** ***Not commenced for JKIA or other airport. However, existing STARs known for JKIA and MIA marked by DVOR locations.***
		16	JKIA – Reorganization of TWR cab This was focused on the proposed 2nd Runway that has since been put on hold. **Scheduled early Short-Term (2016 – 2018)**	✓ This intervention involves expanding the Controllers establishment to provide more support for handling traffic. ✓ Increased human capacity will reduce pressure, stress and hence enhanced safety through efficiency and productivity for the current and future operations. ***Project on hold until the 2nd Runway Project is revived***
		17	JKIA – 2nd Runway ANS adaptations **Had been scheduled for the Short-Term**	✓ The 2nd Runway project has not cot commenced. ✓ The proposed intervention projects may not be scheduled. ***Project on hold until the 2nd Runway Project is revived***
		18	JKIA – Implementation of CAT II operations. It is reported that KAA has commenced the process. **Scheduled for early Short-Term (2016 – 2018).**	✓ Upgrading of the Instrument Landing System for the runway at JKIA from CAT I to CAT II will improve visibility for pilots and hence reducing cases of diversions and aborted landings due to bad weather conditions ✓ This intervention will contribute to unnecessary fuel burning (costs and emissions) as well as social and economic losses, ✓ Improvement is ILS also has a high impact on safety ***JKIA Runway has been upgraded to CAT II (with direct flights to the USA)***

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
		19	Wilson – New Tower **Scheduled for Mid-Term (2017 – 2019)**	✓ This intervention involved construction and equipping of a new Control Tower at Wilson Airport ✓ The modern Control Tower project was at completion stages during this SEA Study, ✓ It also proposed appropriate staffing of the new control tower ✓ The objective of this intervention is to improved safety and operations costs. ***Wilson Airport new Tower completed***
		20	Wajir – Tower Maneuvering Area (TMA) involving defining operational procedures, training of controllers and updating of the AIP. **Scheduled for early Short-Term (2016 – 2017)**	✓ The project involves restructuring the airspace operations arrangement and responsibilities for Wajir International Airport Terminal Maneuvering Area (TMA), ✓ Implementation of Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) for Wajir International Airport ✓ This will enhance efficiency in security and safety control s through prevention of unauthorized aircrafts (especially from Mogadishu), ***Maneuvering procedure Design has been completed.***
		21	Other airports – Implementation of Performance Based Navigation (PBN) procedures **Scheduled to run through the Short-Term (2016 – 2020) and end within the Long-Term (2021).**	✓ Adoption of PBN is focused on the Global Navigation Satellite System (GNSS) and active for JKIA, MIA, KIA and Loki. The same is planned for other airports including Wilson Airport, ✓ The interventions involves design and adoption of Continuous Climb operations and Continuous Descent operations that requires implementation of SID and STAR procedures. ✓ The intervention is anticipated to achieve shorter travel distances, lower fuel usage, reduced operation costs and emissions,

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
				✓ It is also important for social interactions, especially at the holding areas and approach flight corridors and around the airports generally. ***PIA 4 Priority 1 of ASBU Block 0*** ***Project not commenced***
		22	General – Apron management (closely tied to A-CDM initiatives) **Scheduled for early Short-Term (2016 – 2018)**	✓ This is an operations intervention system designed to address the low level collaboration between KCAA and KAA (GFS) on the safe and efficient movement of aircrafts around the Apron as required by ICAO, ✓ The A-CDM initiative will significantly address this issue ***PIA 1 Priority 1 of ASBU Block 0*** ***Activated at JKIA, MIA and Kisumu (informal at Wilson, Eldoret and other smaller aerodromes)***
		23	JKIA – Management of vehicles on maneuvering area **Scheduled for early Short-Term (2016 – 2018)**	✓ The intervention is design to address the potential safety risks within the apron and maneuvering areas of the JKIA (and other airports) arising from inadequate knowledge and understanding capacity of vehicles drivers. ✓ The intervention will involve; ▪ Training of drivers to acquire necessary knowledge and skills ▪ Issuing appropriate special permits ▪ Equipping vehicles with transponders ▪ Developing procedures and limitation hierarchies on the Safety Management Communication frequencies. ***Ground and aircraft safety*** ***Under implementation at JKIA and MIA***
		24	Other airports – Provision of Air Navigation Services (ANS)	✓ Training and capacity building of operators in all other airports

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
			Scheduled to run through the Short-Term (2016 – 2020) and end within the Long-Term (2021).	✓ Acquire adequate skilled support for pilots in the airports ***Project Not commenced***
4	Communications Projects with 10No. Projects	25	Extension of VHF equipment **Scheduled for Short-Term through to Medium-Term (2017 – 2022)**	✓ This is a soft intervention ✓ Equipment installations for improved communications in JKIA, Wilson Airport, smaller airports and parts of Northern Kenya ✓ Capacity building for handling the equipment
		26	Replacement of communication equipment at end of life **Short-Term (2016 – 2017)**	✓ Improved communication for enhanced efficiency and safety ✓ Handling of obsolete equipment would be a concern ***This is a progressive continuous process***
		27	Replacement of HF equipment **Short-Term (2016 – 2017)**	
		28	Replacement of Aeronautical Message Switching System (AMSS) at end of life **In the Long Term (2026 – 2028)**	
		29	Replacement of communication infrastructure **Medium Term (2023 – 2025)**	
		30	Improvement of communication links **In the Short-Term (2016 – 2020)**	This will involve laying of fiber optic cable to further improve communication for KCAA.
		31	System-Wide Information Management (SWIM) communication **In the Medium-Term (2021 – 2023)**	Further improvement of communication infrastructure for Kenya and Regional

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
		32	Mobile TWR **Medium-Term to Long-Term (2025 – 2026)**	This is meant to facilitate KCAA handle special situations where there is no ANS coverage for particular events. ***Already procured for remote airstrips, e.g. Ukunda Airstrip***
		33	Miscellaneous communication equipment **Scheduled for the Short-Term (2016 – 2018)**	✓ This intervention addresses the need for Automatic Terminal Information Service (ATIS), especially for Wilson Airport and Eldoret International Airport, ✓ Soft interventions but with improved safety implications ***Project not commenced***
		34	Aeronautical Telecommunication Network (ATN) B2 implementation **In the Long-Term (2026 – 2030)**	✓ The intervention is designed to improve communication between the ground and the aircrafts by equipping the latter with ATN B2 as per the ASBUS B1. ✓ Noted that this is not yet a priority for Kenya. ***Project no commenced***
5	Navigation Projects with 3No. Projects	35	Remote control for VOR/DME **Short-Term (2016 – 2018)**	✓ This is a simple improvement of introducing a remote control systems for restarting the equipment ✓ The intervention will avoid the safety lapse that arises when the equipment goes down.
		36	JKIA – Instrument Landing System (ILS) for 2nd Runway (RWY) **Short-Term (2017 – 2018)**	The 2nd Runway has not kicked off. ***The intervention project may have to be put on hold.***
		37	NAVAID rationalization at end of life **Medium-Term to Long-Term (2022 – 2029)**	✓ NAVAIDS including VHF Omnidirectional Range (VOR) and Distance Measuring Equipment (DME) have been installed (JKIA, KIA, MIA, EIA and a number of holding areas). ✓ This is a soft intervention towards ensuring harmony in information generation, replacement or decommissioning,

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
				✓ It is a soft intervention for operationalization of the VAVAIDS to enhanced safety
6	Surveillance Projects with 6No. Projects	38	Operational transition to ADS-B **In the Short-Term (2016 – 2017)**	✓ Automatic Dependent Surveillance equipment are reportedly in place but lacks appropriate personnel and skills for operationalization, ✓ Intervention project meant for skills capacity development for ADS-B ***Facility installed at JKIA, MIA and Mua Hills.*** ***Not fully activated as most aircrafts still lack necessary transponders for link.***
		39	Transition from MSSR to ADS-B **Short-Term into the Medium-Term (2019 – 2022, 2026)**	✓ The intervention projects entails replacement of radars at the end of their operational life ✓ Transition process from the convectional radars to ADS systems ✓ There is improved surveillance of the airspace and enhanced airspace safety ✓ Focus on environmental effects of replaced components of entre radar equipment ✓ Concern on disposal of obsolete equipment and scrap parts ***Facility installed at JKIA, MIA and Mua Hills.*** ***Not fully activated as most aircrafts still lack necessary transponders for link.***
		40	Replacement of Primary Surveillance Radar (PSR) at end of life **Long-Term 2024 – 2025)**	
		41	JKIA – Replacement of Surface Movement Radar (SMR) at end of life **Medium-Term (2024 – 2025)**	
		42	JKIA – Airport Multi-Lateration (MLAT) **Short-Term (2019 – 2020)**	This involves installation of ground surveillance sensors linked to a receiver at the control to enable enhanced safety of the runway and taxiway corridors ***Already installed at JKIA, MIA, KIA and Wilson Airport***
		43	Extension of MLAT system to Wide Area Multi-Lateration (WAMLAT)	

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
			Short-Term and Medium-Terms (2016 – 2018, 2025 – 2025)	
7	ATC Systems with 9No. Projects	44	JKIA – AMAN and DMAN **Scheduled for the Short-Term (2016 – 2018)**	✓ This intervention will involve upgrades, installation and activation of ATC systems (AMAN & DMAN Tools) to support aircraft traffic management for JKIA, ✓ This follows the sectorization (North and South) and creation of Points of Merger for JKIA, ✓ To enhance efficiency, safety and lower work load for the ATCOs. ***PIA 4 Priority 1 of ASBU Block 0*** ***Already achieved for JKIA (and MIA)***
		45	Dedicated TWR Electronic Flight Strip (EFS) system **Scheduled for the Short-Term (2016 – 2018)**	✓ Currently paper strips are used at JKIA, MIA and Wilson Airports Control Towers, ✓ Intervention to introduce electronic flight strips for efficiency (time), cost reduction and also environmental control (waste paper) as proposed under the master plan. ✓ To also contribute to low workload to ATCOs and also enable flight information storage and sharing with the stakeholders through the collaborative platforms (see A-CDM). ***Existing equipment in the Control Towers do not support electronic strips and hence not possible to replace the paper strips immediately.***
		46	ATC system for new ACC **Scheduled for the Medium-Term (2020 – 2022)**	✓ Part of the installations in the new Aviation Communication Centre, ✓ Internal activities but with positive implications to safety and Disaster Recovery. ***Functionalization of the new ACC once completed and commissioned at Athi River***

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
		47	Automatic Weather Observing System (AWOS) display **Scheduled for the Medium-Term (2016 – 2018)**	✓ Proposed installation of weather display unit for Moi International Airport ✓ Readily available up-to-date weather data for the control tower enhancing accurate decision and safety ✓ Training and skills for ATCOs ***AWOS already installed at JKIA, KIA and Eldoret. Not yet for Wilson and MIA***
		48	EUROCAT system upgrades **Scheduled for the Short-Term (2016 – 2019)**	✓ This is a soft intervention for enhanced communication, surveillance and aviation data conveyance. ✓ Intended for Eldoret Airport, JKIA Control Tower and the new ACC ✓ Replacement at expiry of life ✓ Training and skills development
		49	EUROCAT system replacement at end of life **Medium-Term (2024 – 2025)**	
		50	A-SMGCS system upgrade **Short-Term (2018 – 2020)**	Advanced Surface Movement Guidance Control System is a soft intervention for improved surveillance and safety
		51	Operational transition to use A-SMGCS **Short-Term into the Medium Term (2018 – 2022)**	✓ Intervention involved integration of MLAT and the A-SMGS at JKIA. ✓ Will improve on the runway throughput, reduced fuel usage (and so less costs and emissions) ✓ ATCOs to have accurate data and improved safety control ✓ JKIA will be more efficient with reduced delays (social gains)
		52	A-SMGCS system replacement at end of life **Medium Term (2024 – 2025)**	
8	Aeronautical Information Services	53	AIS system renewal	✓ Soft intervention involving systems' upgrades to facilitate Aeronautical Information Exchange across functions within KCAA and other states.
		54	SWIM implementation	

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
	(AIS) with 5No. Projects			✓ System Wide Information Management (SWIM) integration to meet the ASBUs provisions ✓ Improved Aeronautical Information Management systems, including digital NOTAM process and implementation, ✓ Development and equipping a new AIS offices in Kisumu International Airport and Wilson Airport, subject to agreement with KAA (This is a physical intervention project).
		55	AIM System extension	
		56	Relocation of AIS offices	
		57	Management and operation of ATS Message Handling System (AMHS)/ Aeronautical Fixed Telecommunication Network (AFTN)	
9	Search and Rescue Projects has 1No. Project	58	Upgrade of Rescue and Coordination Centre **Scheduled for the Short-Term (2016 – 2018)**	✓ Intervention intended to improve coordination and facilitate search for probable areas of aircraft accident and related rescue measures ✓ It will improve the rescue response period that currently ranges between 12 – 18 hours, ✓ Intervention action to involve installation of modern SAR software. ✓ New system to enable centralized coordination of all stakeholders involved in SAR, ✓ Every station has local network for rapid recovery and SAR as they await the central responses.
10	Training Projects has 10No. Projects	59	Development of unit training plans for ATCO/AFISOs **In the Short-Term (2016 – 2018)**	This is a skills capacity building and development programme entailing the following aspects; ✓ Developing training plans covering all staff cadres and a focus on ATCOs, ✓ On-Job training of ATCOs for continuous improvement and keep abreast of the changing aviation scenarios ✓ Provision of appropriate tools that also include airspace and ATM simulators at EASA, ✓ Skills and knowledge competency monitoring tools for the staff
		60	ATCO training **Continuous through the Master Plan Period (2016 – 2030)**	
		61	JKIA – 3D TWR simulator **In the Long-Term (2027 – 2029)**	

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
		62	Development of training programmes for AIS officers **In the Short-Term (2016 – 2018)**	✓ Undertaking specialized training for critical components including ILS, Safety Assessment, airspace design, procedure designs, etc. ✓ Exposure to instrumentation basics for the ATCOs ✓ Elevation of EASA into a Centre of Excellence through upgrading the training curricula and facilities to attract regional and international students. ***KCAA yet to have an institutionalized training plan and capacity building programmes are not centrally streamlined. A grassroots needs assessment necessary***
		63	Development of AIS proficiency check tools AIS specialized training **Continuous through the Master Plan Period (2016 – 2030)**	
		64	Development of training programmes for Air Traffic Safety Electronics Personnel (ATSEPs) **In the Short-Term (2016 – 2018)**	
		65	ATSEP training **Continuous through the Master Plan Period (2016 – 2030)**	
		66	EASA – Development of training programmes with other regions **Short-Term (2016 – 2020)**	
		67	Training equipment **In the Short-Term (2016 – 2018)**	
11	Human Resources Projects with 8No. Projects	68	ATCO recruitment and training (Base Case)	These are Human Resources Intervention actions involving;

Project Area No.	Project Areas	Project No.	Projects Description and Implementation Schedules	Project Objectives and Status
			In the Short-Term (2016 – 2020) and Long-Term (2026 – 2030)	✓ Staff needs assessments based on the interventions proposed under the Airspace Master Plan ✓ Recruitment as per the KCAA staffing procedures and the Public Services Guidelines ✓ Training (short causes on-job training and specialized training programmes) ✓ Re-deployments as the work situation demand. ✓ Sustaining instructors and trainers within KCAA as well as within EASA ***KCAA has not revised its staff establishment structure*** ***Lack of morale among the workers*** ***Work related stress in same stations***
		69	Air Traffic Control Officer (ATCO) recruitment and training **In the Short-Term (2016 – 2020)**	
		70	Aerodrome Flight Information Service Officer recruitment and training at new locations **In the Short-Term to Medium-Term (2016 – 2022)**	
		71	AIS staff recruitment and training **In the Short-Term (2016 – 2018)**	
		72	Technical staff recruitment and training (Base Case) **In the Short-Term to Medium-Term (2016 – 2025)**	
		73	Technical staff recruitment and training (Solution Scenario)	
		74	Redeployment of Communication Centre staff **Short-Term (2019)**	
		75	East Africa School of Aviation (EASA) – Instructor recruitment **Short-Term (2017)**	

2.8.4 Projects Implementation Plan

It is noted that the projects listed under the Airspace Master Plan 2015 – 2030 for implementation through the horizon period are mainly soft interventions and only a few involves physical activities. Due to the inter-dependence nature of the projects and complementarities between the activities, the implementation will also be integrated with common aspects addressed across all the projects. According to the Master Plan, the implementation is based on the analysis of the current situation in the Kenyan aviation industry and on the relevance of the Aviation Systems Block Upgrades (ASBUs) modules.

The implementation of the 10No. Master Plan Project Areas as outlined in the previous sub-section may be viewed in the following main domains;

(i) Aspects of Aviation Navigation Services
(ii) Air Traffic Management (ATM) measures addressing En-Route operations (take-off corridors), approach corridors, holding areas and the Tower operations
(iii) Communication improvement measures with focus on communication systems, navigation, surveillance and air traffic control systems,
(iv) Search and Rescue systems, an important component of the Aviation Navigation Services,
(v) Training for skills and knowledge capacity improvement covering facilities and programmes,
(vi) Human Resources planning issues for Aviation Navigation Services with a focus on needs assessment, recruitment and training.

The Master Plan projects are to be implemented such as to contribute towards achieving the ASBUs models that were scheduled to run from the year 2013 through to beyond 2030. The implementation plan for projects, therefore, will be undertaken in the following schedules (see also the proposed project schedules in the previous section;

(i) Short Term Plan (2016 – 2020)
(ii) Medium Term Plan (2020 – 2025)
(iii) Long Term Plan (2026 – 2030)

Projects implementation schedule shows that it is behind the timelines for Block 0 of the ASBUs that should be closing in 2019 and commencing Block 1. However, there is a notable overlap of the proposed actions between Block 0 and Block 1.

Chapter 3: Environment and Social Analysis

3.1 Environmental Issues

3.1.1 An Overview

The airspace master plan has identified air quality and noise as the key linkages associated with aviation operations arising from aircraft engines (emissions) and aircraft mainframes (noise and vibrations) during flight. It has also pointed at fuel usage as an important phenomenon. The Airspace Master Plan has appreciated the importance of integrating environmental concerns as illustrated by the text extract in the box below;

Box 2: Environment Appreciation in the Master Plan

> ***……..The Master Plan, therefore, offers an opportunity to re-think KCAA's environmental management and to the extent possible set up a structure that reflects its environmental concerns. This is because the global trend is toward improved environmental performance driven by new technologies and operational improvements focusing on efficiency and better ATM.***
>
> ***The overall aim of the Master Plan is to improve the ATM system which should contribute to the protection of the environment by considering noise, gaseous emissions, and other environmental issues in the implementation and operation of the National ATM system. The Plan will therefore provide for the designation of airspace and operational procedures with due consideration of environmental concerns…….***

Aviation operations are associated with environmental and social aspects at the local and global levels including emissions, noise, safety, ecological issues, land use conflicts, social impacts as well as security issues. Key environment and social issues associated with aviation operations are as follows;

(i) Safety and health with respect to occupational conditions, passengers safety and public safety,
(ii) Travel delays with social and economic implications including missing appointments, financial losses, stress and access to medical services, etc.,
(iii) Flight efficiency levels associated with a number of airspace management,
(iv) Fuel consumption levels associated aircrafts management (DMAN and AMAN) and resultant fuel consumption, emissions and noise to the ground receptors,
(v) Operability with respect to communication systems that involves systems enabling inter-functional interactions,
(vi) Land use interactions within flight corridors and other aviation operations. Receptors include people, as well as wildlife in ecological zones.

Aviation Systems Block Upgrade (ASBU) Model described earlier are important initiatives establishing environmental and social interactions for necessary intervention through the Airspace Master Plan implementation period. In order to realize the Aviation Systems Block Upgrades (ASBUs) and associated Performance Improvement Areas (PIAs), the Strategic Environment Assessment (SEA) analyzed the projects under the Airspace Master Plan with a view to identifying their respective implications to the environment setting both in space and on the ground. This analysis formed the basis of the impacts and the management actions.

3.1.2 Emissions and Climate Change

Report by the Inter-governmental Panel on Climate Change (IPCC), indicate that aviation is responsible for 2% CO_2 released in the atmosphere, with international aviation contributing 1.3% and domestic 0.7%. Although the contribution of aviation operations to total global CO_2 emissions is relatively small, forecasted traffic growth (approximately 4.7% per annum) raises questions on the future contribution of aviation activity to climate change. According to IPCC, Climate change is projected to amplify climate related risks and create new risks for natural and human systems.

Little work has been undertaken in establishing the level of aircraft emissions along the major flight corridors and around airports in Kenya while limited measurements have been noted within airport grounds through airport development projects. A sample dataset obtained for air quality sampling around JKIA (on a project based assessment) is presented in the table below as an illustration of ground air quality depicting mixed emission sources including aircrafts and support services.

Table 27: Illustrative Ground Air Quality at JKIA

Source location	Parameter	Findings	WHO Standard Limits
Runway (Average readings for Runway 06 Touchdown – threshold 24)	CO_2	0.05%	0.5%
	NO_X	0.02ppm	5.0ppm
	CO	Nil	5.0ppm
	SO_X	Nil	0.19ppm
	C_xH_y	Nil	0.7mg/m^3
	$PM_{10}/PM_{2.5}$	4.06	10mg/m^3
Taxiway – E & G Intersection	CO_2	0.05%	0.5%
	NO_X	0.03ppm	5.0ppm
	CO	Nil	5.0ppm
	SO_X	Nil	0.19ppm
	C_xH_y	0.02mg/m^3	0.6mg/m^3
	$PM_{10}/PM_{2.5}$	3.02	10mg/m^3
Apron Area	CO_2	0.06%	0.5%
	NO_X	0.03ppm	5.0ppm
	CO	Nil	5.0ppm
	SO_X	0.03	0.19ppm
	C_xH_y	0.03mg/m^3	0.6mg/m^3
	$PM_{10}/PM_{2.5}$	3.04ppm	10mg/m^3

Sources: ESIA Study Report for the JKIA Improvement Project

It was not possible to allocate emission levels to any of the aircraft tracks or airport within the provisions of this SEA Report study. The actual ground emission measurements can be erroneous due to the multiplicity of emissions in the areas including domestic, surface transport and industrial activities.

3.1.3 Ecological Linkages

Airspace operations have direct linkages to ecological settings both on the land and in space. The implications are associated mainly with noise as well as aircraft movements as follows;

(i) Aircrafts overflying conservation areas such as national parks may impact on wildlife characteristics (breeding habitats, grazing areas and dispersal corridors) that could progressively shift. Among the areas noted are the Nairobi National Park (approach corridor to JKIA and Wilson Airport), Tsavo National Park (approaches to Moi International Airport and at least one holding areas,

(ii) Aircraft tracks (flight paths) including holding areas have potential for conflicts with birds' migratory corridors depending on the elevations, especially within the lower airspace zones (1,500ft – 24,500ft above the mean sea level). It is also reported that some birds on migration can fly at high attitudes (Common Crane upto 33,000ft, Bearded Vulture upto 24,000ft, White Stock upto 16,000ft). While this has not been foreseen by the Master Plan, it would be important to establish the same for appropriate mitigation measures,

(iii) In addition to birds migratory corridors, strategic birds attractant areas including waste dump sites, sewage treatment lagoons, sea/lake shorelines and informal settlements are also of great interest,

(iv) There are also risks to aircrafts from birds strikes that may arise from conflicts low flight paths (e.g. LTO corridors) with land use activities that are birds attractants including waste dumping sites, sewage lagoons, dams, informal settlements and lake shores among others,

(v) Incidents of air crashes in forests and other conservation areas have potential for ecological disruptions in the short term (damages and wildlife shock) and long term degradation (oil spills, accident fires) with long term restoration challenges.

It is observed that the Airspace Master Plan 2015 – 2030 has not addressed the interaction of birds' migratory corridors as part of the space planning and management criteria. It is also noted that only advanced radars can detect birds' movements in space such as to warn pilots in flight, especially flight paths along known birds' migratory corridors. The figure below illustrates birds' migration routes through the Kenya airspace, with main origins and destinations being European and Asian habits as they move to the south as influenced by changing weather conditions as illustrated in the caption thereafter

Figure 22: Illustrative International Birds Migratory Routes

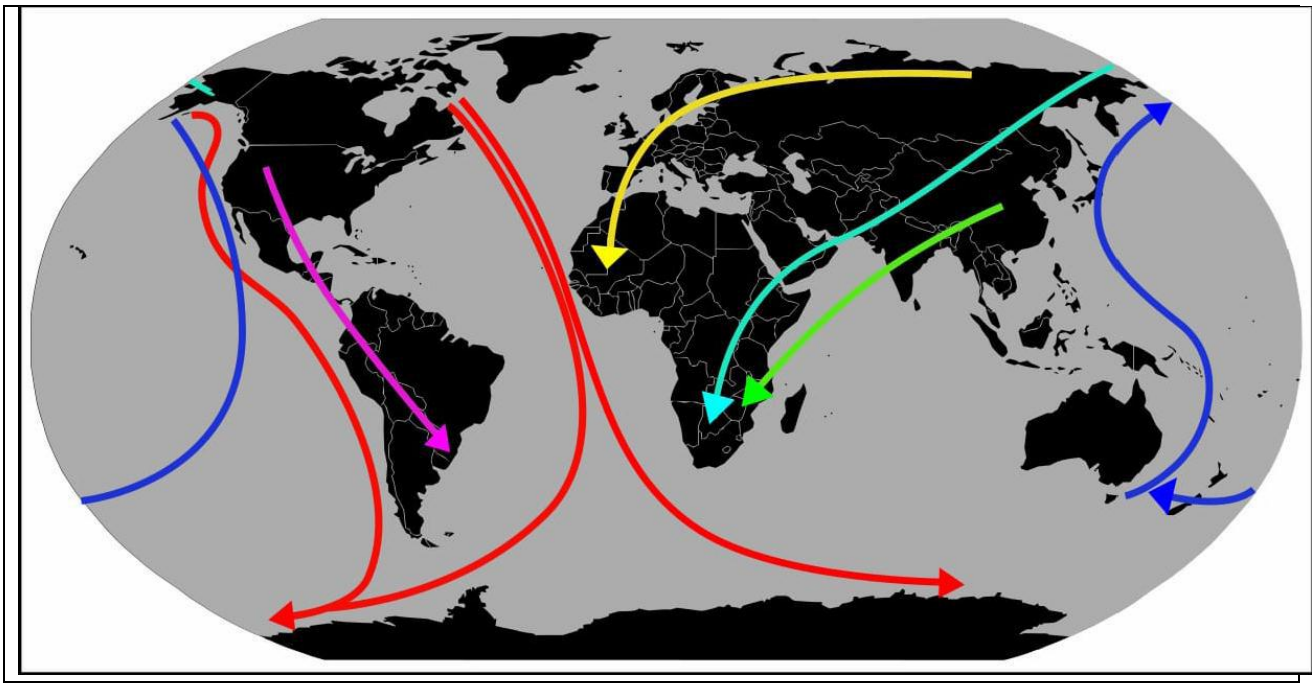
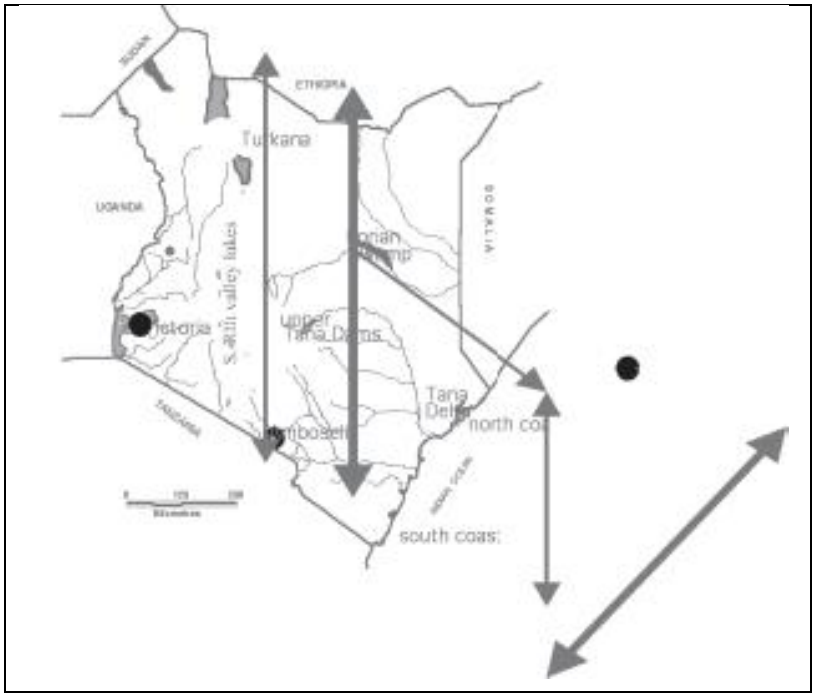


Figure 23: Illustrative Birds Migration Corridors over Kenya Airspace



Source: Oliver Nasirwa National Museums of Kenya, Bird Migration and Bird Strike Situation in Kenya

Box 3: State of Birds Migration Flyways

Situation

Most international airline routes through Kenya fly along the bird migratory routes, especially the Rift Valley. However planes fly at altitudes above 10,000m, which is much higher than migrating birds. Hence most bird strikes occur within the vicinity of airports when airplanes are approaching to land or during take-off. Despite the occurrence of bird strikes in Kenya, a significant number of cases go unreported, and even when reported some lack important details. In this article I review bird migration and the bird strike situation in Kenya.

Migratory birds visiting or passing through Kenya use the Rift Valley, coast and eastern bush lands, central and western grasslands as their flyway. The bulk of migratory water birds use two important flyways that have a chain of suitable sites for feeding and resting. One of the flyways is the Rift Valley, which has a chain of alkaline and freshwater lakes from Lake Turkana in the north to Lake Magadi in the south. The other flyway is along the coast, which includes the beaches, reefs and mangrove creeks. The other important water bird sites lie close to these major flyways. They include the Tana River delta, Lake Victoria, Amboseli, Lake Jipe, Tana River dams and small island dams scattered to the east and west of the central Rift Valley.

The National Bird Strike Committee (KNBSC) has for several years identified the presence of water bodies and garbage in the vicinity of airports as the main bird attractants. However these observations have not been taken into consideration in the development of new airports. Moreover, the local councils responsible for urban planning and managing solid waste have not been involved in air safety development or planning.

Conclusion

Migration of Palearctic birds is well studied and much more understood compared to the migration of Afrotropical species. Many species not known to migrate are highly mobile but their movements, though important, are least understood. Proper knowledge and documentation of the movement of these birds is important for their conservation as well for bird strike control. Movements of non-migrant species to their breeding grounds, feeding areas or in relation to sporadic weather patterns have significant importance for their conservation as well as bird strike control.

Many Kenyan species (e.g. pelicans, herons, egrets, storks etc.) are known to breed in very few areas, but are widely distributed. This suggests that with more studies, seasonal and weather patterns that trigger their movements can be better understood, making their movements predictable in the future. The percentage of migratory bird species in bird strikes is not known due to lack of detailed reporting. Improved documentation of species involved in bird strikes is necessary. The timing of Palearctic and Afrotropical migration through Kenya needs to be understood, such that, if need be, an early warning system to pilots and airport authorities can be developed.

Source: Oliver Nasirwa National Museums of Kenya, Bird Migration and Bird Strike Situation in Kenya

3.1.4 Noise and Vibrations

Aviation noise and vibrations are relevant in flight events within the proximity of the land use features imparting higher average noise levels as stipulated in the national and international exposure standards (within the precincts of aerodromes and below approach corridors). Aircraft noise, therefore, becomes critical within the lower airspace upto FL245 (from the ground to 24,500ft above mean sea level) close to the human receptors (and wildlife within conservation zones). This interaction, therefore, is expected along departure (en-route) and arrival corridors, some areas around the aerodromes as well as aircraft holding areas. It is observed that approach corridors for most of Kenya aerodromes have been seriously encroached by human settlements and institutions. This makes aircraft noise one major conflict calling for attention.

In addition to noise and vibrations, wake vortices, whirlpools of air created by moving aircraft in space, have the potential to affect the stability of other aircraft within the vicinity and may also damage roofing structures for buildings directly below the flight paths for low flying aircrafts. Wake Vortices combined with vibrations from the aircraft mainframe have the potential for structural damages for window glass panes as well as ruffling of roof tiles.

The Airspace Master Plan 2015 – 2030 has indicated part of the interventions will address reduction of aircraft noise. However, it does not seem to appreciate the receptors and the relative locations within the Kenya land use settings. Noise conflicts with land use practices, especially where sensitive functions are involved, as illustrated by the world Health Organization Standards below;

Table 28: WHO Noise Guideline Values

Specific Environment	Critical Health Effect(S)	Laeq [Db]	Lamax, Fast [Db]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	- -
Dwelling, indoors Inside bedrooms	Speech intelligibility and moderate annoyance, day and evening Sleep disturbance, night-time	35 30	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	60
School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	-
Pre-school, bedrooms, indoors	Sleep disturbance	30	45
School, playground outdoor	Annoyance (external source)	55	-
Hospital, ward Bedrooms, indoors	Sleep disturbance, night-time Sleep disturbance, daytime and evenings	30 30	40 -
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1	
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	110
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	110
Public addresses, indoors and outdoors	Hearing impairment	85	110

Specific Environment	Critical Health Effect(S)	Laeq [Db]	Lamax, Fast [Db]
Music through headphones/earphones	Hearing impairment (free-field value)	85 #4	110
Impulse sounds from toys, fireworks and firearms	Hearing impairment (adults) Hearing impairment (children)	- -	140 #2 120 #2
Outdoors in parkland and conservation areas	Disruption of tranquility	#3	

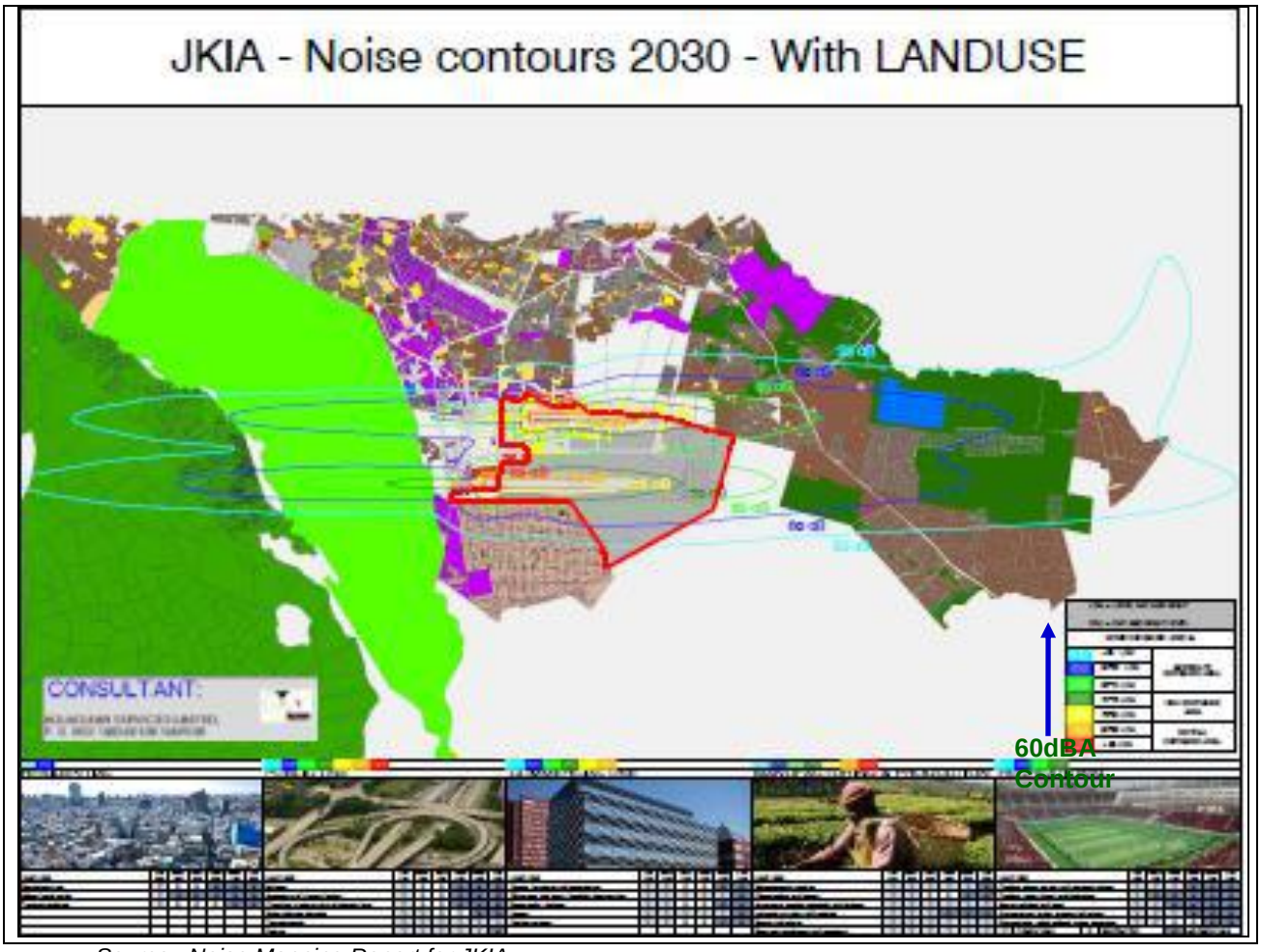
#1: as low as possible;
#2: peak sound pressure (not LAmax, fast), measured 100 mm from the ear;
#3: existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low;
#4: under headphones, adapted to free-field values

The Kenya Airports Authority (KAA) has developed initial aircraft noise maps for JKIA and other airports in the Kenya (MIA, Wilson Airport, KIA and EIA) as an illustration of possible land use conflicts. A sample of the noise contours on land use maps projected to the year 2030 for Wilson Airport JKIA are shown on the figure below while ground noise levels measures along JKIA Runway are illustrated in the table that follows.

Figure 24: Noise Contour Maps for Wilson Airport

Source: Noise Mapping Report for Wilson Airport

Figure 25: Noise Contour Maps for JKIA



Source: Noise Mapping Report for JKIA

Table 29: Illustrative Ground Noise along JKIA Runway

Location	Measured Noise Levels 30m away	Remarks
RWY 06 Touchdown area		
Aircraft taxing to threshold 06 for take-off	65.0	All results are higher than established levels for health, educational and other institutions (60dBA by day and 35dBA by night according to NEMA Regulations. WHO Standards allows upto 75dBA and 55dBA during the day and night respectively
Aircraft Taking Off	76.1	
Aircraft preparing to land at RWY 06	80.9	
Small aircraft landing at RWY 06	85.0	
Large body aircraft landing at RWY 06	75.8	
Helicopter overflying the runway	74.4	
Taxiways		
Large aircraft preparing taking off	88.5	All results are higher that established levels for health, educational and other institutions both by day and night according to NEMA Regulations. WHO Standards allows upto 75dBA and 55dBA during the day and night respectively
Large aircraft taxiing on TWY G	84.7	
Small aircraft taxing on TWY L	69.4	
Large aircraft taxing TWY E/-G Junction	75.0	
Small Aircraft taxing on TWY E-G Junction	73.0	

Source: ESIA Study Report for the JKIA Improvement Project, 2012

3.1.5 Fuel Jettisoning

Fuel dumping by aircrafts (also known as jettisoning) is a common phenomenon in aviation operations where the fuel is a risk to aircrafts in distress in need of emergency landing. Fuel dumping is done by the Pilot in consultation with the Control Tower and involve dispersing the fuel in space areas as directed from the Control Tower. The aircraft will hold and make circuits shedding the fuel in jets into the space until the Pilot achieves the right weight of fuel for safe landing. Jettisoning process leaves fuel droplets in the atmosphere that may also lead to other associated byproducts rising from atmospheric reactions. Among the possible impacts from jettisoning process include;

(i) Air pollution (fuel aerosols spread out in the atmosphere),
(ii) Effects to vegetation within the affected areas arising from depositions of fuel (hydrocarbons) from space following fuel dumping, especially of followed by rains,
(iii) Water pollution (arising from potential contamination of surface runoff from space following fuel dumping)
(iv) Aerial ecological effects (especially where there is interaction with birds migration routes and habitats)
(v) It is also a safety risk to other aircrafts flying to same airspace zone (this to be addressed by the Control Tower).

Among potential areas of fuel dumping may include holding areas for circumstances ranging from emergency landing and excess fuel between two airports. While flying into airports without fuel storage such as Eldoret, Manda, Lodwar, etc. airplanes are forced to carry extra fuel that on return to the original airport, they are forced to dump any extra fuel for safe landing.

3.2 Social Issues

3.2.1 Overview

Aviation operations are associated with dynamic national and global economy as well as improved movement of people and goods. Conflicts in regard are related to land use activities within the aviation operation areas as well as indirect implications arising from airspace disruptions. Among the notable social issues include the following;

(i) Social disruptions along flight corridors (landing and take-off corridor zones) including among other activities social gatherings, religious functions, learning in schools and social and office meetings in institutions or organizations),
(ii) Potential health complaints due to noise recipients suffer from sleeping disorders, hearing impairments and loss of concentration. Other potential health challenges include upper respiratory tract infections (URTI), eye infection, to aerodromes ground support workers while effects to the public is insignificant

(iii) Noise, vibrations and wake vortices have implications associated with potential damages of structures and property. Areas around aerodromes and along low level fly paths are the most likely victims.

(iv) Aviation operations installations (including aerodromes, approaches, holding areas, radar installations and navigation aids sites) attract settlements, commercial premises and institutional developments to an extent of conflicts through encroachments with high exposure to safety of the residents and security of the aerodromes.

(v) Land use trends in the country have the potential for conflicts with high risk to aviation operation areas including flight and emergency corridors effectively constraining airspace utilization.

(vi) Air travel is a convenient and safe transport system for people, goods and services. However, challenges in airspace management could lead to flight delays, some with far reaching social implications including;

- ✓ Efficient attendance to engagements;
- ✓ Access to medical services for emergency cases
- ✓ Connecting flights
- ✓ Flight diversions in the event of disruptions
- ✓ Financial and social cost implications
- ✓ Limited effects on crops and vegetation from potential deposition of aviation fuels residues emanating from fuel jettisoning done in the atmosphere. This could have impact on the health of both human and animals (birds, fish, wild and domestic animals).

3.2.2 Workers Welfare Issues

3.2.2.1 Work Related Stress

The Master Plan has appreciated that most of the intervention projects will reduce the work load on workers, especially the Air Traffic Control Officers (ATCOs). It was reported that the current situation exposes some of the ATCOs to long periods of work on the controls, sometimes with high exhaustion levels. In busy airports such as JKIA, MIA and Wilson Airport the controls are understaffed and even with shift schedules there is still limited rest. In this situation, there are with possibility of stress and exhaustion that effectively could compromise on safety of the aircrafts as well as possible effects at their family levels.

3.2.2.2 Professional Skills Growth

Changing technologies and procedures in aviation operations could impact the current workers in terms of limited professional growth, it is likely that the workers might miss the opportunity to upgrade their skills due to the high level commitment with high workloads and low staff numbers amid increasing traffic, adequate time for effective training is a challenge even when opportunities are available. Among the proposed projects will, therefore, lessen the workload on the workers hence freeing some for their social lives and opportunities to improve their skills and knowledge.

3.2.2.3 Health Welfare

The high workload and long working hours as identified by the master plan in most of the aviation stations could result to health related impact on individual workers or their immediate members of the family. These are in terms of high stress levels and psychosocial impacts to individuals and family members as a result reduced family time and heavy workloads. This has a direct impact on individual work performance and attendance to their roles and responsibilities. If stress levels are not well addressed or managed, it could lead to behavior which put individuals and their families into health risks, including excessive alcohol and drug abuse, indulgence in casual sex behaviours, and stress related illness. These could lead to security and safety risks as a result of reduced concentration levels and also frequent abstention from work. Some of these behaviors expense individuals and their families to social diseases like HIV/AIDS and STIs. Others,

(i) Provision for proper working chairs,
(ii) Accessibility to sanitation
(iii) Exposure to hygiene risks while removing dead animal remains alon the runway corridor

3.2.3 Safety Issues

Safety is the most important component in the aviation industry. It may be related to flight obstructions, poor communication, aircraft conditions, human elements, climatic conditions (weather), infrastructure conditions and even land use related aspects. Airspace, a shared resource for local and global users, is also critical area of safety considerations. It is the main reason that ICAO ensures order and harmony on airspace utilization through global, regional and national responsibilities clearly defined. Areas of high strategic importance are briefly described below;

3.2.3.1 Public Safety

Noise from aircrafts, emissions, fuel dumping and search & rescue are some of the aspects that direct link the public with aviation industry as follows;

(i) The holding areas may subjects the public to elevated noise and anxiety, especially in areas. There is at least 1No. holding area for each approach into a runway, characterized with human settlements, institutional ,
(ii) Aircraft emissions in space has impacts on air quality and climate change. Emissions from an aircraft are associated with fuel usage determined by the flight procedures, flight routes and nature of the aircrafts,
(iii) Potential effects of fuel dumping (jettisoning) have air quality, risk to fire safety in space as well as potential safety risks to other aircrafts.
(iv) Potential air crashes on settlements, institutional areas and other commercial activities draws parallels between airspace operations and land use activities below,

(v) In the unfortunate event of an air crash, tracking and saving the aircraft and lives of the passengers takes longer period arising from poor communication and incidents tracking technologies.

3.2.3.2 Aircraft and Passenger Safety

Aircraft safety on flight is linked to the following aspects;

(i) Turbulence arising from climatic conditions, especially on approaches to landing.
(ii) Wake vortices from other aircrafts that may arise from inadequate separation flight tracks in space,
(iii) Risks from threats arising from land use activities that may habour criminal or terrorists' activities. This also applies to flights paths over war zones or areas with unstable societal conflicts.
(iv) Risk from bird strikes along the flight paths and the landing and departure approaches or corridors due to the different human activities and birds' migratory routes

3.2.3.3 Worker Safety

Workers on the ground and on board flights form the foundation of safety in the entire aviation industry. On the ground workers are subjected to various hazards including ergonomic, physical, chemical, radiation, noise, emissions, and psychological, mechanical and even biological hazards. These hazards have to be mitigated to enable the workers serve for smooth running of the aviation industry. Worker on board flights are custodians of safety in the air. Their safety during flights is of extreme importance.

3.2.4 Land Use and Development

There is a high level interaction of airspace management and operations on the one hand and land use and development features on the other. With demand on land increasing for settlement, urban development, agriculture, institutional and conservation among other uses, there is also increasing encroachments into aviation areas including airports, flight corridors, holding areas and other aviation installations. The implications of this interaction is two way, i.e. land use risks to the aviation operations as well as risks to aviation operations to land use control and safety risks of the inhabitants. These aspects need to be appreciated and integrated in the master plan implementation. Land use issues relating to aviation development and operations include the following;

National land use practices and regulatory provisions. Implications of airspace operations are being established, and they include spatial and land use Act 2019, The Kenyan National Spatial Planning Policy, moreover National land use planning is an important tool in ensuring that land adjacent to, or in the immediate vicinity of the aviation installations and operations, is consistent with activities and purposes are compatible, including aircraft landing and takeoff thus all regulations and policy ought to be participatory and include all the stakeholders during formulation and implementation.

Land use around aerodromes and implications of emissions and noises as illustrated above, Aerodromes create employment opportunities, thereby making areas around airports major industrial compounds that increase the local rate of employment. Businesses that rely upon the aviation industry are established like flower packing industries thus better employment opportunities attract people toward aerodromes. Some conflicting land uses such as certain industries which produce smoke, acts as screens thus reducing visibility.

Land use around key installations potentially conflicting land use activities that could cause interference with radio communications and navigation aids. Such installations include high voltage power transmission lines, Wind farms located in Ngong hills, telecommunication equipment like GSM towers and radio and Television base stations. Land use within holding areas (spanning 10 – 20km wide) with potential for safety, anxiety and risks to the aircrafts security. A good example is where county governments allocate dumpsites below the holding areas and approach corridors posing safety risks due to bird strikes as witnessed in JKIA, MIA and KIA.

Aviation security and land use practices associated with developments around aviation installation without appropriate design and approval criteria or guidelines taking security into consideration. Controlled and restricted land use areas affect the efficiency of aviation since some areas are restricted like military installations and operation areas as well as other State security sensitive areas, in-turn the flight paths are longer and it leads to more emissions. Of particular interest is the northern Kenya zone (HKR10) reserved for military operations shutting out civilian aircrafts for national security reasons.

3.3 Impacts of Airspace Master Plan

3.3.1 Impacts Overview

Impacts to environment and social aspects are related to the proposed Airspace Master Plan implementation projects. The proposed project areas are focused on systems improvement and knowledge and skills enhancement for the staff. The airspace master plan project areas are anticipated to improve operations and operability in the Kenyan airspace operability and its interphase with the neighbouring Flight Information Regions (FIRs). This is to be achieved through the implementation of the proposed projects under the identified intervention operation areas.

The Airspace Master Plan project areas include the following (details are outlined in Chapter 2);

(i) Air Navigation Services (ANS) Projects
(ii) Air Traffic Management (ATM) En-route Operations Projects
(iii) Air Traffic Management (ATM) Approach and Tower Operations projects
(iv) Communications Projects
(v) Navigation Projects
(vi) Surveillance Projects
(vii) Air Traffic Control ATC Systems

(viii) Aeronautical Information Services (AIS) projects
(ix) Search and Rescue Projects
(x) Training Projects
(xi) Human Resources Projects

Most of the proposed Airspace Master Plan projects are basically soft interventions by nature aimed at enhancing efficiency. The intervention projects include software improvement, technological changes and installation of monitoring computer hardware as well as improved staff capacity enhancement. The intervention projects have been considered to address four beneficiary fields namely;

(i) Improved communication and Air Traffic Management,
(ii) Environmental conservation including noise and emission management,
(iii) Safety management including Search And Rescue (SAR) measures,
(iv) Human resources improvement including recruitment and skills capacity building

Impacts from the airspace master plan projects implementation are viewed from the above beneficiary fields as well the emergent secondary and tertiary effects. It is also important to appreciate that while not directly mentioned in the Airspace Master Plan, the receptors of the impacts are of social, economic and ecological nature. Mitigation measures have been formulated for consideration and integration for the main impacts and emergent effects associated with the airspace master plan projects. The following sections outlines impacts associated with aviation operations and mitigation measures provided by or required from the airspace master plan projects.

3.3.2 Impacts on Safety

Safety issues associated with the airspace operations and management are illustrated on the figure below for Nairobi Control Zone extract from the Aeronautical Information Publication (AIP) and impact areas in the descriptive sub-sections that follow;

3.3.2.1 Departure and Approach Corridors

These are areas within the proximity of airports and the flight approach corridors (departures and approach) with impacts classified as follows;

(i) There are potential risks along the approach corridors into aerodromes from landing aircrafts to land use activities, features and residents within varying distances from the runway threshold. Anticipated impacts include potential safety risks of accidental aircrafts crashing, effects of elevated noise levels (average noise levels above the ambient),
(ii) Departure activities also have a combination of potential risks on the land use activities and residents on varying distances from the runway threshold associated with noise and vibrations, aerial emissions as well as potential safety risks,

(iii) There are potential safety risks to the aircrafts from the ground (potential criminal and terrorism) that may be associated with land use activities.

Mitigation Measures

- ✓ Identify land use trends and analyze for integration along the flight departure and approach corridors for all aerodromes,
- ✓ Overlay the flight corridors on the land use maps and apply the same for development approvals and monitoring of potential risks,
- ✓ Consider land use factors in the determination of flight tracks (En-route and approach) and formulation of management systems (DMAN and AMAN), 13No. Projects to be implemented under the ATM and Tower Operations to realize the DMAN and AMAN procedures,
- ✓ Initiate a social and institutional engagement platforms for collaborative land use control guidelines along the flight corridors that informs respective development activities and approval,
- ✓ En-route sectorisation Project in North and South Sectors for enhanced traffic management has already been accomplished
- ✓ Search and Rescue (SAR) interventions through enhanced coordination strategies as well as empowerment of the regional SAR initiatives. The airspace master plan has provided for improved communication system project for SAR

3.3.2.2 Flight Track Routes

Potential safety risks considered where overflying aircrafts are fairly at high elevations from the ground above 24,000ft above sea level (FL245). The safety risks at those levels of the flight tracks including;

(i) Potential aircraft crash accidents risking the passenger and the communities on the ground,
(ii) Potential aircraft mid-air collisions with risks to the passengers and communities in the area
(iii) Effects of wakes vortices on other interactive aircrafts in space with risks to the passengers and communities in the area,
(iv) Potential conflicts with birds' migratory corridors and critical habitats. This issue do not seem to have been addressed under the airspace master plan,
(v) Effects from weather conditions that may including storms, volcanic ash, dust waves, etc.,

Mitigation Measures

- ✓ Improved aviation communication system at higher airspace including alerts for unusual disruptive features,
- ✓ Improved tracks separation and management as may be determined by evolving technologies and aircraft specifications. The sectorization projects under the airspace master plan addresses this situation,

- ✓ Integration of international birds' migration routes and habitats to the established international and local flight corridors especially in the lower airspace. Liaison with the Ornithology Departments (National Museum of Kenya) to overlay the airspace plan on birds' migration routes and important habitats,
- ✓ The introduction of the new Area Control Centre (ACC) for enhanced communications. The project has civil and mechanical works involvements and hence requires EIA study and approval by NEMA. The associated EMP to be part of the ACC project implementation.

3.3.2.3 Holding Areas

Aircrafts holding areas are designated locations relative to the final approach into aerodrome runway corridors awaiting clearance from the control tower to land. Holding areas ranges from one aircraft to multiple aircrafts in vertical stacks or in adjacent holding areas. For JKIA, the holding areas are at Ngong centered on DVOR (01^{o} 23' 47"S, 36^{o} 38' 16"E) on the 06 runway approach and 01^{o} 17' 59"S, 36^{o} 57' 15'E on the runway 24 approach. There is also a holding areas in Stoney Athi centered on DVOR at 01^{o} 30' 12"S, 37^{o} 01' 16"E. The holding areas covers varying radii of between 10 – 20km depending on aircraft sizes and runway capacity.

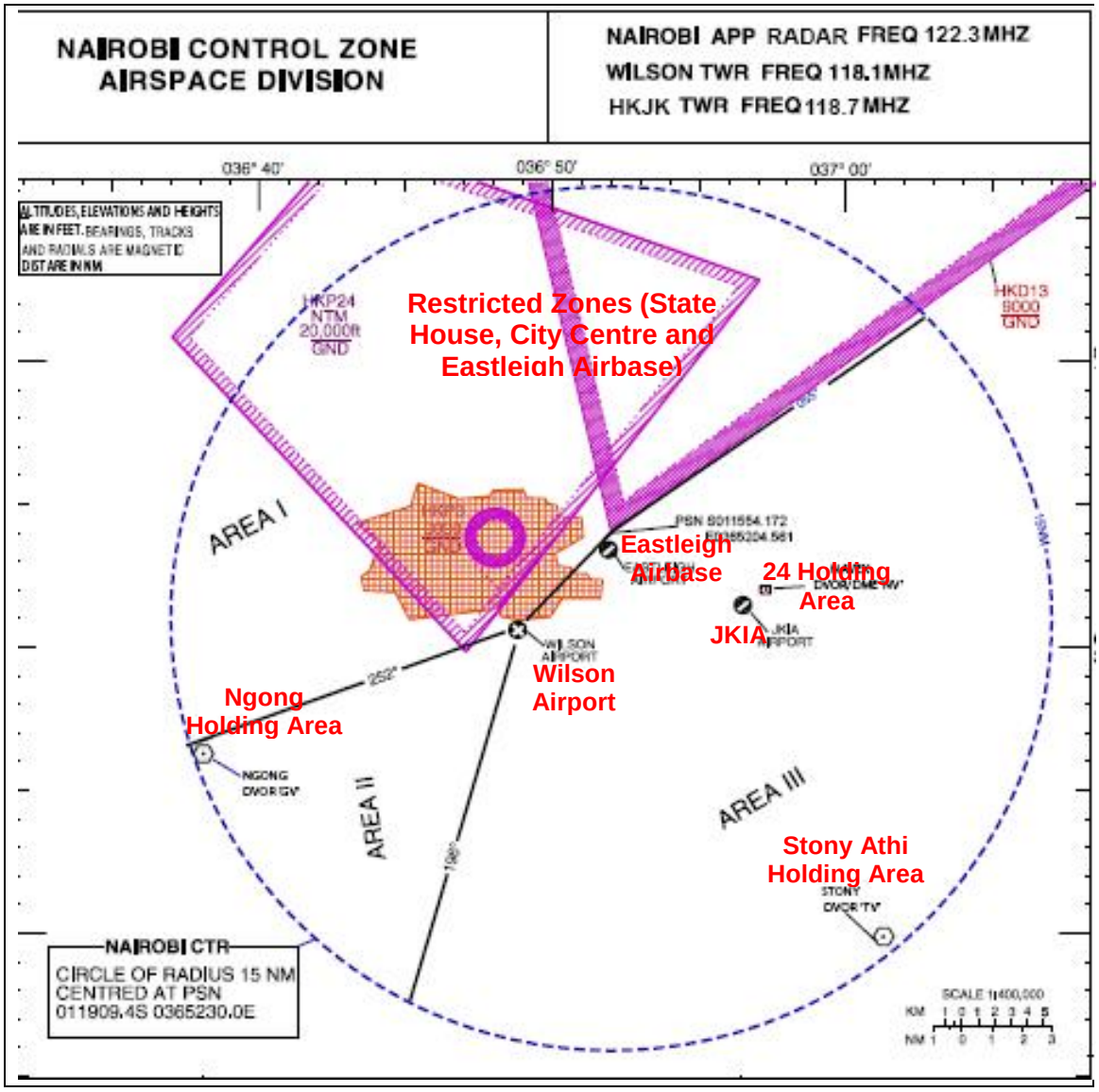
Potential impacts from include;

(i) Safety risks associated with potential aircraft crashing, aircraft collisions and effects of wake vortices on other aircrafts stability.
(ii) Interactions with potential risks to the ground land use activities,
(iii) Anxiety on the residents on the ground
(iv) Jettisoning is also likely to be undertaken with holding areas implying relevance of impacts listed under the fuel dumping above,

Mitigation Measures

- ✓ Develop mapping schemes of the holding areas and overlay the same on land use maps of the specific locations to aid in necessary intervention actions,
- ✓ Establish consultations with the Lands Authorities on land use zoning for precautionary and public sensitization plan,
- ✓ Initiate noise mapping and monitoring programme around the holding areas to assess potential health to the recipients.
- ✓ The Airspace Master Plan should appreciate the interphase between land use and aviation activities within the holding areas,
- ✓ KCAA to commence a public awareness initiative for communities living below the holding areas,
- ✓ The emerging ADS-B technology and improved DVOR equipment to enhance control at holding areas.

Figure 26: Illustration of Potential Safety Zones for Nairobi Area



3.3.3 Impacts on Air Quality

Aircrafts consumes fossil fuels and discharge a range of emissions including hydrocarbons, carbon dioxide, nitrogen oxides, sulphur oxides, particulate matter and water vapour, among them contributing to the 'greenhouse effect' threatening the world's climate. Some of the emission species generated within the ground and the lower atmosphere have potential risks to health and ecological wellbeing. Lack of alternatives to fossil fuels for powering modern aircraft leaves continuous releases of carbon dioxide into the atmosphere. Increasing flight volumes in the Kenyan airspace and the entire world is associated with higher emissions. Associated impacts will be identified with respect to the following aspects;

(i) Air quality degradation in the lower atmosphere with especially CO_2, NO_x, SO_x and particulate matter (PM). The scenario is anticipated within the aerodromes and along the approach corridors where high fuel usage is pertinent during climb and descent phases of flights,
(ii) Greenhouse gases in the lower and upper atmosphere arising from mainly CO_2,
(iii) Air quality from fuel vapour discharged through potential jettisoning process from aircrafts seeking emergency landing. This is, however, a rare phenomenon.

Mitigation Measures

- ✓ Adopt DMAN and AMAN procedures to achieve minimal fuel consumption and hence low emissions. Among the procedures may include Continuous Climb and Continuous Descent procedures, Performance Based Navigation (PBN) procedures for the CCP and CDP functions
- ✓ Collaboration with the Military for limited use of restricted airspaces for reduction in travel distances, low fuel usage and hence reduced emissions,
- ✓ Minimize the need for holding to the extent possible to check of emissions, Tower maneuvering area management projects
- ✓ Enhance collaboration mechanisms for control of emissions on the ground at the aprons and also along taxiing movements, Collaborative Decision Making at the aerodromes
- ✓ Ensure high level of airworthiness of aircrafts flying the Kenya Airspace
- ✓ Training plans and programmes

3.3.4 Influences to Climatic Conditions

Aerial emissions associated with aircraft operations have local impacts on air quality as well as global concern on climate change. The potential impacts of climate change on the aviation industry will vary according to location and scale of operation and may be further be exacerbated by the challenge of accommodating increased growth in demand. Possible impacts of climate on aviation can be looked at in two levels i.e. global (large scale) and local scale. The global scale include phenomena such as;

(i) Higher temperature maxima at the surface of the aerodrome causes the air to be less dense hence difficulties in aircrafts lifting.
(ii) Rising sea levels may result in some aerodromes being submerged
(iii) Dust storms resulting in reduced horizontal visibility

Local scale may include impacts to physical infrastructure including airport building, apron, control tower, energy grid etc. Climate change is a risk for the Kenyan aviation sector as impacts are likely to include more frequent and more disruptive weather patterns.

In order to achieve global aspirational goals for international aviation of improving fuel efficiency by two per cent per year and keeping its CO_2 emissions from 2020 at the same level (carbon neutral growth from 2020), ICAO developed a CO_2 mitigation measures includes aircraft technology and

Standards, operational improvements, sustainable aviation fuels and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Kenya has developed an Action Plan, with selected measures from the basket of measures, for aviation CO_2 emission reduction and voluntarily submitted it to ICAO. This action plan reviewed every two years. These national action plans will allow States to showcase the specific voluntary measures they intend to take in order to improve efficiency and thereby contribute to the global environmental aspirational goals established by the 37th Session of the ICAO Assembly.

Mitigation Measures

- ✓ Kenya has volunteered to participate in the pilot phase of CORSIA.
- ✓ Kenya has developed an Action Plan, with selected measures from the basket of measures, for aviation CO2 emission reduction and voluntarily submitted it to ICAO. This action plan is reviewed every two years,
- ✓ Improved ATM and flights routes reviews will contribute to emissions reductions and control.

3.3.5 Impacts of Aircraft Noise and Vibrations

Noise associated with aircraft operations is significant to land use features (otherwise there are no sensitive receptors in the higher atmosphere). Such impacts are felt within the landing and take-off corridors (i.e. upto 1,500ft above sea level) implying the zones within the airports. From the noise maps, it is estimated that noise levels for JKIA surroundings are 65dBA within the airport boundaries and reduces to 60dBA within the human settlements along the runway 06 departure corridor (including Utawala and the neighbouring areas) and over the Nairobi National Park below 06 approach corridor. The average noise levels reduces further to 55dBA further within settlements areas in Rongai and parts of Ngong on the 06 approach and further along 06 departure corridor in Ruai and surrounding areas.

Similar scenarios can also be deduced for Moi International Airport, Wilson Airport, Kisumu International Airport and Eldoret International Airport where noise maps have been developed. It is also observed that the airports and associated approaches are highly inhabited with human settlements, institutions, public service facilities and commercial premises.

Impacts of aircraft noise has been identified with respect to the following aspects on the ground receptors,

(i) Public safety and health mainly in regard to hearing impairments, loss of sleep, effects to sick people (hospitals and care centers),
(ii) Disruption of social activities including religious functions, school lessons, entertainment activities and meetings,
(iii) Damages to structures (cracks and dislodging installations) arising from vibrations (for structures with close proximity of large aircrafts) and wake vortices from large aircraft movements.

Mitigation Measures

- ✓ Compliance with the provisions of the Aeronautical Information Publication (AIP) defined under the Noise Abatement Procedures. This provision is reflected in the Kenya AIP.
- ✓ Ensuring land use compatibility. No sensitive developments (hospitals, schools, places of worship, hotels and conference facilities, etc.) should be undertaken within the departures and approach corridors within specified distances from the runway thresholds unless appropriate acoustics design components are integrated,
- ✓ Land planning of aerodrome grounds should indicate the minimum development limits for any developments. This will not only enhance safety of the airport operations but also risks of noise and safety to the public and developers,
- ✓ Sound Insulation. Structures developed under the departure and approach corridors may be considered for acoustic interventions to check on noise impacts to the occupants,
- ✓ While commercial and industrial developments have an appreciable level of compatibility to aircraft operations, the related structures should also be designed with acoustic considerations,
- ✓ Ensuring enhanced noise receptor awareness creation and sensitization,
- ✓ Adoption of DMAN and AMAN procedures projects that will ensure minimal noise on the ground during take-off or landing events, especially those within the approach corridors into JKIA, Wilson Airport, Moi International Airport and Kisumu International Airport. Noise avoidance could also be achieved through departures and approach procedures modifications as follows and illustrated in Figures 27 and 28 below;
  - Full power aircraft climb normally have higher impact as the blast is oriented directly to the ground. The aircraft, therefore should cut power and assume a horizontal orientation for the benefit of the receptors within the shortest distance possible from the runway threshold,
  - Low noise approach procedure may require a high ratio of the aircraft height from the ground to the distance left to the runway threshold. This ensures the aircraft is as far as possible from the ground towards the runway without compromising on the landing safety. The 2-segment landing approach is preferred for noise abatement.
- ✓ Review of free route airspace concepts projects that will assist pilots make decisions on approaches. There is need for sensitization and awareness to pilots on the land use features,
- ✓ Training of the Air Traffic Control Officers on noise reduction procedures through appreciation of land use features around aerodromes.

Figure 27: Modified Departure Procedures for Noise Control

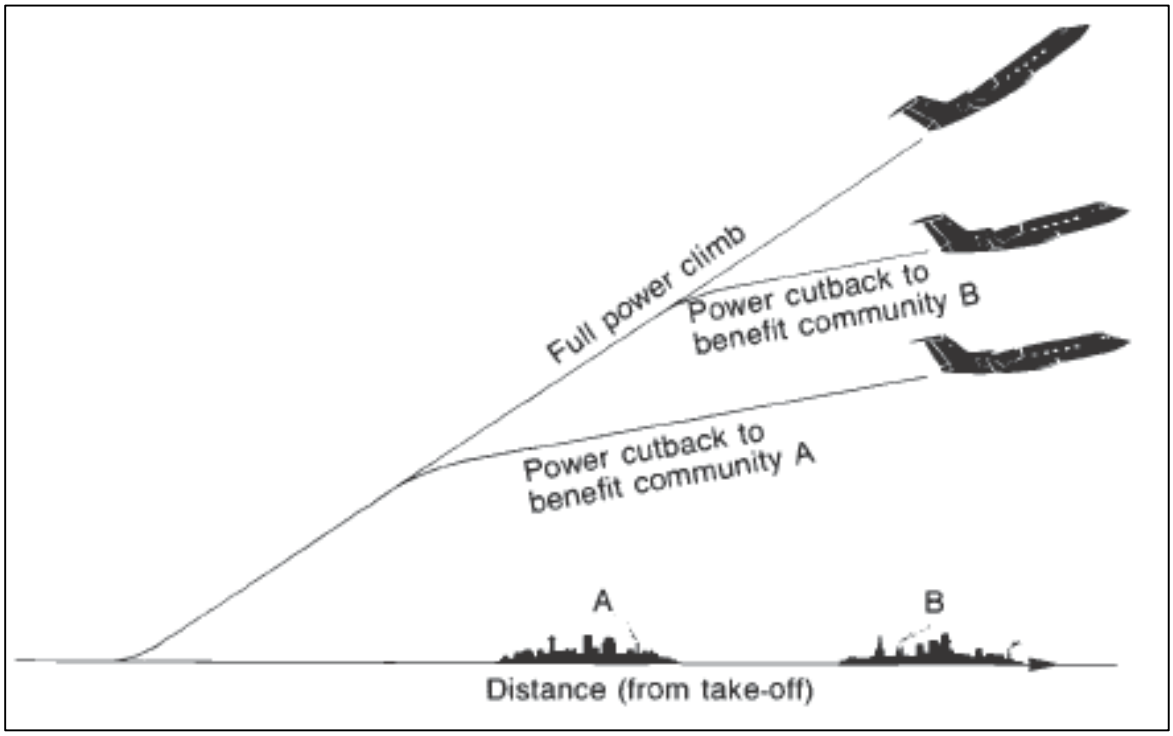
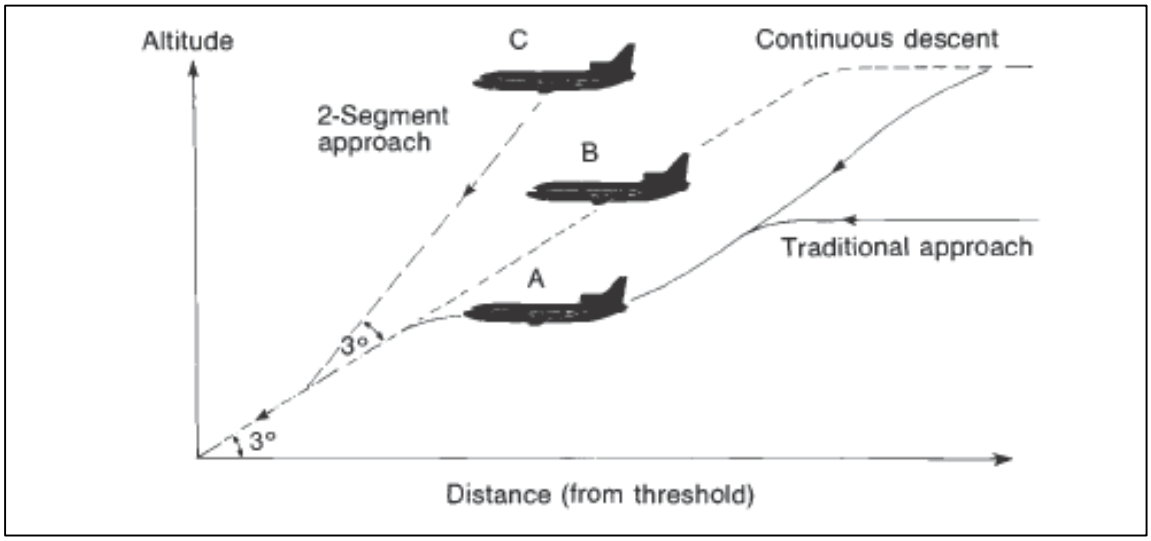


Figure 28: Modified Approach Procedures for Noise Control



3.3.6 Land Use Zoning Issues

3.3.6.1 Land Use Compatibility Mapping

Airspace management and utilization has direct and indirect linkages to land use activities, though little has been discussed in this regard under the master plan. Other areas of interest include holding areas and other aviation operation areas where the land use has not been given due considerations. The associated impacts from the potential conflicts arise from the following inter-linkages;

(i) Incompatibility of certain land use activities to aviation activities including noise sensitivity, emissions challenges and potential security threats. Among the land use activities include health facilities, learning institutions, religious premises, offices, etc. conflicts include excessive noise levels on the receptors, potential safety risks (in case of air crash) and potential effects of vortices,

(ii) Potential safety risks to the aircrafts and passengers from the ground especially with threats from terrorism and criminals as well as risks from inappropriate building structures,

Mitigation Measures

- ✓ Initiate collaborations on formulation of land use zoning plans for spatial developments with reference to aviation or airspace activities at respective areas,
- ✓ Consider overlaying airspace plans and operations aviation schemes on land use zoning maps for developers and communities in general appreciate the potential conflicts at the respective areas. Such airspace plan aspects would include approach corridors, holding areas and flight routes,
- ✓ Influence land use and development control authorities on strict adherence to established spatial plans policies, especially where there is potential conflicts with aviation operations. Among the players may include National Land Commission (NLC), National Construction Authority (NCA) and National Environment Management Authority (NEMA) to name a few. Influence development approving authorities on involving KCAA in the project approval processes.
- ✓ Consider a programme for sensitizing communities on aviation and land use practices with respect to their linkages and conflicts with aviation operations. Such communities would include land owners and institutions around aerodromes and approach corridors,

3.3.6.2 Development Approval Principles

It is noted that need for approval of land development activities is confined within the precincts of aerodromes. Other areas such as approach corridors, holding areas, controlled and restricted areas have not been considered during project approval process posing potential conflicts between aviation operation and land use activities that can be avoided.

Mitigation Measures

Engage development approval agencies including National Construction Authorities, County Governments and National Environment Management Authority (NEMA), etc. on the approval process. Influence the development approving authorities in involving KCAA in the project approval processes.

3.3.6.3 Land Use Control

Aerodromes are occasionally ignored during land use planning and control (Wilson Airport is one such case). Some land use features are so close to the aerodrome grounds that sections of the aviation functions cannot be fully utilized. The implications are potential safety risks to the land users as well as the aircrafts.

Mitigation Measures

- ✓ To the extent possible, no sensitive development should be undertaken within the approach corridor into an aerodrome. Such developments should include hospitals, schools, places of worship, hotels and conference facilities, etc.
- ✓ The aerodrome planning should indicate the minimum distance limit for any development. This will not only enhance safety of the aviation operations but also risks of noise to the public and developers,
- ✓ Structures developed under the approach corridors should be designed with specific considerations of aviation aspects as well as acoustic considerations to buffer against excessive noise to the occupants,
- ✓ While commercial and industrial developments have an appreciable level of compatibility, the related structures should also be designed with acoustic considerations,
- ✓ Influence land use and development control authorities on strict adherence to established spatial plans policies, especially where there is potential conflicts with aviation operations. Among the players may include National Land Commission (NLC), National Construction Authority (NCA) and National Environment Management Authority (NEMA) to name a few. Influence development approving authorities on involving KCAA in the project approval processes.
- ✓ Consider a programme for sensitizing communities on aviation and land use practices with respect to their linkages and conflicts with aviation operations.

3.3.7 Social Impacts

The environmental effects of aviation, particularly in relation to noise and air quality, have consequences for health and wellbeing of the airports and flight paths neighboring communities who are directly exposed in regard to the airspace operations. Other negative impact areas of concern include increased vibrations, increased aviation operators' and employees' workload, passengers' inconveniences as a result of flight delays and rescheduling, compromised staff welfare, increased levels of anxiety, as well as safety and security concerns.

3.3.7.1 General Public

(i) Effects of noise and vibrations on human health and damages to building structures. This is experienced along low level flight corridors including departures and approach corridors,
(ii) Safety risks (potential air crashes) with land use activities within the departures and approach corridors being the highest prone,
(iii) Aircraft emissions determined by fuel usage factors
(iv) Lack of collaboration with key stakeholders and the community leading to conflicts and mistrust

Mitigation Measures

- ✓ KCAA to develop consultative platforms for stakeholders and local communities for an affective engagement process,
- ✓ KCAA to work with local communities to consider options on how best to mitigate local environmental impacts and seek mutual agreement on any community proposed measures and initiatives
- ✓ Put in place grievance resolution mechanism to address conflicts emanating from the local communities,
- ✓ KCAA to share with all the stakeholder the airspace master plan in order to sensitize them on their future plans, including development proposals and initiatives, along with their related local environmental impacts and proposed mitigation measures,
- ✓ KCAA to initiate localized programs/projects and operationalize her CSR plan in consultation with local communities and other actors to promote good neighborliness and
- ✓ KCAA to have an accessible and friendly mechanism through with complaints and grievances are reported and acted on,
- ✓ Provide opportunities for local institutions, especially educational, to visit KCAA aviation installations for learning and appreciation of the sector.
- ✓ KCAA to work with local leadership and schools to provide apprenticeships and training to enable local people, including young people, to benefit from the new jobs that would be generated through the growth.
- ✓ Efficiently management of airspace by introduction of new approach and departure paths to distribute and disperse the noise impacts more widely, limiting the impacts on any individual community or receptor
- ✓ KCAA to work with local communities to consider options on how best to mitigate local environmental impacts and seek mutual agreement on any proposed measures

3.3.7.2 Aviation Stakeholders

(i) Limited coordinated flights and airspace management relationship between KCAA and other actors leading to inefficiencies and conflicts in flight management, which has significant overall negative aviation impacts. The impacts are in terms of delayed aircraft takeoffs and landing, diversion of flights to other airport,

(ii) Risks of overflying high security zones of national importance, e.g. National security installations.
(iii) Inefficient and delayed search and rescue initiatives after distress calls,
(iv) Disjointed search and rescue efforts whenever an accident occurs, hence taking too long to reach the areas of accident or need.

Mitigation Measures

- ✓ Work in sync with the various actors including airline operators, KAA, the security to coordinate the various activities taking place before departure or landing and thereafter,
- ✓ Enhance more efficiency by opening up the airspace for direct flight through working together with KAF to permit planes to overfly high security area/zones
- ✓ Initiate continuous descent and ascent for all the flights to reduce on the impact of noise and air pollution,
- ✓ Enhance coordination and collaboration between various airports in order to manage flights schedules,

3.3.7.3 Staffing and Staff Welfare (Air Traffic Control Officers – ATCOs)

(i) Staff welfare associated with work related stress arising from low staffing and hence long working hours, families and social disconnection. This has potential risks of concentration lapse and related aircraft safety,
(ii) Low staff retention leading to lose of key and experienced members of staff. This has effects of draining experience out of KCAA as well as potential low morale,
(iii) Low collaboration across functions with KCAA and cross sectoral interactions among aviation players. This is contributory factor in low interoperability and hence low efficiency,

Mitigation Measures

- ✓ Provide conductive environment for personnel working in unfriendly stations, e.g. working in acceptable shifts, health breaks, adequate staffing training and skills development, etc.
- ✓ Provide psychological support to workers as it may be necessary to address issues which affect their productivity through stress management initiatives,
- ✓ Put in place a staff retention policy and attractive HR packages, including career development opportunities,
- ✓ Review staff recruitment plan that allows overlap between the outgoing and incoming staff for effective mentorship and training,
- ✓ Ensure the aviation training school is adequately staffed with the key teaching and training staff to achieve acceptable standards and continuous staff training and skills development,
- ✓ In some stations, KCAA to consider provision of housing for staff and family within convenient distance from the work stations,
- ✓ Enhance cross-functional collaboration mechanisms for enhanced efficiency, knowledge and experience transfer and stress management,

3.3.7.4 Passengers

(i) Potential risks to travelers safety associated with risks arising from aviation communication systems, land use to aviation conflicts, search and rescue efficiency and air worthiness of aircrafts,
(ii) Travel efficiencies associated with flight schedules pegged on en-route and approach procedures and shorter flight paths,
(iii) Travelers safety associated with risks arising from aviation ineffective communication systems, conflicts with land use, search and rescue systems efficiency and air worthiness of aircrafts,

Mitigation Measures

- ✓ Improve the passenger experience by enhancing the facilities including safety and security in the aerodromes and onboard to be exciting and friendly to all users, e.g. communication of any anticipated delays and provision of acceptable ways to compensate or address passenger loses, among others,
- ✓ Adopt Airports Collaborative Decision Making (ACDM) in the management of ground flights and airspace utilization as proposed under the Airspace Master Plan projects. This systems has been adopted at JKIA, MIA, EIA and KIA at various levels,
- ✓ Improved onboard and ground-based systems operations and efficiency by adoption of new technologies and procedures to fly more direct flight routes, reduce fuel burn, and arrive punctually,
- ✓ Ensure passenger comfort in the formulation and implementation of DMAN and AMAN procedures, which may be different for different aerodromes.

3.3.7.5 Security and Safety

(i) Effects to security and safety for the travelers and aircrafts within the airports and along flight arises from influx of populations into areas around the airport, unplanned structural development,
(ii) Potential air crashes on populated areas below flight corridor and holding areas. This is a real threat, especially considering the fact that populations are ignorant of the activities in the space above them,
(iii) Potential effects of aircraft vibrations and vortices to the structural integrity and safety of the occupants residents, especially below the approaches,
(iv) Potential risks to safety among aircrafts arising from turbulences effects with potential discomfort of the passengers and possible accidents,
(v) There is notable encroachments into aerodromes and flight corridors with significant risks to safety to the aircrafts as well as the public,
(vi) Overflying restricted and controlled airspaces across the country among them HKR10 reserved for military operations.

Mitigation Measures

- ✓ KCAA to consider collaboration with land use control authorities and players on interventions in the unplanned development of building structures and other obstructions around aerodromes and flight corridors. This may include reclamation of encroached corridors to restore their safety and security integrity,
- ✓ Consider a programme to engage the populations around aerodromes and along the flight corridors for sensitization and awareness raising on aviation safety and other effects, especially with to potential air crashes amidst their neighbourhoods. This may be made part of the SAR systems under the airspace master plan,
- ✓ Stakeholders to continue discussions with the Kenya Defense Forces within existing platforms on the most efficient and safe interphase of airspace utilization.

Chapter 4: Stakeholders Engagements

4.1 General Observation

The airspace has a stakeholders cutting across the country and beyond, some directly and others indirectly. There are stakeholders who even do not know how they related with the airspace on their day-to-day activities. This stakeholder's engagement process achieved the purpose of enhancing the responsibilities for those directly related to the airspace while sensitizing those not aware of their roles. The obvious observations made include;

(i) There was general lack of information regarding the airspace master plan amongst almost all the stakeholders consulted. This was attributed to low or perceived lack of tangible interactive consultations and engagement with stakeholders during the development of the airspace master plan,
(ii) The mandate of KCAA seemed to be unknown by or unclear to most of the stakeholders. Due to the existing minimal interactions between KCAA and a majority of stakeholders, there was minimal appreciation of and interaction for any complementary roles
(iii) The general public also have very little information on the existence of KCAA, the roles and mandates, who to see or contact in case of an issue. Majority could not differentiate between functions of KCAA and KAA,
(iv) Appreciation of the linkages of land use and aviation operation areas other than the aerodromes is still very low to a majority of the stakeholders.

The following are the main observations made through the engagement process while the respective opinions from the stakeholders are briefly outlines in the sub-sections that follows;;

4.1.1 Stakeholders with Direct Role

The stakeholders with direct link to the airspace including airline operators, security agencies and aerodrome operators knows very well the dynamics of the airspace management and plays their roles in accordance with policies of their respective industry. However, it was notable that only a few if any are aware of the environmental and social aspects of the airspace they manage. The concept of and use issues, ecological linkages and community interests has not featured as an important aspects in their operations.

4.1.2 Stakeholders with Indirect Roles

There is a large proportion of Stakeholders in the country who do not know how they relate with the airspace or their role in air space management. The indirect linkages with airspace are those entities (institutions or individuals) whose day-to-day activities have little to do with aviation operations but are either affected by or affects aviation activities. Impacts arising from aviation operations including noise, aerial emissions, safety risks and health implications may not be considered significant until there is a receptor. The receptors constitutes a majority of indirect stakeholders.

4.2 Stakeholders' Opinions by Sectors

4.2.1 Overall Aviation Sector

The following are sentiments expressed variously by the Aviation Stakeholders;

(i) The Air Navigation Services (ANS) equipment are designed, planed and operated to interact with the aircraft throughout the phase of flight,
(ii) KCAA policies and standards are the backbone to national legislative frameworks related to the airspace through the roles of other partners including KMD,
(iii) The association of Air Operators' Committee (AOC) noted there is limited stakeholders' interaction with the Regulator Airspace Master Plan creating a gap in the airspace master plan document formulation and roll out.
(iv) KCAA plays the coordination role in case of an air crash. Each region in Kenya has a SAR command office although they lack resources and infrastructure to fulfil their mandate.
(v) Weather changes contribute majorly to delays in flight scheduling, landing and takeoff and frequent diversions.
(vi) Lack of guidelines for the operations of drones is a very big gap in the airspace management and security.
(vii) Timely review of Air routes design is necessary to address emerging related social and economic challenges
(viii) There is a need for coordinated implementation of national regulations on construction and building code in regard to construction and developments near airports and flight path, and the review of the legal and regulatory framework to enhance aviation safety in relation to construction and development,
(ix) Development and provision of the physical infrastructures e.g. push car, taxiways and increase for the Apron size for Eldoret Airport is overdue,
(x) As a regulator, KCAA should give assurance in the providing of smooth flow of Air traffic so as to reduce carbon emissions,
(xi) Wilson Airport is meant for smaller aircrafts. However, larger aircrafts are being allowed to operate from WAP exceed the design limits of the airport pavements and handling capacity, therefore, posing a safety risk

4.2.2 Environment Sector

(i) There are concerns of environmental pollution from fuel dumping in the space. However, this notion has been clarified since fuel dumping phenomenon in Kenya is extremely low. Pilots are often encouraged to burn the fuel as opposed to dump while if any dumping is necessary, it is done at high elevations from the ground,
(ii) Air pollution is anticipated from aircraft emissions, with high loading during the take-off and landing cycles. Aircraft emissions, with a particular reference to CO_2, constitutes main greenhouse gases causing climate change,

(iii) It is observed that Aviation electronic waste disposal can be an environmental as well as occupational safety hazard if not properly disposed. It was important that the wastes were handled professionally and cautious disposal at all times,

(iv) Aviation equipment are energy intensive and provision for solar power back-up would be a noble idea, therefore, KCAA should encourages KAA to consider power back-up from the mains for aircrafts on the ground to reduce on greenhouse gasses,

4.2.3 Conservation Sector

(i) Flights from Nairobi to and fro Mombasa cover huge tracks of wildlife conservation land (i.e. Tsavo East and West) though the effects are insignificant as aircrafts are at high elevations. However, approaches into JKIA's RWY06 have a notable interaction with wildlife within the Nairobi National Park,

(ii) Migratory birds should be taken into serious consideration especially in areas where the flight paths transverse through the migratory corridors. Detailed information may to be provided from the Ornithologists at NMK. KCAA might consider to interact further with the Ornithology team on advisory capacity especially because of the role they play in the Wildlife Hazard Committee.

(iii) National Museum of Kenya is in constant contact with KAA on training Wildlife Guard Scouts on bird around the airports. KCAA needs to interact with the Ornithology team to exchange notes on birds' behaviors and aviation interests or concerns.

(iv) Fuel dumping and emissions contribute significantly to climate change and Air quality, this is through fuel consumption which is related to CO_2 emissions and greenhouse gas emissions. Improvement of aviation systems to use clean energy solar and wind power could be a better option,

(v) Forest fires as a result of aircraft crush in forested areas have advance impact on conservation,

(vi) Aviation related noise and emission receptors should be created or established in order to reduce on human and on biodiversity impacts,

(vii) Aviation sector should adapt clearly spelled out plans and actions on climate change with clear targets, and also should support deliberately adaptation and mitigation actions to climate change,

4.2.4 Transport Sector

(i) Aircraft scheduling affects travelers, transporters and operators adversely and therefore should be well managed,

(ii) An increase in aviation operations has a direct impact on the existing infrastructures serving the airports and the environs especially road network, traffic flow management, parking, among others, hence KCAA should work closely with the parent ministry in order to address any challenges which could affect smooth aviation operations

4.2.5 Construction Sector

(i) There is unregulated and unlicensed sprouting of structures around airports and flight corridors by developers which need to be addressed urgently (NCA),
(ii) Waste dumping and management site/points - especially near airports, flight holding areas, take off and descending corridors conflict with aviation operations. The dumpsites attract birds/scavengers which could lead to birds' strikes,
(iii) Building is restricted to only three or four floors on majority of structures around the airdromes especially the flight paths. However, there is need for strict aviation regulated building code and rules around the airports and aircraft flight path. Housing design and structural considerations around aviation operation areas should be adjusted in consideration with growing aviation technology
(iv) Designing and positioning of transmission towers away from aviation interest areas,
(v) The National Construction Authority (NCA) appreciates need for enhanced interactions with KCAA to mutually appreciate and develop approval guidelines that takes into consideration aviation linkages,
(vi) NCA's role in the airspace master plans is in the approval of construction of structure or and the demolition of conflicting developments along the flight corridor and also enforcement of the regulations set aside for building procedures around airports,
(vii) Critical activities along the flight corridor such as industries producing smoke, quarrying activities that involve blasting and fireworks require approvals from KCAA because they can negatively impact on the safety on the aviation operations.

4.2.6 Land Sector

(i) There is need for proper land use mapping and planning around the aerodromes, holding areas and flight paths.
(ii) There is need for KCAA and Ministry of lands to engage on land use in regard to aviation activities,
(iii) Aviation practices such as fuel dumping could lead to safety risks to others on the land
(iv) Land encroachment at Wilson Airport is a safety hazard, high buildings in the vicinity of the airport which is also used for training students,
(v) Land use practices in areas with aviation interests must be compatible with aviation ICAO Doc 9184 Airport planning manual – PAN 2 Land use and environmental management,
(vi) Review of existing land use zoning and layouts to ensure compatibility with aviation sector,
(vii) The integration of development control and enforcement efforts within aviation priority areas should be a priority

4.2.7 Other government institutions

(i) Some key infrastructures were not compatible with aviation operations and posed safety risks if not properly positioned (Kenya Power and Lightning Company)
(ii) Transmission power lines especially pylons conflict with low flying planes

(iii) Vibrations from planes affect sensitive SCADA systems in power substations, therefore affecting equipment,

4.2.8 General Public Opinion

(i) Early morning and late night flights especially between 11pm and 6am are very unpopular with residents living next to major airports including MIA and JKIA. Public suggests that Airlines consider reschedule their flights (especially the very noisy Planes) to more acceptable hours,

(ii) Noise insulation should be done to protect or mitigate on the local communities, using the various approaches, institutions should be targeted in this intervention; e.g. schools, hospitals, worship places, offices,

(iii) KCAA in consultation with other stakeholders should determine the appropriate contribution to support local development in CSR initiatives which promote harmony and coexistence.

(iv) There is need for KCAA to work with local communities to mitigate local environmental impacts and seek mutual agreement on social and environmental impact management

(v) Restriction of the development of structure to three to four floors on majority of structures around the airdromes especially the flight paths interfered with individual rights and therefore impacted livelihoods negatively. Property land use and development were affected by this restriction, because developers avoided such areas,

(vi) There was need to Improve on health monitoring around the flight paths and airdromes to protect the locals from advance health impacts and also to ensure compliance with the laid down regulations

(vii) There was an urgent need for KCAA to collaborate with the various actors and more so the local community to ensure timely response in case of an aviation related emergency

(viii) The day to day interactions within hospitals, school and churches, mainly communication (teaching and preaching, counseling, consultation and general communication) were curtailed as they were forced to stop/pause for a while and or forced to speak louder than usual whenever an aircraft overflew their locality.

(ix) Children's learning and concentration are mostly affected and interfered with whenever aircrafts overtly their institutions during class and other extracurricular sessions. This has an impact on the performance and general learning of the affected schools or children

(x) Aviation conflict with drones' operators was identified as a key safety concern - a project that is likely to regulate the use of drone's operations across Kenyan Airspace is on the pipeline (Pioneer International University)

(xi) Health hazard, more so earing impacts due to excessive noise levels affects the aviation neighboring communities. This could lead to psychological impacts on the affected,

(xii) There are some noisy aircrafts which passes at night - around 3pm that causes a lot of noise and violent vibrations. Criminals may tend to take advance of the noise to break into properties,

4.3 Stakeholders Inputs into the SEA Scope

(i) An airspace Integration Master plan and proper regulations on drones,
(ii) Feasibility of intractability of KCAA and the local community and other bodies of the government,
(iii) Update building code to capture additional standard measures to address noise and vibrations, including other regulatory framework
(iv) Need for accurate weather forecasting system in real time,
(v) Capacity building of stakeholders in order to understand aviation standards,
(vi) Airspace interaction with biodiversity especially birds.

4.4 Professional Opinions

(i) Efficient management of airspace by introduction of new approach and departure paths to distribute and disperse the noise impacts more widely, limiting the impacts on any individual community or receptor
(ii) Initiatives to work with local communities and considerations on how best to mitigate local social and environmental impacts and building of mutual agreement on any proposed mitigation measures to co-exist in harmony and in an acceptable neighborhood. Broader sensitization of stakeholders on the master plan is essential for smooth implementation and collaboration.
(iii) SAR process has a big impact in the safety and efficiency of the aircraft operations and holds a big part in the Master Plan however there lacks harmony in how the process is carried out in the country. Coordination needs to be harmonized and communication channels/avenues should be taken into consideration.
(iv) Interaction between KCAA and the neighboring institutions, e.g. schools, health facilities, churches, offices, etc. along the flight paths, should be initiated and institutionalized . Create awareness on the functions of KCAA to stakeholders in order to be clear on their mandate. Sensitization of the residents around aerodromes, there should also be deliberate interaction between KCAA and community for improved and better relationship,
(v) Involve other stakeholders in the construction and housing industry i.e. EBK (Engineers Board of Kenya), IEK (Institution of Engineers of Kenya), BORAQS (Board of Registration of Architects & Quantity Surveyors), AAK (Architectural Association of Kenya), IQSK (Institute of Quantity Surveyors of Kenya) in the aviation process for more insight and interactions. Need for systematic land use planning in order to interact properly with the Airspace plan to avoid any mismatch that could impact negatively land use or social concerns,
(vi) Overlaying the birds' migration corridors and habitat areas with flight paths in consideration with land use practices.
(vii) Number of workers available in some departments is limited and could negatively impact the operations – It therefore recommended that the department should have more workers, this calls for more recruitment into the aviation industry. There is also a need to consider age gaps when recruiting to allow for a succession plan.

(viii) Training of more staff can also help others get a chance to engage in trainings and workshops, further their studies in order to take advantage of promotional opportunities.

(ix) Provision of psychological services to aviation personnel in order to address impacts due to long working hours and challenging working environment

4.5 KCAA Stations Managers and Staff

4.5.1 Jomo Kenyatta International Airport

An intensive interactions of the SEA Consultants with JKIA KCAA Control Tower (Area Control room, Approach and Control Tower) was conducted on the 17th October 2019 involving discussions with the Air Traffic Controllers at their respective work areas. Other areas visited include the Briefing Office as well as the NOTAM Offices. Following are among the issues discussed;

JKIA Sectorization

The process of sector definition comprising of virtual division of airspace to ease communication and traffic management. The Northern and Southern Sectors are now managed by separation ACTOs lessening work loading and enhancing efficiency and safety.

Multi-Lateration (M-LAT)

This is a surveillance system technology for monitoring what is around the aerodromes' grounds. It comprises of monitor antennas (transmitter/receivers) installed around the airport grounds linked to processors and a display unit at the Control Tower. M-LAT sensors may be considered micro-radars installed at the runway thresholds and along the runway corridors over an extended area where conventional radar is not is not able to sense for monitoring en-route traffic. This project has been accomplished

Automatic Dependent Surveillance – Broadcast (ADS-B)

ADS-B is a Surveillance technique that relies on aircraft or airport broadcasting their identity, position and other information derived from on board systems (GNSS etc.). This signal (ADS-B Out) can be captured for surveillance purposes on the ground (ADS-B Out) or on board other aircraft in order to facilitate airborne traffic situational awareness, spacing, separation and self-separation (ADS-B In). The equipment has been installed at JKIA but only aircrafts installed with transponders are able to utilize the ADS-B. This technology is expected to replace the convention Radar system.

Search and Rescue (SAR)

Search and rescue is proposed to be decentralized to be a fully independent entity away from the normal tower operations. The SAR operations will be moved to Mlolongo Office where they can coordinate with other agencies following the SOP set for the activities. On search and rescue there is a possibility of making it a 24hrs with a memorandum of understanding. KCAA is working towards getting contact people from all over the country for efficiency and coverage. Also drills are to be done to gauge the preparedness of involved parties, a toll free line for the public to be set up for emergencies.

Stress Management

The work at the stations is generally stressful with 7 – 8 hour shifts with periodic breaks in between working hours. The main concern for ATC workers are;

(i) Number of workers available – It is recommended that the department should have more workers, this calls for more recruitment into the aviation industry,
(ii) There is need to consider age gaps when recruiting to allow for appropriate mentoring, training and succession plan,
(iii) Training of more staff will help the others get a chance to engage in trainings and workshops, further studies and promotional opportunities,
(iv) Equipment should be up to date for enhanced efficiency and ease by the ACTOs
(v) The staff should be upto date with modern operation procedures
(vi) The staff should be allowed space for social interactions as part of strategy to deal with stress on the workers.
(vii) Excessive work load and inadequate space for facility to the workers could a possible source of stress and lack of concentration hence potential risks to safety.

Other Issues

(i) Issues raised by operators to the ATC include local radio frequencies interfering with the aviation frequencies especially when the planes are approaching to land.
(ii) There are 3 holding areas that serve JKIA and Wilson airport. Holding time maybe any time from 2 minutes to when the flight controllers call for landing. One of the holding sites is over Ngong Hills, the other one is over Kilimambogo (rarely used).
(iii) There is need of sensitizing the local community on ground on the flight path in regards to land use. Building heights should be regulated. This calls for coordination between KCAA, NCA, NEMA and other relevant agencies.
(iv) Critical activities along the flight corridor such as certain industries, quarrying activities that involve blasting and fireworks require approvals from KCAA.
(v) All the sensitive airport waste (flight strips) are handled at a warehouse at Mlolongo. It was noted that none
(vi) Jettisoning is carried out at a heights of 6,000ft of above the highest obstacle only if need be and when extremely necessary in case of an emergency.

4.5.2 Wilson Airport

(i) On the issues of emission there has been enhancements to expedite the flow of traffic through collaboration Decision Making (CDM). There is a program to clear and dispatch flights to reduce stopping time in turn reduce emissions on the apron and holding areas.
(ii) The noise at the airport does not only affect the workers but also others at large. Among the mitigation measures to curb noise at WAP include installation of double glass in the offices to reduce noise to the occupants. To reduce the noise within the airport and the neighbouring areas, WAP is expediting landings and take offs. This will reduce the amount of time taken by planes with engines running while on airport grounds or while on approach

there is also need to make the two runways open to reduce on the noise. There has been encroachment by people on the land. This poses a safety issue in case of a crash the encroachers are in the path of danger. There is need to improve and integrate the planning and approval process for land use around airports and aerodromes.

(iii) There is the limited size of the aircrafts that are allowed to operate from WAP. However operators are bringing larger planes which exceed the design limits of the airport and this poses a safety risk. Current tower conditions are lacking in terms of instrumentation, working conditions (air conditioning) and spacing for the workers

(iv) There is a proposed search and rescue unit at Mlolongo that will improve the coordination of SAR. There is need for improved coordination with other agencies. There need of more workers to help reduce the workload on the staff and improve stress management and allow for more training of the staff

4.5.3 Moi International Airport

(i) There is a lot of encroachment around the airport especially around Magongo slum with issues on land that are still being worked on by KCAA. KCAA have acquired 2.5Ha for their Mwakirunge VOR with title deed.

(ii) Security of the airport and surrounding areas including the landing and take-off corridor and aviation installations are guarded 24hrs by armed security

(iii) The enforcement of the laws remains an issue. Most agencies have adopted a silo mentality where all the agencies work on their own instead of collaboration for efficient operations. It was recommended that there is need for an intergovernmental committee with all agencies and sectors represented to address issues affecting aviation including environment, and waste management, social and land use issues. This committee should meet frequently. There is a problem of information sharing. Agencies don't share information which hinders effective operations. The approval process need to be regulated to control development especially around airport and aviation installations.

(iv) Sensitization of the people is very important. People around the holding areas (Mwakirunge area) and flight corridors have not been fully sensitized. Solid waste dumping site moved from Kibarani to Mwakirunge area. This poses a safety hazard as smoke from the burning refuse affects visibility for the pilots and also increases chances of bird strike (scavenging birds being hit by planes landing). There is need to superimpose the KCAA air maps on land use maps to integrate land use planning with aviation and improve land use planning all together especially around airport installations

(v) Search and Rescue is achieved in collaboration between KCAA and Kenya Maritime Authority (KMA), Kenya Navy, Coast Guards, Kenya Ports Authority (KPA) in search and rescue operations. SAR standard Operating Procedures in place to guide rescue operations in case on an emergency. On the issue of search and rescue there is constant communication with all the agencies involved ,there is also an Air force Officer who calls other departments,

(vi) Noise and air emissions especially staff in the briefing office (main terminal building) suffer from noise from the planes starting their engines and parking at the apron. There was a

request for sound proofing of the offices. The airport has adopted certain hours (Stopping and flying hours) where the traffic is low to allow the neighbours to sleep. ICAO guidelines recommend to plane manufacturers to develop more fuel efficient engines and less noisy engines. There is a height control measure over Port Reitz hospital as a measure to curb noise

(vii) Training and recruitment through a 3-year step recruitment to allow for proper training and succession. Staff need assessment is recommended to enhance efficiency and productivity. The airport has adopted pairing system where staff with similar qualifications are paired together. The staff should be provided with rest areas within the airport for short breaks, gym and well equipped showers

(viii) **CSR policies** including visiting of schools, the elderly and being involved in charitable events like remembering all cancer patients and provision of tree seedlings to staff to improve tree cover and fruits

4.5.4 Kisumu Airport

ATC at Kisumu is meant for tower control only; all approach control is done at Eldoret Airport
Main concerns:

(i) KCAA visibility to the public and other relevant agencies especially those that have activities closely related to aviation.

(ii) Control development of structures on the flight path and those around the aerodrome clear out activities that are conflicting with aviation activities.

(iii) Overwhelming workload especially for Air Traffic Controllers

(iv) MLAT equipment with solar installations around the airport are under threat of vandalism.

(v) Landfill at Kachok poses a risk of bird strikes as the flight path lies above it.

(vi) Distance between tower and terminal is long, KCAA clients need to cross the airside to get to KCAA offices posing a safety risk.

(vii) Proposition to make Kisumu Airport a 24 hour station as traffic and demand increases from other areas to access the airport.

(viii) Rising water levels of the Lake pose a risk to the runway. Waters can rise all the way to the end of the runway that could rise even further in the coming years.

4.5.5 Eldoret International Airport

(i) Eldoret International Airport serves as the approach control for the western region of Kenya. This means the ATC handles approach for the regions and tower for the airport

(ii) Interaction with Eldoret county government on development approvals especially along flight path and around EIA

(iii) Tree plantation on the side of the runway act as a carbon sink

(iv) EIA lacks a Collaborative Decision Making mechanism making it hard for airport operations to work seamlessly between operators, regulators and other actors within the airport.

(v) EIA does not have MLAT installations while ADSB are installed but are not functional

(vi) Social Responsibility illustrated through KCAA team takes part in the annual ASK shows in Eldoret. Plans are underway on sinking boreholes in Lodwar as part of social responsibility and giving back to the society.

(vii) Land use through collaboration between KCAA and farm owners along the flight path and those surrounding the aerodrome. This will cause an exchange between the two in terms of developments and farming. This is to ensure that there is compatibility with aviation operations. There are periods of farm preparation for planting seasons that involve burning of dry grass. In such instances there should be a mechanism of exchange between KCAA (ATC) and farmer so that their activities do not affect the visibility of the controller and of the pilot. Fauna commonly observed include antelopes, migratory birds and dogs.

(viii) Human resource discussion led to the understanding that the main issue is under-recruitment.

(ix) ATCs are overworked meaning there is a shortage of workmanship hence they do not have the morale for work. Organizational Company structure does not support workforce; in that some functions are not allocated workers that makes one person in charge of more than one role. Or in other instances one function has fewer workers hence overworking the few. (Accountant, drivers)

(x) Staff welfare is an issue that needs attention from the Main office (bonuses, job grades, 13th salary)

(xi) As a mode of stress management, a gym was recently equipped and an acceptance team was due to have it rendered operational. Other team members make sacrifices so that trainings can be made possible to all individuals. Job trainers are essential for all sections so that there can be structured trainings.

(xii) KCAA Headquarter office is carrying out a country-wide search of liaison people for SAR in the event of an accident. Currently, in the event of an accident or incident ATC contacts the local police who will respond faster as the relevant bodies are informed and dispatch to take over. Response time within the aerodrome is 3 minutes as in the case of the Silverstone Aircraft that lost a wheel after it took off at Lodwar airstrip.

(xiii) Other recommendations

- ✓ Electric flight strips to reduce the amount of paper used up every day.
- ✓ KCAA offices should be noise proof as they are right next to the runway.
- ✓ Weather changes are unpredictable hence there is need for forecasters
- ✓ The airport is experiencing increased traffic while the apron is insufficient (space-wise). Controller takes up the task of regional approach, tower and arranging the apron while navigating aircrafts on one runway that acts as a taxiway.

Chapter 5: Policy and Regulatory Framework Analysis

5.1 Policy Provisions

The SEA process will also identify the regulatory framework governing the aviation industry at the local and international levels. Among the policy and legal sections to be analyzed will include the following sections;

5.1.1 The Constitution of Kenya

Article 42 of the Bill of Rights of the Kenyan Constitution provides that 'every Kenyan has the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative and other measures'. Part 2 of Chapter 5 of the constitution is dedicated to Environment and Natural Resources. Article 69 in Part 2 provides for among others sustainable utilization and exploitation of natural resources, public participation on matter affecting the environment, establish environmental assessments and monitoring systems.

Further, Article 70 states that if a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress. The sub-project should ensure compliance with the constitution in so far as equitable sharing of the resources, between the stakeholders. Further, the project should ensure the sustainability of livelihoods and biological resources within the project areas are protected. Any development proposals should also be cognizant of the increased powers under the Constitution given to communities and individuals to enforce their rights through legal redress.

5.1.2 Kenya Vision 2030

Kenya Vision 2030 is the current national development blueprint for period 2008 to 2030 and was developed following on the successful implementation of the Economic Recovery Strategy for Wealth and Employment Creation which saw the country's economy back on the path to rapid growth since 2002. The objective of the vision 2030 is to transform Kenya into a middle income country with a consistent annual growth of 10% by the year 2030".

One of the aims of the Kenya Vision 2030 is designed to make Kenya to be a nation that has a clean, secure and sustainable environment by 2030. This will be achieved through promoting environmental conservation to better support the economic pillar. Improving pollution and waste management through the application of the right economic incentives in development initiatives is critical.

5.1.3 The Land Policy

The Constitution of Kenya 2010, Kenya Vision 2030 and the Sessional Paper No. 3 of 2009 on National Land Policy all justify formulation of a framework for effectively addressing the challenges

related to land use. As provided for by Article 260 of the Constitution, Land in Kenya is defined as the surface of the earth and the subsurface rock, any body of water on or under the surface, marine waters in the territorial sea and exclusive economic zones, natural resources completely contained on or under the surface and the airspace above the surface.

Ministry of Lands and Physical Planning developed Sessional Paper, No. 1 of 2017. The Policy designates all land in Kenya as Public, Community or Private. 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.

The sustainable management of land based natural resources depends largely on the governance system that defines the relationships between people, and between people and resources. To achieve an integrated approach to management of land based natural resources, all policies, regulations and laws dealing with these resources shall be harmonized with the framework established by the Environmental Management and Coordination Act (EMCA), 1999.

5.1.4 Transport Policy

The Transport Policy identifies promotion of aviation safety and security as well as improving environment as among the key guiding principles. KCAA coordinates the overall aviation airspace management and operations within the area mandated by ICAO including the Kenyan Airspace while the State Security providing the necessary backup. The current arrangement is that the State Police provide this service through Kenya Airports Police Unit (KAPU).

5.1.5 National Environmental Policy, 2013

The National Environment Policy aims to provide a holistic framework to guide the Management of the environment and natural resources in Kenya. It further ensures that the linkage between the environment and poverty reduction is integrated in all government processes and institutions in order to facilitate and realize sustainable development at all levels. This is done in the context of green economy enhancing social inclusion, improving human welfare and creating opportunities for employment and maintaining the healthy functioning of ecosystem. The main goal of this Policy is “A better quality of life for present and future generations through sustainable management of the environment and natural resources” Finally, the main objectives of the National Environmental Policy are:

(i) Promote and support the use of innovative environmental management tools – such as incentives, disincentives, total economic valuation, indicators of sustainable development,

SEA, EIA, Environmental Audit, and payment of environmental services – in environmental management;

(ii) Promote and enhance cooperation, collaboration, synergy, partnerships and participation in the protection, conservation, better management of the environment by all the stakeholders;

5.2 Regulatory Provisions

Provisions of the national regulations on environmental management and conservation implies that the Kenya Civil Aviation Authority (KCAA) has a legal duty and responsibility to operate sustainably and to comply with the established environment management regulations and should not compromise on the environmental health and safety requirements. This position enhances the importance of this ESIA and subsequent implementation of the ESMP developed therefrom. The key national laws that govern the management of environmental resources in the country will also be integrated throughout the construction and subsequent operations. Note that wherever any of the laws contradict each other, the Environmental Management and Coordination Act 1999 prevails.

KCAA regulations pertaining to air navigation services are drawn largely from, and are kept in uniform with the Chicago convention and refers to the provisions contained in the ICAO annexes.

5.2.1 The Kenya Civil Aviation Act (No. 21 of 2013)

This Act that was assented to on 14th January 2013 and commenced on 25th January 2013 provides for the control, regulation and orderly development of Civil Aviation in Kenya.. The Act establishes the Kenya Civil Aviation Authority (KCAA) under Section 4 and its functions listed under Section 7 such as to have powers over aviation operations (except for state aircrafts) as out lined under Section 3 including all aircrafts whilst in or over any part of Kenya, all Kenya aircraft and the crew and other persons on board wherever they may be as well as all aerodromes and services providers within the aerodromes,

Section 6 of the Act bestows Kenya Civil Aviation Authority (KCAA) with the responsibilities for economically and efficiently plan, develop and manage civil aviation, regulate and operate a safe civil aviation system in Kenya. Among the functions indicated under Section 7 of the Act include licencing of air services as well as planning, developing and formulation of the Airspace Master Plan for the safe and efficient utilization of Kenyan Airspace. KCAA is also responsible of providing air navigation services in Kenya airspace and any other areas outside Kenya for which Kenya has undertaken to provide air navigation services, alerting services and to coordinate search and rescue. Accordingly, KCAA functions will be guided by conventions relating to international conventions that Kenya is party.

Section 40 states that where land is required by the Authority for its use, the Authority may acquire such land through the stipulated processes, and the Cabinet Secretary responsible for matters relating to land place such land at the disposal of the authority to be utilized for the purposes of the Authority.

Section 46 prohibits wilfully or negligently imperil the safety of an aircraft or any person on board, whether by interference with any member of the crew of the aircraft or by tampering with the aircraft or its equipment, or by disorderly conduct or by any other means causing or permitting an aircraft to endanger any person or property; interference or tampering with an air navigation facility. A person who contravenes these provisions commits an offence and shall be liable to prosecution.

Figure 29: Sample Regulatory Issue from KCAA

Ministry of Transport, Infrastructure, Housing and Urban Development

KCAA
efficiently managing air safety

Kenya KENYA VISION 2030

KENYA CIVIL AVIATION AUTHORITY

PUBLIC REMINDER

PROHIBITION TO FLY UNMANNED AIRCRAFT (DRONES) IN KENYA

The Cabinet Secretary for Transport, Infrastructure, Housing, Urban Development and Public Works through Kenya Gazette **Legal Notice No. 76** on 26th March 2019, published prohibition to fly and operate Unmanned Aircraft also known as Remotely Piloted Aircraft Systems (RPAS) and popularly known as 'Drones'. This includes the operation of such drones by the public for video coverage, filmmaking, surveillance, and any other interference with the Kenya airspace.

The public is hereby reminded of this prohibition which shall apply to any person who imports, tests, operates, procures, assembles, manufactures or maintains a Remotely Piloted Aircraft System in Kenya wherever they may be and operation in Kenya.

Annulment of Previous Regulations on RPAS
This prohibition followed the annulment by Parliament of the Regulations previously published by Kenya Civil Aviation Authority (KCAA) on 21st March, 2018. KCAA has since incorporated the recommendations of Parliament and general public in the proposed draft Unmanned Aircraft Systems (UAS) Regulations pending grant of the prerequisite approvals and further promulgation.

The Civil Aviation Act, 2013 (No. 21 of 2013)
For purposes of clarity the Legal Notice No. 76 of 26th March, 2019 states;

1. These regulations may be cited as the Civil Aviation (Prohibition to Fly Unmanned Aircraft) Regulations, 2019.
2. In these Regulations, unless the context otherwise requires –
   "Unmanned aircraft" means an aircraft and its associated systems which are operated with no pilot on board; and "unmanned state aircraft" means an aircraft used in military, customs or police services or any other State or civil registered unmanned aircraft at the time performing a state function and fully converted to offer services to heads of State, military service, customs, police or any other State officer, operated with no pilot on board.
3. (1) Subject to the provisions of the Act, a person shall not fly unmanned aircraft in Kenya, including its territorial waters.
   (2) Despite the provisions of paragraph (1), these Regulations shall not apply to unmanned State aircraft.
   (3) Any person who contravenes the provisions of paragraph (1) commits an offence and shall be liable, upon conviction, to a fine not exceeding one hundred thousand shillings or imprisonment for a term not exceeding twelve months, or to both such fine and imprisonment.
4. The provisions of these Regulations shall prevail in case of any inconsistency between these Regulations and any notice issued prior to the commencement of these Regulations.
5. These Regulations shall stand revoked upon the commencement of the Civil Aviation (Unmanned Aircraft Systems) Regulations made under section 82 of the Civil Aviation Act, 2013.

Capt. Gilbert M. Kibe,
DIRECTOR GENERAL

5.2.2 Kenya Airports Authority Act

The Kenya Airports Authority (KAA) was established by an Act of Parliament in 1992 under the Kenya Airports Authority Act (Cap. 395) of the laws of Kenya that provides for the powers and functions of KAA. According to the Act, KAA's roles include;

(i) Manage all civilian airports and airstrips efficiently and profitably,
(ii) Provide, develop and maintain such services and facilities that we are necessary or desirable for efficient operations of aircrafts,
(iii) Provide rescue and fire fighting equipment and services at airports,
(iv) Approve the establishment of private airstrips and control the operations thereof.

5.2.3 Environmental Management and Coordination Act, 1999 (Amendment, 2015)

The Environmental Management and Coordination Act (EMCA) 1999 being the principle law shall be read alongside the Environmental Management and Coordination (Amendment) Act 2015. The latter provides amendments to the Principle Act on section by section basis.

Part II of the Environment Management and Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment. Section 3 of the Act also states that every person shall cooperate with the State Organs to protect and conserve the environment and ensure sustainable development and use of natural resources. In order to partly ensure this is achieved, Part VI under Section 58 of the Act directs that any proponent for any project to undertake and submit to NEMA an Integrated Environment Impact Assessment (unless exempted by NEMA), who in turn may issue a license as appropriate.

Section 9 of the Act provides for voluntary environment conservation practices through natural resources conservancies, easements, leases, payments for ecosystem services and other instruments. Guidelines in this regard are to be formulated through relevant Agency collaborations. This will be partly achieved through sustainable land use practices that are in conformity with conservation measures as emphasized under Section 51 of the Act. This include sustainable land use methods, selection and management of sensitive areas including buffer zones and catchments, control of alien species and encouraging traditional conservation knowledge integration among others.

Section 57 of the Acts provides that all policies, plans and programmes undergo Strategic Environment Assessment (SEA) following guidelines issued by NEMA. On specific projects, Part VII of the Act requires preparation of Integrated Environment and Social Impact Assessment as enhanced under Section 58 and sub-section 6 under which the National Guidelines for Strategic Environmental Assessment in Kenya were established.

Other relevant regulations include the Noise and Excessive Vibration Pollution Control Regulations, 2009, the Environment Co-Ordination (Air Quality) Regulations, 2008 and the EMCA (Fossil Fuel Emission Control) Regulations, 2006. Among the regulations established under EMCA 1999 and relevant in the proposed project are listed here below;

5.2.3.1 Waste Management Regulations, 2006 (Legal Notice No. 121)

The regulations are formed under sections 92 and 147 of the Environmental Management and Coordination Act, 1999. Under the regulations, a waste generator is defined as any person whose activities produces waste while waste management is the administration or operation used in handling, packaging, treatment, conditioning, storage and disposal of waste. The regulations requires a waste generator to collect, segregate and dispose each category of waste in such manners and facilities as provided by relevant authorities. Regarding transportation, licensed persons shall operate transportation vehicles approved by NEMA and will collect waste from designated areas and deliver to designated disposal sites.

It is observed that the Regulations is limited on standards for general wastes management giving more weight on hazardous wastes. The project activities will release oils and grease residuals from machinery and vehicle maintenance. Oils and grease are considered hazardous waste whose treatment and handling guidelines under these Regulations are illustrated under the 3rd Schedule of the Regulations.

5.2.3.2 Noise and Excessive Vibration Pollution Control Regulations, 2009

Part II section 3(I) of these Regulations states that: no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment and section 3(2) states that in determining whether noise is loud, unreasonable, unnecessary or unusual. The second schedule defines maximum noise levels emitted from construction areas to facilities including health centers, educational institutions, homes for the aged and the aged, residential areas and commercial centers. The recommended levels are 60dBA by day and 35dBA by night. Other areas outside public locations are allowed to emit noise levels of upto 75dBA during the day and about 65dBA during the night. Quarrying activities within the proximity of silent zones and commercial areas are allowed to emit noise levels of upto 109dBA and 114dBA respectively. Under the first schedule, sensitive zones have been identified and clustered for noise level considerations in the table below.

Table 30: National Noise Guidelines

Zones	Noise Levels (dBA)		Remark
	Day	Night	
Silent zones	40	35	This covers hospitals, schools, homes for the aged, retreat centers, hotels, etc.
Places of worship	40	35	Churches, mosques and shrines
Residential areas	45 (indoors)	35	Estates and associated facility premises
	50 (outdoor)	35	Residents recreational centers
Mixed land use (residential, commercial and institutional	55	35	Urban centers and market areas
Commercial	60	35	Industrial areas and trading areas

Source: Noise and Excessive Vibration Pollution Control Regulations, 2009

5.2.3.3 Air Quality Regulations 2014

Under the general prohibitions (Part II), section 5 states that no person shall act in a way that directly or indirectly causes immediate or subsequent air pollution. Among the prohibitions are priority air pollutants (as listed under schedule 2 of the regulations) that include general pollutants, mobile sources and greenhouse gases. Odours are also prohibited under section 9 of the regulations (offensive emissions). Sources of air pollutants from the construction works will include traffic in and out of the site emitting dust, rock crushing at quarry sites, batching plants, power generators and earth works at site among others. In these activities, the Contractor will comply with the following air quality standards.

Table 31: Ambient Air Quality Tolerance Limits

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
Sulphur oxides (SOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	125 ug/m^3	80 ug/m^3	30 ug/m^3
	Annual Average		0.019 ppm/50ug/m^3	
	Month Average			
	24 Hours		0.048ppm /125ug/m^3	
	Instant Peak		500 ug/m^3	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hours	150 ug/m^3	80 ug/m^3	30 ug/m^3

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 ug/m^3	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 ug/m^3	0.1 ppm	
	One Hour		0.2 ppm	
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 ug/m^3	140 ug/m^3	70 ug/m^3
	24 hours	500 ug/m^3	200 ug/m^3	100 ug/m^3
	Annual Average		100 ug/m^3	
	24 hours		180 ug/m^3	
Respirable Particulate Matter (<10□m) (RPM)	Annual Average	70 ug/m^3	50 ug/m^3	50 ug/m^3
	24 hours	150 ug/Nm^3	100 ug/Nm^3	75 ug/Nm^3
PM2.5	Annual Average	35 ug/m^3		
	24 hours	75 ug/m^3		
Lead (Pb)	Annual Average	1.0 ug/Nm^3	0.75 ug/Nm^3	0.50 ug/m^3
	24 hours	1.5 ug/m^3	1.00 ug/m^3	0.75 ug/m^3
	Month Average		2.5	
Carbon Monoxide (CO)/ Carbon Dioxide (CO_2)	8 hours	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/m^3
	1 hour	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3
Hydrogen sulphide	24 hours	150ug/m^3		
	instant Peak	700ppb		
Total VOC	24 hours	600 ug/m^3		
Ozone	1-Hour	200 ug/m^3	0.12 ppm	
	8 hour (instant Peak)	120 ug/m^3	1.25 ppm	

Source: Air Quality Regulations 2014

5.2.3.4 Fossil Fuel Emission Control Regulations, 2006

This Regulation aims at eliminating or reducing emissions generated by internal combustion engines to acceptable standards. The regulation provides guidelines on use of clean fuels, use of catalysts and inspection procedures for engines and generators. It is recommended the requirements of the regulation be implemented in order to eliminate or reduce negative air quality impacts.

5.2.4 Occupational Safety and Health Act No. 15 of 2007

Occupational Safety and Health Act (OSHA), 2007 provides for safety, health and welfare of persons at places of work. This Act is applicable both in air and on the ground. In particular section 89 that lays emphasis on control of air pollution, noise and vibrations. Competent persons shall be in charge of site safety and appropriate arrangements be made to ensure that safety and health committees are formed as provided for in Section 9 of OSHA and Section 4 of the Factories and Other Places of Work (Safety and Health Committees) Rules.

All employees are expected to be made aware of their obligations to comply with provisions of the Act through appropriate trainings organized by the contractors. Appropriate personal protective equipment shall be provided by the contractors to all employees so as to protect them from hazards associated with their work. These should include highly reflective jackets, helmets, dust masks, ear muffs, safety harnesses when working at heights, and protective clothing. The Act has subsidiary legislations that are applicable to aviation industry that are outlined in the following sub-sections.

5.2.4.1 Safety and Health Committee Rules, 2004 Legal Notice No. 31

These rules are described in Legal Notice No. 31 of the Kenya Gazette Supplement No. 25 of 2004. The rules apply to all places work that have twenty or more employees. The Legal Notice provides for formation of safety committees and describes the functions and duties of the committees, the purpose and the roles of the office bearers. This Subsidiary Legislation will be applicable when KCAA to forms a safety committee to oversee safety of aviation activities in the country.

5.2.4.2 Fire Risk Reduction Rules, 2007 Legal Notice No. 59

Every operator of a workplace employer is required to maintain good ventilation to allow exit of flammable fumes in case of fire, maintain good housekeeping, maintain good electrical fittings, provide and maintain fire exits, form and train firefighting teams, conduct fire drills yearly, designate an assembly points, provide and maintain first aid facilities, post fire safety notices, install fire detectors, provide and maintain firefighting appliances, conduct an annual fire safety audit and formulate a fire safety policy.

KCAA will apply the rules to ensure fire safety at their offices, control towers and installations. At the same time, the rules become handy for use by the KCAA at their go-downs. A fire safety policy for KCAA has to be developed and adopted. It is also paramount that all users of airspace which fall within purview of KCAA to put fire safety measures. On board aircrafts fire safety is essential.

5.2.4.3 Hazardous Substances Rules, 2007 Legal Notice No. 60

The rules require that where hazardous substances are handled, protection be provided. Employees handling electronic devices have to be protected against electromagnetic radiation, other forms of radiation by way of personal protective equipment and medical examination. Material Safety Data Sheets (MSDS) must be availed in respect of all chemicals handled. Correct disposal of hazardous substances must be done and containers of such hazardous substances be labeled. Substances in form of detergents and fumigants are used in cleaning and sanitation. The rules will help the KCAA to ensure safety and health of workers with regards to chemical and electronic substances.

5.2.4.4 First Aid Rules, 1977 Legal Notice No. 160

These rules outline first-aid requirements with respect to every workplace and under whose charge the first-aid box should be placed. In all workplaces, provision of first aid is a requirement and the

rules will be useful in this regard in catering for injuries sustained. The rules will apply in all KCAA workplaces including offices stores, control towers, manned installations etc.

5.2.4.5 Eye Protection Rules legal Notice No. 44 of 1978

The rules were developed for purposes of eye safety in workplaces. In aviation activities where eyes may be subjected to strong wind currents, eye protection is required. There are some aviation activities where eye protection will be a common feature. The activities include use of hot air balloons, gliders, gyroplanes and ultra-lights. The rules will provide a good platform for ensuring eye safety of the workers involved in the activities

5.2.4.6 Electric Power (Special) Rules, 1979 Legal Notice No. 340

The rules were developed to provide for electrical safety with regards to electrical power installations, use and handling. These rules apply to generation, transformation, conversion, switching, controlling, regulating, distribution and use of electricity. The rules will be applied to ensure electrical safety at the offices, control towers and installations. KCAA will apply the rules to ensure fire safety at their offices and control towers. Also, same time, the rules become useful in the go-downs.

5.2.4.7 Medical Examination Rules, 2007 Legal Notice No. 24

The rules apply to workplaces of certain classified hazards. Every employer has to ensure medical examination of workers in the workplaces of classified hazards. Noise emission is a common feature in the aviation industry. Employed persons exposed to sound levels of 90dB or more have to undergo audiometry on annual basis. Exposure to dusts, fumes & other emissions and musculoskeletal hazards by employees will require statutory medical examination and the rules will be useful in this regard.

5.2.4.8 Noise Prevention and Control Rules, 2005. Legal Notice No. 25

The rules state that 'No worker shall be exposed to noise level excess of the continuous equivalent of 90 dBA for more than 8 hours within any 24 hours duration'. Where there are emissions of sound levels of the said magnitude, not only are Medical Examination Rules applicable, but also an annual noise survey has to be conducted, so that safety planning for the noise management can be done. The rules will guide KCAA in protecting workers from effects of high noise levels.

5.2.5 Work Injury Benefits Act (WIBA), 2007

Part II of the Act requires Employers to obtain and maintain insurance policy for their employees while Part III Section 10 provides for compensation of employees who gets involved in accidents resulting in disablement or death and is entitled to benefits unless it is a result of misconduct of the employee. Under Section 34, in the event of death arising from the occupational accident, the compensation shall be paid to the dependents of the employee in accordance. Part VII section 45 requires that an

employer provide and maintain appliance and services for rendering first aid to his employees. Section 48 instructs that an Employer shall defray any expenses reasonably incurred by an employee as a result of an accident arising out of and in the course of the employer's employment.

The Act provides the minimum standards for compensation of injuries sustained at work. In an event of an accident or ailment, a worker may sustain permanent incapacity/disablement or temporary incapacity/disablement or both permanent incapacity and disablement and temporary incapacity and disablement. This law will be useful in setting the minimum for compensating persons who may sustain injuries while at work. In the same precinct, it would be within the interest of KCAA for all organizations in aviation industry to ensure adherence to this law.

5.2.6 Physical Planning Act (Cap 286)

Section 24 of the Physical Planning Act gives provision for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land. The plan shows the manner in which the land in the area may be used. Section 29 of the physical Planning Act gives the county councils power to prohibit and control the use of land, building, and subdivision of land, in the interest of proper and orderly development of its area. The same section also allows them to approve all development applications and grant development permissions as well as to ensure the proper execution and implications of approved physical development plans. On zoning, the act empowers them to formulate by-laws in respect of use and density of development.

5.3 Environment, Health and Safety Guidelines for Airports

The IFC General EHS Guidelines (Environment) comprises the following key sections that are also applicable in aviation operations for the integration of environmental, health and safety aspects in the operations. These guidelines enhances the National Occupational Health and Safety (OHS) and Public Safety regulations to attain the desired best practices for the operations. EHS Guidelines covers the following areas;

Airports are the main link of airspace and the ground. Under the International Industry Best Practices guidelines, activities associated with airport operations have environment, health and safety linkages that requires to be addressed. These include;

(i) Noise and vibrations arising from aircrafts take-off and landing cycles into the airports in addition to other ground based sources. Airport managements are encouraged to ensure appropriate airport grounds planning and orientation with the surrounding land use practices with respect to approaches for control of noise impacts. Other practices should include use of preferred flight procedures and collaboration with relevant authorities in land use zoning for controlled exposure to noise,

(ii) Aircraft operations (landing and take-off as well as taxing and auxiliary power) are among sources of emissions in addition to other ground sources within airports associated with fuel vapors and combustion by-products.
(iii) Energy consumption around airports is mainly focused on lighting, aeration and running of lists and escalators. Aircrafts also consume energy through auxiliary power requirements as well as taxing and flying. This implies energy mix including power from the mains, diesel and jet fuels.

These guidelines provides measures for protecting workers from potential risks while working in close contact with contaminated environment including soil and other media. In order to comply, employers are advised to ensure basic measures as follows;

(i) Hazard elimination,
(ii) Hazard control
(iii) Hazard minimization
(iv) Provision of employee protection (personal protective equipment – PPEs) and enforcement of application,

5.4 ICAO Provisions

The Chicago Convention is a source of international air law and the constitution of ICAO. The Convention on International Civil Aviation, drafted in 1944 by 54 nations, was established to promote cooperation and “create and preserve friendship and understanding among the nations and peoples of the world. “Known more commonly today as the ‘Chicago Convention’, this landmark agreement established the core principles permitting international transport by air, and led to the creation of the specialized agency which has overseen it ever since – the International Civil Aviation Organization (ICAO).

Standards And Recommended Practices (SARPs) are technical specifications adopted by the Council of ICAO in accordance with Article 37 of the Convention on International Civil Aviation in order to achieve "the highest practicable degree of uniformity in regulations, standards, procedures and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation". SARPs are published by ICAO in the form of Annexes to Chicago Convention.

5.4.1 Air Navigation Services (ANS)

This is a system for provision of services to flight operations pertaining to air navigation including;

(i) Aeronautical Information Service (AIS), to ensure the flow of information necessary for safety, regularity and efficiency of air navigation
(ii) Air Traffic Management (ATM), comprising of air traffic control, flight information and alerting services also to ensure the safety and efficient operation of air traffic

(iii) Aeronautical Meteorology (MET) for weather forecasts, reports, warnings and alerts
(iv) Search and Rescue (SAR) for rapid location and rescue of survivors of aircraft accidents
(v) Communication, Navigation and Surveillance (CNS) for radar navigation aids, communication procedures, communication systems, surveillance radar and collision avoidance systems; and aeronautical radio frequency spectrum utilization

5.4.2 Balance Approach to Aircraft Noise Management

The Balanced Approach was developed by ICAO in its Assembly Resolution A33-7in October 2001 as an agreed tool to enable States to address aircraft noise problems in an environmentally responsive and economically responsible way. This concept is designed for adoption by individual airport upon realization of potential challenges associated with uncoordinated noise alleviation programmes that do not consider fully economic linkages of aviation operations and related land use linkages. The tool is driven by four key principles namely reduction of noise at source, land use planning and management, noise abatement operational procedures and operating restrictions on aircrafts. The four Balanced Approach principles are briefly described below;

5.4.2.1 Reduction of Noise at Source

There is continuous research on aircraft technology improvements for reduction of noise impacts to the receptors and the same reflected on individual airports. An associated element of the technology development is certification of standards imposed on certain restricted aircrafts for specific airports as per ICAO guidelines. Other measures include imposing noise related restrictions on aircraft operation procedures. For a specific airport, the following considerations may be necessary for noise reduction;

(i) Integration of technology to the extent possible of an existing fleet,
(ii) Technology improvements through progressive aircraft fleet modernization programmes by the operators. This is a costly affair and requires commitment by the operators and continuous consultations for ownership,
(iii) National programme of adoption and enforcement of noise standards
(iv) Adoption and implementation of latest ICAO noise standards.

5.4.2.2 Land Use Planning and Management

The principle of land use planning involves directing land use activities incompatible (schools, houses health centers, religious premises, etc.) with airport operations away from the airports and associated features while encouraging compatible land use activities (industrial and commercial activities) with airport operations are developed within the neighbourhoods. This initiative is designed to ensure minimal number of people exposed to noise, the number of people with potential exposure is dependent on the nature of land planning and management, especially for residential land use and sensitive areas. Among preventive measures on land use planning and management include the following;

(i) Locating new airports in appropriate locations away from noise sensitive areas,
(ii) Taking appropriate measures for land use planning integration in development of new airports or expansion or improvements of existing airports,
(iii) Defining and updating zones around airports with respect to populations and sensitive areas for purposes of growth and expansion projects including establishing appropriate corrective actions
(iv) Establishing appropriate land use legislation and guidelines to achieve compliance with compatible land use criteria,
(v) Providing reader friendly materials for information and sensitization to land developers.

5.4.2.3 Noise Abatement Operational Procedures

Upon demonstrating a noise problem, appropriate flight procedures may be introduced for considerations. In-flight and ground-based procedures may determine the size and shape of noise contours that reflects the ground coverage. This implies by changing the shape and size of a noise contour can be used to minimize or increase the number of people exposed (changing of flight procedures, however, should not compromise on the safety of the operations). Among the procedures applied may include the following;

(i) Use of noise preferential runways deflecting initial take-off of final landing paths away from people or sensitive areas,
(ii) Use of noise preferential routes that assists aircrafts to avoid people or sensitive areas on departure and arrival,
(iii) Use of noise abatement take-off or landing approaches to optimize distribution of noise on the ground without compromising safety.

Noise abatement procedures calls for high level cooperation by airline operators and pilots to be achieved through selection of operational procedures, identification of new challenges and suitability of modified procedures to existing fleets among others. Following are key examples of noise abatement procedures;

(i) Use of flight departures and approach routings (preferential routes, SID/STAR procedures, dispersed flight tracks and automated arrival/departure procedures)
(ii) Use of runways (noise preferential runways and displaced thresholds)
(iii) Use of departure procedures (noise abatement departure procedures)
(iv) Use of approach procedures descent profiles, reduced power/reduced drag techniques, continuous descent approach)
(v) Use of reverse thrusts
(vi) Use of ground-based operational procedures

5.4.2.4 Operating Restrictions

This involves reducing noise by limiting or prohibiting access certain aircraft types into the airport that may reduce the size of the overall noise contours depending on the number and capacity of the restricted or prohibited aircrafts. This measures, however only comes as a last options to allow operators take necessary control actions on their own. Among considerations while imposing restrictions or prohibitions include the following;

(i) Conditions and terms outlined under a certification programme
(ii) Design restrictions and prohibition to the airport specifications and other principles under the Balanced Approach
(iii) Confining restriction to a partial conditions
(iv) Consider available air travel alternatives for the destinations and type of travelers,
(v) Consider economic capability of the operator to avoid impacts
(vi) Spreading the restrictions over a period of time to avoid impacts
(vii) Give reasonable notice

Avoidance is attained when the Control Tower instructs that pilots do not over-fly sensitive areas such as security zones, hospitals, highly built-up urban areas and areas with potential conflicts with other aviation operations. While this has a multiplicity of impacts, noise avoidance could also be achieved through take-off and landing modifications. This involves the following among others,

(i) Application of power on take-off to enable gain height progressively over a successive communities. Full power climb will normally have higher impact as the blast is directed directly to the ground. The aircraft, therefore should cut power and take assume a horizontal orientation for the benefit of the communities within short distances from the runway threshold,
(ii) Low noise landing procedure may require that the ration of the aircraft height from the ground to the distance left to the runway threshold is high. This ensures the aircraft is as far as possible from the ground towards the runway without compromising on the landing safety.

5.4.3 Global Air Navigation Plan (GANP)

This is a high level document that provides framework for global planning. The planning is for states, equipment manufacturers, operators and service providers, industries and international organizations on the basis of operational thresholds and timeframes. The GANP explores the need for more integrated aviation planning at both the regional and State level and addresses required solutions by introducing the consensus-driven (ASBUs) systems engineering modernization strategy.

In addition, it identifies issues to be addressed in the near future alongside financial aspects of aviation system modernization. The increasing importance of collaboration and partnership as aviation recognizes and addresses its multidisciplinary challenges ahead is also stressed. The GANP

also outlines implementation issues involving the near-term performance-based navigation (PBN) and Block 0 Modules and the Planning and Implementation Regional Groups (PIRGs) that will be managing regional projects.

5.4.4 International Air Transport Association (IATA)

This is an international association of scheduled carriers in international air transportation. The airlines it represents are the main users of airports therefore they affect airport planning with regard to design and development to ensure effective, safe, efficient and secure air transport. It sets standards for runway length depending on type and size of aircraft and also the area to be left for a clearway in airports. The noise levels of aircraft also influence the type of land uses around the airport.

5.4.5 Aeronautical Information Publication for Kenya (AIP)

A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. The format is provided in ICAO Annex 15. Each State is required to have its own AIP.

5.5 ICAO Annexes

The International Civil Aviation Organization (ICAO) has a set of requirements, contained in relevant Annexes to the ICAO Convention, to be implemented by airports operating at international standards. While most of the guidelines seem to focus on aircraft operations, airport ground conditions are of great importance to aviation operations. Annex 14 and 16 of the ICAO Regulations focus on integration of environmental provisions through the development and operations of aerodromes while the Balance Approach, contained in ICAO 9829, provides guidelines on land use practices around aerodromes. The relevant ICAO annexes and rerated documents (detailed analysis will be in the main SEA Report) include;

5.5.1 Annex 2 (Rules of the Air)

This Annex contains generally agreed rules of the air, developed by ICAO, which consists of the general rules, visual flight rules and instruments flight rules

5.5.2 Annex 3 (Meteorological Services for International Air Navigation)

The object of the meteorological service outlined in Annex 3 is to contribute to the safety, efficiency and regularity of air navigation. This is achieved by providing necessary meteorological information to operators, flight crew members, air traffic services, search and rescue units, airport management and others concerned with aviation.

5.5.3 Annex 4 (Aeronautical Charts)

For the safe performance of air operations, it is essential that a current, comprehensive and authoritative source of air navigation information be made available at all times and aeronautical charts provide a convenient medium for supplying this information in a manageable, condensed and coordinated manner.

5.5.4 Annex 11: Air Traffic Services (ATS)

The prime objective of air traffic services, as defined in the Annex, is to prevent collisions between aircraft, whether taxiing on the maneuvering area, taking off, landing, en route or in the holding pattern at the destination aerodrome. The Annex also deals with ways of expediting and maintaining an orderly flow of air traffic and of providing advice and information for the safe and efficient conduct of flights and alerting service for aircraft in distress. To meet these objectives, ICAO provisions call for the establishment of flight information centers and air traffic control units.

5.5.5 Annex 12 (Search and Rescue)

Search and rescue services are organized to respond to persons apparently in distress and in need of help. Prompted by the need to rapidly locate and rescue survivors of aircraft accidents, a set of internationally agreed Standards and Recommended Practices has been incorporated in ICAO's Annex 12 - Search and Rescue (SAR).

5.5.6 Annex 13 (Aircraft Accident and Incident Investigation)

Annex 13 provides the international requirements for the investigation of aircraft accidents and incidents. It has been written in a way that can be understood by all participants in an investigation. As such, it serves as a reference document for people around the world who may be called on, often without any lead time, to deal with the many aspects involved in the investigation of an aircraft accident or serious incident. As an example, the Annex spells out which States may participate in an investigation, such as the States of Occurrence, Registry, Operator, Design and Manufacture. It also defines the rights and responsibilities of such States.

5.5.7 Annex 14 (Aerodromes)

This Annex contains a broad range of subjects, extending from the planning of airports and heliports to such details as switch-over times for secondary power supply, from civil engineering to illumination engineering; from provision of sophisticated rescue and firefighting equipment to simple requirements for keeping airports clear of birds.

5.5.8 Annex 15 (Aeronautical Information Services)

The objective of the aeronautical information service is to ensure the flow of information necessary for the safety, regularity and efficiency of international air navigation. Annex 15 defines how an aeronautical information service shall receive and/or originate, collate or assemble, edit, format, publish/store and distribute specific aeronautical information/data

5.5.9 Annex 16 (Environmental Protection)

Annex 16 (Volumes I and II) deals with the protection of the environment from the effect of aircraft noise and aircraft engine emissions while Volumes III and IV deal with Aircraft CO_2 emission Standards and Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) respectively. The four volumes under Annex 16 are briefly outlined below;

(i) Vol. I was developed to address aircraft noise, especially with respect to noise levels at lateral, approach and flyover receptor measurement points. Noise measurement under this Annex is considered a subjective effect of an aircraft noise on people taking into account the instantaneous perceived noise level and duration (average noise level).

(ii) Vol. II provides for standards on aircraft engine emission addressing venting raw fuel into the atmosphere, emission of smoke from aircraft engine and emission of gasses during landing and take-off phases (including carbon monoxide, unburned hydrocarbons and NO_X).

(iii) Vol. III was established to provide a basis for guidelines on the requirements or CO_2 emissions certification. The development of an airplane CO_2 standard as part of the range of measures for addressing greenhouse gas emissions from international aviation was one of the recommended elements within the ICAO Programme of Action on International Aviation and Climate Change. This was subsequently endorsed by the ICAO

(iv) Vol. IV created the Carbon offsetting and reduction scheme for international aviation (CORSIA). The Volume contains detailed rules for the administration of CORSIA by states, for the monitoring, reporting and verification of emissions, and for the cancellation of emissions units. It is complemented by the CORSIA Implementation elements, which include additional requirements for emissions units and CORSIA eligible fuels.

5.5.10 Annex 19 (Safety Management)

With Annex 19 ICAO aims to enhance its strategic regulatory and infrastructure developments and stress the importance of overall safety performance in all aspects of air transport operations to complement the Global Aviation Safety Plan (GASP). This Annex is a consolidation of existing safety management provisions contained in as many as 6 different Annexes. This Annex, dedicated to safety management, re-enforces the role played by the State in managing safety at the State level, stressing the concept of overall safety performance in all domains, in coordination with service providers. Specific provisions of Annex 19 include;

(i) The Safety Management System (SMS) framework by organizations responsible for the type design and manufacture of aircraft
(ii) State Safety Programme (SSP) framework to consider Safety Policy and Objectives, Risk Management, Safety Assurance and Safety Promotion,
(iii) The State Safety Oversight System be applicable to all product and service providers
(iv) Safety Data Collection Analysis and Exchange be part of the SSP

Chapter 6: Environmental Management and Monitoring Plan

6.1 Strategic Environmental and Social Integration

The Airspace Master Plan and associated projects areas and sub-projects have been evaluated to establish specific global links and benefits with environment and social aspects projected through the plan implementation horizon period. While enhancing and promoting benefits of the projects to the environment and social linkages, the following potential conflicts will also be addressed;

(i) Evaluation of project areas and the projects with respect to their environment and social linkages,
(ii) Preparation of screening statement for the projects with respect to potential linkages to environment and social settings,
(iii) Where environment and social relevance is identified, Terms of References framework established for ESIA Study at the of the projects implementation.
(iv) The procedure for seeking approvals from the environmental authorities

6.2 Summary of Impacts and Strategic Management Actions

The analysis of impacts under chapter 3 has established a series of broad impacts based on the Project Areas. The mitigation actions have been scheduled to run along the projects implementation plan. The summary is presented as per the schedule in the matrix below;

Table 32: Strategic Impacts Management Actions

Project Area	Projects Lists	Strategic Management Actions.
Air Navigation Services (ANS) Projects	(i) Safety Management System (SMS) (ii) ANS Planning and Projects (iii) Air Traffic Management (ATM) and Security Management	✓ Integrate public safety as a component of air traffic management and security ✓ Review the projects budget to ensure realistic components cost and including environment and social cost ✓ Establish an appropriate and dedicated project management team to guide the implementation of the Master Plan projects components in a timely and cost effective manner.
Air Traffic Management (ATM) En-route Operations	(i) Flexible Use of Airspace (FUA) extension into HKR10 (review of flight tracks to include Controlled Routes (CDRs) and increase ATC Capacity) (ii) Operational use of Automatic Dependent Surveillance – Contract (ADS-C) and Controller Pilot Data Link Communication (CPDLC). (iii) Development of Performance-Based Navigation (PBN) routes network providing capacity to cope with increasing traffic. (iv) Implementation of Free Route Airspace (FRA) concept for airlines (v) Air Traffic Flow Management (ATFM) involving centralized flight planning database that will enable verification of flight plans and routes. Key focus on JKIA operations management. (vi) Operational use of ATS Interfaculty Data Communications (AIDC) (vii) ATM-ENR Sectorisation (viii) New Area Control Centre (ACC)	✓ Overlay airspace plan on national land use plans to minimize conflict between aviation operation and stakeholders development activities ✓ Initiate cross-sectoral stakeholder engagements for sustainable interaction of air space management and other social and economic activities ✓ Undertake ESIA Study and seek approval for the proposed new ACC Building in Athi River
Air Traffic Management (ATM) Approach and Tower Operations	(i) JKIA – Sectorization (ii) JKIA – Arrival Management (AMAN) and Departure Management (DMAN) (iii) JKIA – Development of Airport Collaborative Decision Making (A-CDM) (iv) JKIA – Implementation of Point Merge concept (v) JKIA – Reorganization of TWR cab	✓ Regularize approval for the construction of Wilson control tower with NEMA and other approving authorities ✓ Sustain consultations and collaborations with KAA on improvement interventions around aerodromes as listed

Project Area	Projects Lists	Strategic Management Actions.
	(vi) This was focused on the proposed 2nd Runway that has since been put on hold. (vii) JKIA – 2nd Runway ANS adaptations (viii) JKIA – Implementation of CAT II operations. It is reported that KAA has commenced the process. (ix) Wilson – New Tower (x) Wajir – Tower Maneuvering Area (TMA) involving defining operational procedures, training of controllers and updating of the AIP. It is reported the design has been completed. (xi) Other airports – Implementation of Performance Based Navigation (PBN) procedures (xii) General – Apron management (closely tied to A-CDM initiatives) (xiii) JKIA – Management of vehicles on maneuvering area (xiv) Other airports – Provision of Air Navigation Services (ANS)	
Communications Projects	(i) Extension of VHF equipment (ii) Replacement of communication equipment at end of life (iii) Replacement of HF equipment (iv) Replacement of Aeronautical Message Switching System (AMSS) at end of life (v) Replacement of communication infrastructure (vi) Improvement of communication links (vii) System-Wide Information Management (SWIM) communication (viii) Mobile TWR (ix) Miscellaneous communication equipment (x) Aeronautical Telecommunication Network (ATN) B2 implementation	✓ There is a lot of scrapping of communication equipment that require special handling. KCAA to initiate a comprehensive special waste handling plan ✓ Prepare a decommissioning Plan for all obsolete equipment with clear supervised mechanisms during the removal, storage and final disposal.
Navigation Projects	(i) Remote control for VOR/DME (ii) JKIA – Instrument Landing System (ILS) for 2nd Runway (RWY) (iii) NAVAID rationalization at end of life	✓ There is a lot of scrapping of communication equipment that require special handling. KCAA to initiate a comprehensive special waste handling plan ✓ In light of the increase in air traffic KCAA to initiate the implementation of modern navigational aids equipment installation to ensure that airspace safety is maintained to 2030 and beyond

Project Area	Projects Lists	Strategic Management Actions.
Surveillance Projects	(i) Operational transition to ADS-B (ii) Transition from MSSR to ADS-B (iii) Replacement of Primary Surveillance Radar (PSR) at end of life (iv) JKIA – Replacement of Surface Movement Radar (SMR) at end of life (v) JKIA – Airport Multi-Lateration (MLAT) (vi) Extension of MLAT system to Wide Area Multi-Lateration (WAM)	✓ There is a lot of scrapping of communication equipment that require special handling. KCAA to initiate a comprehensive special waste handling plan ✓ Prepare a decommissioning Plan for all obsolete equipment with clear supervised mechanisms during the removal, storage and final disposal.
ATC Systems	(i) JKIA – AMAN and DMAN (ii) Dedicated TWR Electronic Flight Strip (EFS) system (iii) ATC system for new ACC (iv) Automatic Weather Observing System (AWOS) display (v) EUROCAT system upgrades (vi) EUROCAT system replacement at end of life (vii) A-SMGCS system upgrade (viii) A-SMGCS system replacement at end of life	✓ Undertake ESIA for the new ACC development and seek appropriate approvals from NEMA and other authorities ✓ Initiate stakeholder consultations on collaborative system upgrades for sustainable air space management
Aeronautical Information Services	(i) AIS system renewal (ii) SWIM implementation (iii) AIM System extension (iv) Management and operation of ATS Message Handling System (AMHS)/ Aeronautical Fixed Telecommunication Network (AFTN)	✓ Initiate stakeholder consultations on collaborative system upgrades for sustainable air space management
Search and Rescue	Upgrade of Rescue and Coordination Centre	✓ Institute a framework for involvement of communities through local administrative leadership in support of near real time controlled access to the aircraft accident scene. ✓ Enhanced stakeholders network on SAR
Training	(i) Development of unit training plans for ATCO/AFISOs (ii) ATCO training (iii) JKIA – 3D TWR simulator (iv) Development of training programmes for AIS officers (v) Development of training programmes for Air Traffic Safety Electronics Personnel (ATSEPs) (vi) ATSEP training (vii) EASA – Development of training programmes with other regions (viii) Training equipment	✓ Providing an environment that will free up adequate time for training of the staff without compromising on the operations ✓ Introduce components on environment and social aspects into the training programs including OHS, Noise management, Emissions control and Land use linkages

Project Area	Projects Lists	Strategic Management Actions.
Human Resources	(i) ATCO recruitment and training (Base Case) (ii) Air Traffic Control Officer (ATCO) recruitment and training (iii) Aerodrome Flight Information Service Officer recruitment and training at new locations (iv) AIS staff recruitment and training (v) Technical staff recruitment and training (Base Case) (vi) Technical staff recruitment and training (Solution Scenario) (vii) Redeployment of Communication Centre staff (viii) East Africa School of Aviation (EASA) – Instructor recruitment	✓ Consider reviewing the recruitment plan to cater for proper succession plan focusing on mentorship, continuous training and career advancement ✓ Develop a stress management program for the staff especially the ATCOs

6.3 Performance Monitoring Programme

Kenya Civil Aviation Authority is committed to ensuring a sustainable implementation of the Airspace Master Plan 2015 – 2030. This will be achieved through a dedicated programme with measurable performance and monitoring parameters. The matrix below is an outline of the parameters.

Table 33: Environmental Performance Monitoring Plan

Performance Parameter	Performance Actions and Responsibilities	Master Plan Period
Noise and Vibrations	▪ Receptor identification to every aviation operation area ▪ Consider Noise Mapping exercise for all critical aviation operations areas (approach corridors and holding areas. ▪ Collaboration with efforts by KAA on noise mapping ▪ Ensuring compliance with established Noise regulations **Responsibilities** KCAA Lands Authorities Land users NEMA	Initiate action within the Short Term and Medium Term of the Master Plan Noise exposure to receptors
Land Use Compatibility	▪ Review maps for aircraft tracks and critical airspace features, ▪ Overlay the airspace maps on land use zones and special plans ▪ Make the superimposed maps public for application in development plans and approvals **Responsibilities** KCAA Lands Authorities Land users	This may be achieved through the Medium Term of the Master Plan Level in land use – aviation conflicts
Ecological Issues	▪ Identify and map ground ecological settings below all critical aviation operation areas including national parks ▪ Review established aircraft tracks and overlay the same on a birds' migration routes in space. **Responsibilities** KCAA KWS Ornithology Department (NMK)	This is to be achieved by the medium term of the Master Plan Ecological interactions
Stakeholder's involvement and engagement	▪ Institute an Environment and Social function within the Organizational establishment,	✓ The number of meetings in a month,

Performance Parameter	Performance Actions and Responsibilities	Master Plan Period
	▪ Develop a stakeholder's engagement framework and plan with defined interaction forums and schedules with defined agenda. ▪ Develop a simple Grievance Redress Mechanism for recording and maintain public complaints associated with aviation operation. ▪ Prepare and execute a public sensitization and' awareness creation plan on aviation related issues. **Responsibilities** KCAA	quarterly or annually to be recorded ✓ Number of complaints per month, quarterly of annually to be noted ✓ Number of awareness creation meetings done against number of peopled reached out and communication media used. Review of achievement to be reviewed along the Master Plan blocks – Short Term, Medium Term and Long Terms
Public Participation in Search and Rescue	▪ Identify strategic community partnership role on search and rescue missions through social administration and leadership ▪ Map out key high risk areas with potential challenges on SAR for strategic approach planning ▪ Provide appropriate training and sensitization of strategic community on basic handling of aviation accidents. Prepare appropriate IEC materials, training forums and activities. **Responsibilities** KCAA SAR Organizational Partners Community Administration and Leadership Identified Community Groups	Identifiable Partnership groups, their locations and involvement forums within the Short Term and Medium Terms of the Master Plan
Air Traffic Control Officers (ATCOs) Welfare	▪ Consider review of the Organizational establishment as a basis of ATCOs Needs Assessments process ▪ Prepare and institute a Stress Management Frameworks for the ATCOs in addressing risks of airspace safety lapses, ▪ Institute a participatory motivational and capacity building programme for ATCOs to enable matching with evolving technology in the aviation industry. **Responsibility** KCAA Station Managers	The initiative to be initiated within the Medium Terms of the Master Plan and implemented in the Long Term

6.4 Institutional Arrangements

Kenya Civil Aviation Authority is structured for the Aeronautical Navigation Services and the Regulatory responsibilities under the Director General. It is noted that there are operational in-house conflicts that require to be addressed for effective discharging of the respective departmental mandates. It is also important that KCAA institutionalizes and streamlines environment and social functions for effective integration of the Strategic Environmental Report into the Airspace Master Plan Implementation. Currently, environmental issues of KCAA operations are handled through the engineering and planning functions without clear systems and responsibilities in the establishments. In view of this situation, the following structure is proposed;

The current establishment at KCAA comprises of 4 Directorates namely Corporate Services, Aviation Safety and Security Regulations (Regulator), Air Navigation Services (ANS) and East African School of Aviation (EASA). The Directorate of ANS is responsible to technical functions of the Organization, including environment and social issues. The existing functions under ANS are Engineering, ATM Management and Aeronautical Information Services (AIS), ANS at JKIA and Chief ANS Planning and Development. Station Managers situated at the various airports also falls under this Directorate.

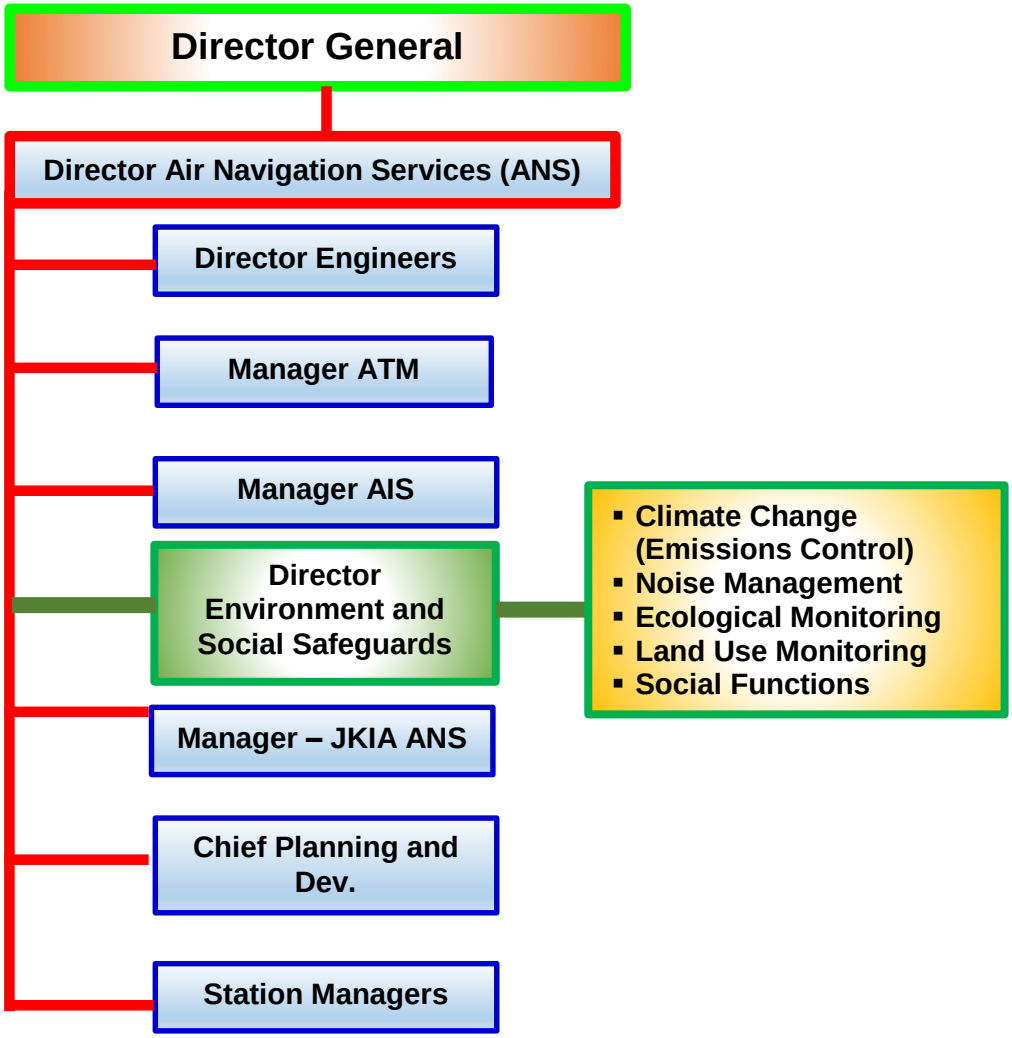
With emerging importance of environment and social functions in aviation operations, it will be necessary for the functions to be instituted such as to stand on their own. For effectiveness, the function should be reporting directly to the Director ANS but also have the ear of the Director General. The function should be a Department placed under an Environmental Safeguards Expert to be in-charge of environmental integration and social components. It will also be strategically positioned such as to be directly accessed by environment and social by stakeholders.

A Safeguards Management Department is, therefore, proposed that will be charged with the following responsibilities;

(i) Prepare and execute an Environmental and Social Policy for KCAA,
(ii) Plan and implement an Environment and Social Framework with Sectoral standards to guide KCAA through best practices in her airspace projects
(iii) Identify key environment and social linkages of aviation operations and prepare guidelines to ensure compliance, including provisions of ICAO and other best international practices,
(iv) Liaise with other partners in the field for enhanced harmonization and collective responsibilities,
(v) Enhance integration of environmental and social safeguards in the implementation of the current airspace master plan and other KCAA strategies in future.

The figure below illustrates the proposed creation of environmental and social Safeguards Department as part of the institutional organogram.

Figure 30: The Proposed Environment and Social Safeguards



6.5 Skills Capacity Enhancement

It has been observed that through this SEA Report, critical social and environmental issues have emerged with regard to airspace management. In addition to the above interventions regarding strategic management actions, performance monitoring and institutional arrangement, it is also proposed that the employees involved in the implementation of the airspace management are also equipped with necessary skills towards appreciation of the social and environment integration. The skills improvement in this regard may be achieved through in-house on-job training sessions as well as expanding the initial and progressive training programmes to include environment and social aspects of the operations.

In addition to training programmes, the proposed Department of Environment and Social Safeguards will be made an information hub for reference by the ATCOs through the operations. In this regard, the following skills areas are proposed;

(i) Aircraft emissions controls through air traffic procedures
(ii) Aircraft noise and vibration control through air traffic procedures
(iii) Land use practices and trends vis-à-vis air traffic management with regard to ground noise management, air quality from emissions and safety aspects,
(iv) Appreciation of ecological aspects covering overflying wildlife habitats and dispersal areas as well as interactions with birds migratory corridors and habitats,

6.6 Master Plan Projects Implementation

The Airspace Master Plan 2015 – 2030 comprise of about 73 intervention projects, 2No. out of which are physical and involved civil and mechanical works. The physical interventions include Project No. 9 that will involve construction of a new En-route Control Centre in Athi River and Project No. 17 that involves construction of a new Control Tower at Wilson Airport. These are physical buildings that would also be installed with appropriate equipment for the intended functions. Other projects are basically soft by nature enhancing communication and consequently improve aviation safety and social conflicts. Implementation of the proposed projects will either directly have involvement with the environment and social settings or have indirect implications within the areas of operations.

The projects proposed under the Airspace Master Plan may be categorized as follows;

(i) Physical projects involving civil construction works and installation of equipment. The works on the new ACC in Athi River area and the new Control Tower at Wilson Airport include construction of housing structures with excavations for the building foundations and installations upon completion,
(ii) There are projects involving replacement of communication equipment including radars at the end of the life. Such equipment are likely to contain components with hazardous and toxic parts requiring specialized handling,
(iii) Softer projects involves installation of communication components, new or upgraded software that will contribute to improved efficiency and services. These intervention project may not have direct implications to the environment.

In ensuring compliance with established environmental laws, it is recommended as follows;

(i) All physical projects involving construction works shall undergo the mandatory Environment and Social Impact Assessment (ESIA) Study and appropriate EIA License sought from the National Environment Management Authority (NEMA). In this regard qualified person licensed by NEMA to undertake EIA Studies shall be engaged.
(ii) Replacement of communication equipment will require professional guidance due to the potential hazardous nature of the parts and components. In this regard appropriate Decommissioning Plans will need to be prepared by qualified personnel licensed by NEMA. The Decommissioning Plan should be approved by NEMA before implementation. Disposal of the decommissioned equipment shall also be guided through the decommissioning plan and at least to approved destinations,

(iii) While the installation of soft gadgets in the system and upgrading of software may not require NEMA Approval, KCAA may consider preparing a monitoring plan on the improvements and effects of the interventions to the associated environment and social aspects of the aviation operations. The monitoring plan for each intervention actions is to be domiciled within the proposed environment and social safeguards department.

Environmental and social Impact Assessment studies for the projects will be guided by the terms of reference outline below;

Box 4: ToR Outline for Projects ESIA Studies

(i) Project Background
- ✓ Location
- ✓ Justification
- ✓ Design Features
- ✓ Project Components
- ✓ Facility Use Options
- ✓ Project Activities

(ii) ESIA Study Objectives
- ✓ ESIA Scope
- ✓ ESIA Study Approach
- ✓ ESIA Study Activities
- ✓ Stakeholders Consultations
- ✓ Documentary Review
- ✓ Field Assessments
- ✓ Reporting
- ✓ Work Plan

(iii) Basic Consideration
- ✓ Preliminary Study Findings
- ✓ General Environmental and Social Features

(iv) Impacts Overview
- ✓ Potential Impacts
- ✓ Environmental Impacts
- ✓ Management Issues

Chapter 7: Conclusions and Recommendations

7.1 Conclusions

7.1.1 Airspace Appreciation

(i) The Airspace Master Plan 2015 – 2030 do appreciate the environment component with respect to aircraft emissions and noise, especially with regard to climate change and health aspects. However, the plan has not established clearly the potential receptors and levels of impacts associated with the aircraft emissions and noise,

(ii) The Airspace Master Plan 2015 – 2030 has given clear illustration regarding cross-sectoral roles in its realization though without directly pointing to specific players other than aviation related actors. Implied non-aviation sectors include the County Governments, Health Sector, Security, Land Sector, Construction Sector and Environmental Sector,

7.1.2 Social Components

With the increasing air traffic in space and population across the country, direct linkages between the aviation operations and socio-economic activities is increasingly evident. While the Airspace Master Plan 2015 – 2030 is geared towards enhancing efficiency and safety of the airspace operations, it is a bit silent on social and economic components, especially with respect to public safety aspects. It, therefore, becomes difficult to draw the general stakeholder's attention on their roles and responsibilities on safe airspace management,

7.1.3 Emissions and Climate Change

(i) Significant work is being undertaken by KCAA, through programmes and projects, in its efforts to reduce CO_2 aircraft emissions within Kenyan airspace. The efforts include the voluntary development and submission to ICAO of a robust Action Plan for aviation CO_2 reduction. This is important as it allows Kenya to showcase its national mitigations measures to reduce CO_2 emissions from aviation as well as identify any assistance needs to implement such measures.

(ii) Kenya has also volunteered to participate in the CORSIA programme of ICAO. This means, though not obligated, that Kenya will participate the pilot phase (2021 – 2023), First Phase (2024 – 2026) and also the Second Phase (2027 – 2035) of the phased implementation of the CORSIA.

(iii) The aviation operations gives a mysterious outlook to the general public who may not be able to define means of dealing with the associated impacts including noise and vibrations.

The public may consider aviation activities a nuisance to their social environment and livelihoods but lack clear avenues of reaching out to KCAA for grievances or concerns.

7.1.4 Land Use Conflicts

Demand for land for social and economic development has seen encroachments into aviation operations areas, including aerodromes, approach corridors, holding areas and other critical installations with serious conflicts. This important interactions between aviation and socio-economic land use practices and trends has not been addressed under the Airspace Master Plan 2015 – 2030 as an important area of conflicts for plan actions,

7.1.5 Ecological Interactions

The most notable and appreciated ecological interaction with aviation involves birds strikes that has serious safety implications to the aircrafts and passengers. However, the main cause of bird strikes is the conflict between birds' habitats and migration routes that have not been appreciated in the airspace management planning. The Kenyan airspace has been noted to be a major international migratory route influenced by the Rift Valley lakes, which in effects also constitute important birds' habits (also including Lake Victoria and the Indian Ocean coastlines).

7.1.6 AFI Planning and Implementation Regional Group (APIRG)

Within the APIRG Regional framework all the 18 modules of ASBU Block 0 have or are about to be implemented. Indeed, projects proposed by the Master Plan are focused all these modules. This will help ensure environmental gains and also that air traffic management improvement programmes are effectively harmonized and barriers to future aviation efficiency are removed at reasonable cost.

7.1.7 Air Traffic Control Officers (ATCOs)

Air Traffic Control Officers (ATCOs) have been appreciated by the Airspace Master Plan 2015 – 2030 as a critical section of KCAAs staff. For this reason, there is a dedicated effort to enhance their numbers and capacity through recruitment and training programmes

7.2 Recommendations

The following recommendations have been found appropriate;

7.2.1 Airspace Appreciation

While appreciating the recognition of the environmental aspects including emissions and noise levels, it would add more value to identify all environment issues and associated resources requirements alongside potential receptors. For instance, adequate financial resources will be paramount to the

realization of fuel efficiency and hence aviation CO_2 emission reduction. This will enable KCAA adopt the mitigation actions under this Strategic Environmental Assessment Report.

7.2.2 Social Intervention

(i) The stakeholders listing under this SEA Report has brought out the need for KCAA to review the inventory of her operations Partnership including the general public. This review will work towards enhanced cross-sectoral collaborations at the various levels of airspace management with reduced conflicts and across board benefits. The key stakeholders should be sensitized on the Airspace Master Plan and in particular, the projects which impacts them in one way or the other. This will also better collaboration and networking between KCAA and specific stakeholders. Broader stakeholders support is needed for smooth implementation of the master plan and more so from the personnel who will play a key role in ensuring that the implementation was effective and efficient.

(ii) Open communication and cordial relationship needs to be cultivated to help build trust and friendly social environment within aviation operation areas. Initiatives to work with communities and considerations on how best to mitigate local social and environmental impacts and building of mutual agreement. Purposive interactive and engagement initiatives with other key stakeholders should be a priority in both short and long term agenda of KCAA. This will help in leveling expectations, streamlining roles and responsibility, defining mandates, information sharing and awareness creation, especially among the neighboring communities and key actors. The communities should be engaged in regard to CSR projects or initiatives, which should be in line with the communities' localized needs.

7.2.3 Land Use Intervention

In order to create a harmony between airspace operations and management on the one hand and land use activities on the other, it is highly recommended that the Airspace Master Plan implementation process consider mapping the airspace plan and overlay the same on land use maps across the country. This will assist in collaborations with lands authorities in appropriate land use zoning around areas considered important for aviation operations including among others aerodromes, approach corridors, holding areas and other installation areas,

7.2.4 Ecological Intervention

Like land use mapping, aerial ecological setting has a critical interaction with airspace planning and management, with birds' strikes being the worst of all. For this reason, it is recommended that in collaboration with the Ornithology Department at the National Museums of Kenya, KCAA may consider overlaying the airspace plan on the important birds' migration routes and habitats. This will enable enhanced airspace safety and ecological compatibility.

7.2.5 Staff Welfare and Efficiency

It is recommended that part of programme involve stress management initiatives. Adequate sensation and awareness on environmental linkages should also be encouraged. The welfare of the aviation personnel should be prioritized and actioned on to address key concerns especially psychosocial concerns which could impact negatively on security and safety of the aviation industry.

7.2.6 ASBUs

(i) The Plan is almost silent on the implementation of Block 1, 2 and 3 Modules of the ASBU methodology. Thorough environmental analyses need to be undertaken on these modules in readiness for their implementation.

(ii) Dialogue, cooperation and coordination between KCAA and KMD need to be enhanced. This may help improve the understanding of how climate/weather will change in the vicinity and within local aerodromes.

Annexes

ANNEX 1: SEA Study Terms of Reference

AIRSPACE MASTER PLAN (2015 – 2030) FOR KENYA CIVIL AVIATION AUTHORITY

Terms of Reference

For

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

November 2018

Mandate of KCAA

Kenya Civil Aviation Authority (KCAA) is a State Corporation established on 24th October 2002 by the Civil Aviation (Amendment) Act 2002(now repealed and re-enacted as the Civil Aviation Act, 2013). The primary functions of the Authority is to provide technical, economic and safety regulation and air navigation services to the air transport sub-sector. KCAA also provides aviation training through the East African School of Aviation. The Authority is required to carry out its functions in a manner consistent with the Chicago Convention on International Civil Aviation and any other international conventions and protocols relating to civil aviation, to which Kenya is a party.

In order to effectively and efficiently perform the function of providing air navigation services, the Authority is required to develop and implement air traffic management systems that will facilitate safe movement of aircraft in Kenya's Flight Information Region. The rapid growth of air traffic witnessed during the last ten years reinforces the need for the Authority to continuously upgrade and modernize its air traffic management systems in order to meet requirements of airspace users.

The Assignment Statement

Kenya Civil Aviation Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Master Plan will be implemented through a pre-determined programme. Implementation of the master plan anticipates various environmental and social linkages manifested through the proposed projects requiring standard approaches for adoption during the process of the Master Plan implementation. This will involve a comprehensive assessment of the Master Plan in light of the proposed series of projects to establish basic environmental and social settings, standard methodologies and management plan structures. These concepts will then be applied in the scoping process and impact studies for each project for necessary review and approvals.

In accordance to the Environmental Management and Coordination Act (EMCA), 1999 (EMCA Amendment, 2015), Section 49 provides for Section 57A that requires all policies, master plans and programmes be subjected to Strategic Environment Assessment (SEA). Sub-section 3 of the Act requires that the proponent prepare and submit the SEA to NEMA for approval. Kenya Civil Aviation Authority (KCAA), therefore, intends to engage a qualified Consultant to carry out a Strategic Environmental Assessment (SEA) process on the of the Airspace Master Plan to provide a platform for implementation of the individual projects during the strategic plan period as per the master plan implementation schedule.

Scope of Assignment

The Consultant will prepare a comprehensive SEA for the Master Plan and identify the necessary approvals required for the implementation of the various Master Plan projects taking into account the international (e.g. World Bank) and national safeguards.

Objectives of the Strategic Environment Assessment (SEA)

The Strategic Environmental Assessment (SEA) for the Airspace Water Master Plan would be designed to take stock of the current airspace status and the anticipated impacts arising from the implementation of the Master Plan. The SEA will be based on the structure and clear definition of the Master Plan objectives and activities in addition to the relevant national policy and legislative framework as well as the international safeguards. This will enable KCAA and the Sector to identify the linkages by developing integrated environmental and social

management plans in the separate Environment and Social Impact Assessment (ESIA) studies. The process will identify environmental and social impacts and opportunities for mitigation measures into the Master Plan implementation thus enhancing associated ESMPs and decision making. Upon completion and approval of the SEA, each of the projects related to the Master Plan will individually be subjected to ESIA requirements.

SEA Approach

A Strategic Environmental Assessment (SEA) is designed to assist in decision making and design of the Master Plan projects through highlighting of the specific developments associated potential environmental and social impacts, costs and benefits wherever possible. It will also provide alternatives and broad mitigating measures and action plans. The process assists in deciding on the most appropriate mix of initiatives for the implementation of the Master Plan. The SEA helps ensure that specific initiatives aligned to the Master Plan are designed in ways that they are environmentally sensitive and sustainable, thus supporting the overall success of the Master Plan. However, as with all environmental assessments, the SEA does not make decisions but rather guides the process of decision making.

The SEA is substantially dependent on available information and data on the airspace management and performance as well as other environmental and social linkages. The Master Plan and other documents comprise the main references in this regard. Considerable time, therefore, will be spent in collection of baseline data and information across the study areas and associated linkages.

The Consultant will address the following aspects;

(i) A review of the Aviation Policies and other regulatory framework relating to aviation operations as well as the requirements for environmental assessment in Kenya. This will enhance an understanding of the current policies, regulations and practices in aviation.
(ii) A careful review of all available relevant reports and other information including the Airspace Master Plan itself. This will be incorporated into the SEA report for this exercise and appropriate extracts annexed.
(iii) Detailed experts consultations and discussions to provide insights on the level of importance and priorities given to aviation aspects.
(iv) Consultations with a full range of stakeholders including relevant individuals, institutions and the general public. Appropriate stakeholder analysis will be conducted and a comprehensive list of persons and agencies to be consulted prepared in consultation with KCAA in order to ensure an all-inclusive participation,
(v) Review of the available data on aviation operations to prepare a descriptive of baseline conditions, information and data. The review process will provide the baseline status in order to identify gaps to be addressed during specific environmental assessments for the master plan implementation initiatives. Appropriate general guidelines will be established for information and data generation in respective areas during the implementation period.
(vi) The SEA team will identify along with KCAA sample visits to strategic locations and installations to provide a basis for the identification of the overall impacts and associated mitigation actions. The impacts and mitigation actions will then guide key aspects for considerations during specific environmental and social assessment on the master plan implementation initiatives.
(vii) Preparation of the Strategic Environmental Assessment Report in accordance to guidelines outlined in the Terms of Reference will be done.

Stakeholders of the Project

Presented in the table below is a list of key stakeholders, the role they are expected to play, what they require to play the assigned role and the recommended means of communication to each stakeholder.

Stakeholder	Role	Information and Reports Required	Means of Communication	Frequency of Communication
KCAA	Project Owner and overall project management	▪ The Master Plan ▪ Operations Policies and guidelines ▪ Sites details	▪ Meetings, ▪ Documentation ▪ Letters ▪ Emails.	As requested by the Consultant
	Equipment users	Briefs on all aspects the project		
Government of Kenya (MOTIHUD/MoF)	▪ Policy Administrator, ▪ Funding, ▪ Appraisal Agency	▪ Policy guidelines ▪ Financing arrangements ▪ Economic expectations	▪ Meetings, ▪ Documentation ▪ Letters ▪ Emails	Requests through KCAA (the Project Owner)
Air Space Users	Investors Systems users	Brief on the project to enable them provide feedback	Meetings and correspondences	On need basis
NEMA	Regulator (Environmental management)	To receive the final SEA Report	Submission (and presentation if required)	Statutory requirement

Risk Framework for the Project

No.	Risk Factor	Description	Mitigation Measures
1.	Inadequacy of the TORs	Inadequate TORs to the consultant resulting to challenges during implementation process	This risk will be mitigated including involvement of wide expertise in TORs preparation process.
2.	Procurement of consultant	Vested interests which may hamper selection of the best technically qualified firm	Strict adherence to procurement regulations.
3.	Contract management	▪ Delays in implementation of the contract. ▪ Failure by consultant to adhere to TORs. ▪ Variation in contract price.	▪ Ensure robust monitoring and evaluation. ▪ Enforcement of the provisions of the ToR ▪ Management minimizes the opportunity for contract variations.
4.	Payments for the project.	Delay in processing payments to the consultant.	▪ Ensure timely inspection and approval of contract deliverables. ▪ Follow-up with finance to ensure no inordinate delays in effecting payments.

Equipment, Logistics and Facilities

The Consultant will be responsible for the provision of all the necessary resources to carry out the Services and will make arrangements for the establishment of their office, supporting equipment and furniture, vehicles, accommodation, utilities, communications and any other required resources through the assignment period.

Client Inputs

(i) The Client will facilitate the consultant access to reports and data relevant to the assignment to the extent of availability of such information,

(ii) The Client will collaborate with the Consultant in making accessible all data including operation policies and the Airspace Master Plan.

(iii) Sites locations, installations and other aspects addressed by the Master Plan.
(iv) The Client will also facilitate the Consultant's access to Government Departments and Institutions with relevance to the Master Plan.

Time Schedule

Strategic Environment Assessment (SEA) process will be an all-inclusive exercise requiring inputs from Environmentalists, Sociologists, Aviation Engineers, Safety Experts, Economists as well as the participation of the relevant stakeholders in the sector. The time period required for the provision of the SEA services is envisaged to be Twelve (12) Calendar months from the date of the contract is signed.

Expected Outputs

Among the expected outputs will include;

(i) Inception Report to be submitted in 3No. Copies and 1No. CD ROMS
(ii) Draft SEA report to be submitted in 5No. Copies and 2No. CD ROMS
(iii) Final SEA report to be submitted in 7No. Copies and 2No. CD ROMS
(iv) Presentations with to KCAA and Stakeholders. The presentations will be done by the Consultant on date and venue to be determined by the Client. The Client will also take the responsibility of invitation of the relevant Stakeholders.

In order to achieve this, the following activity schedule could be adopted;

Activity No.	Activities Description	Duration from Date Contract is Signed
1	Contractual Process (KCAA to determine)	KCAA to determine
2	Inception Activities	Month 1
3	**Inception Report Submission**	Month 1.5
4	▪ A review of the KCAA Operation Policies and guidelines ▪ A review of all available relevant reports and other information ▪ Study of the Airspace Master Plan	Months 2 and 3
5	Detailed interactions and discussions with key experts involved in the development of the Master Plan	Months 3 and 4
6	Visits to identified operation sites and installations (Field Visits)	Months 4 – 6
7	Consultations with a full range of stakeholders including individuals, Government institutions and the general public	
8	Preparation of the Strategic Environment Assessment Report	Months 6 and 8
9	**Draft Strategic Environment Assessment Report** Submission and Presentations	Month 9
10	**Final Strategic Environment Assessment Report** Submission	Month 12

Professional Requirements

The Strategic Environment Assessment (SEA) will be undertaken under the leadership of a Lead Environment Expert Registered by NEMA with a valid practicing licence. The Team Leader will have a technical support team. The qualification of the team will include the following;

	Staff Description	Minimum Experience
1	Environmentalist/Team Leader	Holder of a minimum of Master's Degree in Environmental Studies and must have over 10 years' experience in environmental assessments. Must also demonstration involvement in the Aviation Sector. He should also be registered by NEMA as a Lead Expert and with a valid practicing license.
2	Socio-Economist	Holding a Bachelors University Degree in Social Studies and a minimum of 7 years' experience on economic development projects and demonstrate exposure to transport and aviation sector development.
3	Civil Engineer	A Bachelor's Degree in Civil Engineering from a recognized university and a minimum of 7 years' experience in infrastructure development. Experience in aviation sections MUST be demonstrated.
4	Health and Safety Expert	A Bachelor's Degree in Health and Safety studies or other relevant discipline and at least 5 years of experience in occupational and environmental health assessments preferably in the transport sector. Experience in aviation sections MUST be demonstrated. Registration with relevant authorities is also a must.
5	Physical Planner	Hold a Bachelors University Degree from a recognised university and at least 10 years' experience in land use planning and/or valuation activities with focus on infrastructural development projects. Exposure to aviation sector would be an added advantage.
6	Meteorologist	Holds a Bachelor's degree in Meteorological related Studies and at least 10 years working experience.

ANNEX 2: Airspace Master Plan Background (Summary)

Kenya Air Navigation Services (ANS)

The Kenya Civil Aviation Authority (KCAA) is a State Corporation, established on 24th October 2002, which exists to regulate the Civil Aviation industry and provide Civil Aviation services on behalf of the Government of Kenya. KCAA is composed of several Directorates which are:

- Aviation Safety and Security Standards and Regulations,
- Air Navigation Services (ANS),
- East African School of Aviation (EASA), and
- Corporate Services.

The ANS Directorate is responsible for providing Air Navigation Services within the Kenyan airspace and any other airspace delegated to Kenya by the ICAO, which includes Air Traffic Services (ATS), Aeronautical Information Services (AIS), and Engineering and Telecommunication Services (CNS).

Airspace organisation

Flight Information Region
Kenya airspace consists of one single FIR, the Nairobi FIR, which extends from ground to unlimited over the territory of Kenya, except on the north boundary. In addition, KCAA is also controlling a portion of oceanic airspace and part of the airway UA405 between EVATO and LOSIN above FL245, delegated by Tanzania. Coordination procedures and communications are as if these portions of airspace are an integral part of the Nairobi FIR.

Upper Airspace
The controlled airspace in upper airspace (from FL 245 to UNL) includes Nairobi UTA (Upper Traffic Area) defined from FL 145 to UNL, and Mombasa TMA (Terminal Manoeuvring Area) defined from 1500ft to UNL. This airspace organisation was subsequently changed on 28th April 2016 by the AIRAC Amendment n°14. It results that the Nairobi UTA is no longer applicable and the Mombasa TMA is now defined from 1500ft to FL 145. Airspace includes restricted military areas.

Lower Airspace
The controlled airspace in lower airspace (from ground to FL 245) is composed of:

- Nairobi TMA defined from 1500ft to FL 145,
- Mombasa TMA defined from 1500ft to UNL,
- Eldoret TMA defined from 1500ft to FL 145, and
- Two ATS routes (A609 between Entebbe and Mombasa via Nairobi & A610 between Mombasa and Kilimanjaro).

This airspace organisation was subsequently changed on 28 April 2016 by the AIRAC Amendment n°14,

- The Nairobi TMA is defined from 1500ft to FL 195.
- The Mombasa TMA is defined from 1500ft to FL 145.
- A new Wajir TMA is defined from 1500ft to FL 145.
- The horizontal boundaries of all TMAs have been changed.

Area Airspace

The airspace is divided into two area sectors including Area North defined from 1500ft to UNL and Area South defined from 1500ft to UNL.

Airports

The main airports in Kenya are listed below.

International Airports

- Nairobi – Jomo-Kenyatta International Airport,
- Mombasa – Moi International Airport,
- Eldoret International Airport,
- Kisumu Airport,

Domestic Airports

- Malindi Airport,
- Nairobi – Wilson Airport,
- Lokichoggio Airport,
- Wajir Airport.

In addition, there is a multitude of small airports and airstrips across the country.

Air Navigation Services and facilities

A range of KCAA facilities exists across the country for the provision of ANS, which comprise:

- ATS facilities,
- AIS facilities,
- CNS facilities,
- SAR facilities.

The East African School of Aviation (EASA) contributes to the provision of ANS in Kenya through the training of KCAA ANS personnel (both technical and operational). Aeronautical meteorology is provided by Kenya Meteorology Department.

Air Traffic Services and facilities

The following types of Air Traffic Services are provided: Flight Information Service and Alerting Service;

- Area Control Service (procedural and surveillance);
- Approach Control Service (procedural and surveillance);
- Aerodrome Control Service (tower runway and ground control).

Air Traffic Control is exercised:

- On Air Traffic Services (ATS) Routes covering the main Air Routes,
- In Terminal Control Areas and in Control Zones at Controlled Aerodromes equipped with Navigational Aids,
- In Aerodrome Traffic Zones at other Controlled Aerodromes.

ATS facilities in Kenya are as follows.

ATS Facilities	ATS provided
Nairobi ACC, FIC, APP and TWR	Area control, Approach radar control and approach procedural, Aerodrome control, Alerting service, Flight information service (FIS).
Nairobi RCC	Search and Rescue (SAR) services.
Mombasa APP and TWR	Approach radar control, Approach procedural, Aerodrome control, Alerting service, Flight information service (FIS).
Eldoret APP and TWR	Approach procedural control, Aerodrome control, Alerting service, Flight information service (FIS).
Kisumu TWR	Aerodrome control, Alerting service, Flight information service (FIS).
Malindi TWR	Aerodrome control, Alerting service, Flight information service (FIS).
Wilson TWR	Aerodrome control (tower runway and tower ground), Alerting service, Flight information service (FIS).
Lokichoggio TWR	Aerodrome control, Alerting service.
Wajir TWR	Aerodrome control, Alerting service, Flight information service (FIS).

Aeronautical Information Services and facilities

The Aeronautical Information Services, which form part of the ANS Directorate of the KCAA, ensures the timely flow of aeronautical information necessary for the safety, regularity and efficiency of international and national Air Navigation within the area of its responsibility. The AIS facilities are:

- In Nairobi JKIA, the AIS Headquarters, International NOTAM Office (NOF), Cartography unit and PANS OPS unit;
- Aerodrome AIS facilities at the airports manned by KCAA: Nairobi JKIA and Wilson, Mombasa, Eldoret, Kisumu, Lokichoggio, Malindi and Wajir.

CNS services and facilities

The objectives of these services are to provide the appropriate facilities in line with global ICAO CNS/ATM Plan, AFI Air Navigation Plan, and domestic requirements.

The key facilities provided are:

- Communication equipment for both air-ground communications (VHF, HF and CPDLC) and ground-ground communications (AFTN and ATS/DS), including supporting communication infrastructure (VSAT, Radio links and Fiber Optical links);
- Landing and Navigation Aids (ILS, VOR, DME, NDB and VDF);
- Surveillance radars (PSR and MSSR) and ADS-C; and
- ATC Systems for the processing and integrated display of surveillance and flight data to controllers.

The CNS facilities are installed at the airports where ATS is provided as well as at some remote stations e.g. Mua Hills Radar Station and Poror Radar Station.

SAR services and facilities

In Kenya, the Search & Rescue (SAR) is the responsibility of KCAA ANS. Its role is to determine the most probable area of an accident and then to coordinate all the appropriate actions based on the available resources in this most probable area of accident. The SAR facilities are located in Nairobi. There are 17 SAR coordinators trained. The Military, the Kenya Wildlife Service and the National Police play a major role in SAR as outlined in the Kenya SAR plan.

East African School of Aviation (EASA)

The East African School of Aviation (EASA) is the Training Department of KCAA. It is situated in Nairobi, close to JKIA. EASA is recognized by ICAO as a regional institution of excellence in aviation matters. It provides aviation training for KCAA staff and external students from several States in Africa in the following areas: Aeronautical Engineering; Air Traffic Services; Aeronautical Information Services; CNS Equipment Maintenance; Aeronautical Communication Operations; IATA courses; Aviation Management Programmes; Aviation Security; Aviation Safety; and Search and Rescue. The school is also affiliated to a local university which provides higher education programmes within the region.

Traffic

This section describes the type of traffic in the Kenyan airspace. The main sources of data are the Kenya historical and forecasted data and the report from the AFI Traffic Forecasting group (AFI TFG) 7th meeting

Traffic evolution (1995 – 2014)

Per airports

This section describes more in details the evolution of the traffic between 1995 and 2014 for the 8 main airports. Note: figures are detailed per year for the last 5 years.

- The Nairobi airports (JKIA, Wilson) gather the majority of movements. The number of movements is quite similar for JKIA and Wilson, but the type of traffic is completely different; JKIA concentrates nearly all the international traffic whereas the traffic at Wilson is domestic traffic for the vast majority.
- At JKIA, there was a strong traffic increase between 2005 and 2010 (+10% per year on average). Since 2010, there are significant fluctuations: strong traffic increases in 2011 (+12%) and 2014 (+10%) and slight decreases in 2012 (-5%) and 2013 (-3%).
- At Wilson, there was a moderate traffic increase between 2005 and 2010 (+2%), a strong traffic increase in 2011 (+17%) and 2012 (+11%), followed by decrease on the last 2 years.
- In Mombasa, there was a downturn in 2012: the traffic tends to decrease since that date.

- Eldoret, Malindi, Kisumu, Wajir and Lokichoggio are far less developed. In Eldoret for instance, there are 2 morning flights, 2 evening flights and some cargo flights during the day.
- During the on-site visit in July 2015, additional information was gathered:
  - Significant differences exist between peak season (from end of July until early December) and low season for some airports. In Malindi for example, there are about 10 flights per day but up to 25 flights per day in peak season.
  - Significant differences may also exist between week-ends and week days. In Kisumu for example, there are about 8 flights per week day and up to 10-11 flights during the week-ends.

Synthesis

The main conclusions that can be drawn are:

- Between 1995 and 2014, the international movements increased by 85% and the domestic movements increased by 48%.
- Distribution between domestic and international flights depends on the airport. Except at Nairobi JKIA where the international traffic is the majority (60% and progressively up to 70%), all the airports received much more domestic flights.
- Major differences can be observed between the airports.
  - At JKIA there was a strong traffic increase between 2005 and 2010 but there have been significant fluctuations since 2010.
  - At Wilson airport, there was a moderate traffic increase between 2005 and 2010, a strong traffic increase in 2011 and 2012 but a decrease on the last 2 years.
  - In Mombasa airport, there was a downturn in 2012: the traffic tends to decrease since that date.
- Although the figures are quite low compared to the other airports, the number of movements for Eldoret, Kisumu and Malindi increased quite significantly.
- At Kisumu, this growth is due to:
  - New facilities: new terminal (and an advertisement campaign), a longer runway allowing Kenya Airways to come with larger aircraft.
  - Kisumu County with official duties.

Further growth is expected from cargo and international flights. There are also many offers from airlines due to competition. The runway will be extended and strengthened. In this context, Kisumu might be better than Eldoret for cargo flights because the altitude is lower so cargo could carry more weight. Cargo apron is already constructed and a contract has been awarded for cargo terminal.

Traffic forecast (2015-2030)

From 2012 to 2032, the Gross Domestic Product of the African region is forecasted to grow at an average annual rate of 4.6 per cent which induces a strong impact on the traffic evolution. Nairobi (JKIA) is expecting a significant rise in traffic movements across the world and within Africa. In the perspective of handling all these aircraft, KCAA will have to adapt its infrastructure to meet the demand and offer the best services.

Overview of Kenyan traffic

The number of domestic movements is still greater than the international one. An average increase of 3.3% and 4.6% is foreseen for the domestic and international movements respectively. A steady traffic increase is foreseen between 3% and 5%, except for Mombasa which is expected to continue to have a slow increase (in the continuation of the trends observed before 2014), although it may be related to the recent security concerns.

Synthesis
In conclusion:

- JKIA is the only Kenya airport with 5% increase, for both international and domestic flights. This will imply to develop the ANS infrastructure to cope with this increase of aircraft movements, and with the variety of aircraft (in particular from international flights).
- A slow increase is forecast in Mombasa although it may actually depend on threats.
- Wilson, Eldoret and Kisumu airports will continue their progression but still in reasonable limits and mainly for domestic flights.

Regional initiatives
Launched in 2008, Kenya Vision 2030 is the country's development programme up to 2030 which is to be implemented in successive five-year medium-term plans. Kenya Vision 2030 calls for the development of a highly competitive civil aviation industry, which is critical for the development of the country. In this respect, Kenya Vision 2030 targets strong growth in the aviation sector relying inter alia on the modernization of the Jomo Kenyatta airport, the regional aviation hub, which should reach about 14 million passengers annually by the year 2030 (vs. 6 million currently).

Other infrastructure expansion (or upgrade) projects at secondary airports such as Mombasa, Kisumu or Eldoret will be key to meet this strategic objective as they are expected to unlock business opportunities in the different regions of Kenya. Additionally Kenya is participating to several regional initiatives, which contribute actively to the development of aviation in the country. The main ones are listed below.

East African Community (EAC)
The East African Community (EAC) Treaty was entered into force on July 7, 2000, following its ratification by the East African Partner States, Kenya, Uganda and Tanzania while Rwanda and Burundi joined the EAC in July 2007. The EAC Civil Aviation Authorities have several projects about Civil Aviation, as follows.

Establishment and Operationalization of the EAC Unified FIR (UFIR)
The objective of the project, started in 2007, is to create a single block of upper airspace (i.e. above FL 245) over Tanzania, Kenya, Uganda, Burundi and Rwanda, leading to a seamless Airspace in the region. It was envisaged that the new Upper ACC would control the UFIR and that the existing three national ACCs would be responsible for the lower airspace of the national FIRs, as currently defined. An associated study was launched to define the roadmap for the establishment of this EAC UFIR.

Implementation of the Recommendations of the GNSS Pilot Study
The goal of this project is to develop GNSS procedures for identified three airports in each Partner State in order to bring the existing airports in the region in line with ICAO SARPs. The project is coordinated by the EAC Secretariat and implemented by the Partner States through their national budgets.

East African Aviation Training Organizations Rehabilitation Project
EAC developed a project proposal for rehabilitation of the aviation schools in the region including the East African School of Aviation (Kenya), Civil Aviation Training Centre (Tanzania) and East African Civil Aviation Academy (Uganda).

East African Upper Airspace and Northern Corridor Initiative

Seamless Airspace

'Corridors' is one the key organizing principle for transport and development within EAC. The Northern Corridor is an arc connecting Bujumbura, Kigali, Mbarara, Kampala, Nairobi and Mombasa. In respect to aviation, the Northern corridor initiative is expected to help fast track the harmonization of the region's airspace and consequently reduce the cost of doing business.

In February 2014 the Airspace Management Initiative has been launched between Kenya, Uganda, Rwanda and South Sudan aiming to establish seamless CNS/ATM operations and Aeronautical Information Management. The initiative is also working at reducing intra-regional air travel costs and any other impediments to regional air travelling. It also encourages the development of a harmonized implementation and modernization of ANS facilities.

Common Market for Eastern and Southern Africa (COMESA)

COMESA Aviation - Regional CNS/ATM project

COMESA launched an Airspace Integration project in order to reinforce regional integration through the creation of a Unified Single Airspace control framework in the COMESA Region. This project started in 2011 and is on-going. This project includes, among several activities, the evaluation of the technical and financial feasibility to enable the relevant countries to determine the requirements for implementing a cost-effective regional CNS/ATM system.

African Indian Ocean Region (AFI)

AFI Plan

The AFI Region published the AFI Plan "Comprehensive Regional Implementation Plan for Aviation Safety in Africa". The AFI Plan was developed to address the concerns expressed by the ICAO Council on the safety status of aircraft operations in the AFI Region. The AFI Plan was adopted by the 36th ICAO Assembly (Assembly Resolution A36-1). To implement the AFI Plan, the ICAO Secretary General established on 1st January 2008 the AFI Comprehensive Implementation Programme (ACIP). The ACIP developed its work programme around 3 focus areas to give effect to the objectives of the AFI Plan:

- Enabling States to establish and maintain a sustainable safety oversight system (infra-structure and capacity building);
- Assisting States to resolve identified deficiencies within a reasonable time;
- Enhancing aviation safety culture of African aviation service providers.
- As of January 2011, the implementation of the AFI Plan is part of the programme of activities of ICAO Africa Regional Offices.

AFI Air Navigation System Implementation Action Plan for the AFI Region

In May 2013, the Council of ICAO approved the Fourth Edition of the Global Air Navigation Plan (GANP, Doc 9750) and following that it called on the Planning and Implementation Regional Groups (PIRGs) of the ICAO Regions to develop regional action plans with priorities and targets, determine performance indicators/metrics to measure implementation progress and associated benefits, and identify implementation challenges.

In that perspective, an initial version of the "AFI Regional Air Navigation System Implementation Action Plan" as approved in 2013 at the ICAO APIRG 19. The objective of this document is to describe the selection and prioritization of the ASBU Block 0 for the AFI Region and to provide guidance to support States in the implementation of the ASBU.

ICAO Aviation System Block Upgrade (ASBU)

Overview

In 2010, ICAO launched the Aviation System Block Upgrades (ASBUs) initiative as the framework to apply the concepts defined in the ICAO GANP (Doc 9750). The ASBUs comprise a suite of modules organised into building blocks that can be introduced and implemented in a State or Region depending on the need and level of readiness. To each specific module correspond defined measurable operational improvements with appropriate metrics to determine success and are associated a set of standards and procedures, necessary equipment and/or systems in aircraft and on the ground (with an operational approved or certification plan) along with positive business case.

Four building Blocks (0, 1, 2 and 3) have been defined based on timelines for the various capabilities they contain. The associated Initial Operating Capabilities are 2013, 2018, 2023 and 2028 respectively. The core of concept is linked to four specific and interrelated aviation Performance Improvement Areas, namely: Airport Operations; Globally-interoperable systems and data; Optimum capacity and flexible flights; and Efficient Flight Paths.

ASBU Implementation in the AFI Region

For the future CNS/ATM development in the AFI Region, the major challenges are to improve aviation safety, modernize ATM and achieve a Single African Airspace and improve the technical expertise in the field of satellite radio navigation.

Today, the management of the airspace is currently the responsibility of each one of the Member States and the current practices of airspace management (based on VOR, ILS, NDB and Radars) are overburdened with the ever increasing levels of traffic. The implication is loss of performance, which can be reflected in compromised safety, extensive delay, flight inefficiency, unnecessary fuel consumption, lack of interoperability, unacceptable noise etc.

The remedy is the transition to modernized satellite-based CNS/ATM, a global initiative which has been mandated and coordinated by the ICAO (see worldwide PBN implementation plan, in section. In term of ASBUs, these priorities were declined into a set of specific modules and the AFI Region made a selection and prioritization of the ASBU Block 0 modules although the AFI Region has chosen all 18 Block 0 modules for implementation. This selection is described in the ICAO "AFI Air Navigation System Implementation Action Plan for the African-Indian Ocean (AFI) Region" document. Consequently, to support the States in their implementation plan, the AFI Region suggests allocated priority as follows: Priority 1 for an immediate implementation; Priority 2 for a recommended implementation.

ANNEX 3: Environmental Appreciation by the Master Plan

Compliance to Environmental Regulations

The Kenyan Environmental Management and Coordination Act 1999 and The Environmental (Impact Assessment and Audit) Regulations, 2003 as guided by the Strategic Environmental Assessment (SEA) guidelines demands that SEA is required for public programmes, plans and policies under Kenyan law. The 2003 Regulations define SEA as *"the process of subjecting public policy, programmes and plans to tests for compliance with sound environmental management"*. The 2003 Regulations were amended in 2009. The 2009 Amendment Regulations provide additional detail on how the requirements for SEA should be met. SEA is defined by NEMA as: *"the formalized, systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of that evaluation and using the findings in publicly accountable decision-making to promote and guide sustainable development"*

The 2009 Amendment Regulations seem to capture all policies, plans and programmes prepared by a public body, in this case KCAA and states that *"all proposals for public policy, plans and programmes [should be subject] …to a SEA"* (Part VI, (42)(1)). That NEMA shall in consultation with relevant Lead Agencies subject all proposals for public policy, plans and programmes for implementation to a strategic environmental assessment…) (Part VI, (42)(1)).

The NEMA regulations require:

- An integrated environmental, social and economic assessment of a policy, plan or programme;
- Consideration of cumulative, indirect and secondary impacts;
- Consideration of alternatives;
- The preparation of a Scoping Study (which involves defining the scope and the geographical location/extent of the assessment);
- Consultation with relevant stakeholders and consultants at key stages during the assessment;
- A review of existing policy and legislative requirements; and
- Documentation of the outcomes of the process within a report referred to as an SEA Report under the 2009 Amendment Regulations.

The SEA will be submitted to the National Environment Management Authority (NEMA) who will review SEA report and issue a license accordingly.

Implications on the Airspace Master Plan

The implication is that legally the master plan will require to be subjected to a Strategic Environmental Assessment (SEA) process and that the SEA outcomes be part of the master plan documentation to be compliant to the Kenyan laws. Whereas the SEA guidelines do not require a 'Post Adoption Statement', instead the *"outcomes of the recommendations of the SEA are included within the proposed policy, programme or plan"*; and there appears to be no requirement for the monitoring of significant effects.

Consultations were done with the National Environment Management Authority (NEMA) on the need for a SEA. Considering that the Master Planning process did not factor strategic environmental assessment at the outset, NEMA recommends that a brief on the master plan be prepared and submitted to the authority to assist them evaluate the need or not of a SEA. This could be done after completion of the master plan. The KCAA will, therefore, have sufficient time to mobilize the necessary resources to undertake a SEA should NEMA so demand.

Corporate Environmental Policy

KCAA has an Environmental Policy that was developed in 2013 but which will be reviewed periodically to align it with the changes that may occur over time. One of the policy aims is to progressively develop operating procedures and appropriate work practices that will reduce the adverse impact on the environment. It is this objective and the ICAO global environmental targets that have informed Kenya's CO_2 Reduction Action Plans of 2015.

Environmental Management System for KCAA

Good environmental management will help to secure the long-term future of not only KCAA but also the KAA of which KCAA has a mutual partnership through achieving compliance with legislation, promoting best practice and developing good relations with airlines, local communities and the general public, as well as enhancing corporate reputation and image. Environmental management also makes sound business sense, for example ensuring that Operations Improvements will provide cost savings for the airlines.

KCAA environmental management system should be driven by the development and implementation of an Environmental Management System (EMS) capable of being certified under ISO 14001:2004. The EMS will be a key driver for environmental management and continuous improvement at KCAA. Importantly, the EMS will provide the necessary structure and framework within which to embed sustainability principles into all facets of airspace operations and development activities.

Relevance of the EMS to the KCAA CO_2 Reduction Action Plans

To assist in the delivery and monitoring achievements of the recently adopted Action Plan, KCAA should consider developing an Environmental Management System (EMS) capable of being independently certified to ISO 14001:2004, the internationally recognized standard to deliver and continually improve environmental management.

The very nature of aviation activities ensures that a wide range of environmental issues are required to be managed. The raft of measures proposed in the Action Plan are most effectively executed through a consistent, systematic and integrated approach so that issues are not considered in isolation, and there is a sharing of best practice with the international community as is encouraged by ICAO. In addition to reduction of fuel consumption and attendant CO_2 emissions this systematic approach also aids the full recognition of the other important environmental effect that needs to be controlled, namely noise, and allows for the clear allocation of roles and responsibilities for their management.

The EMS has the superior advantage in that it presents formalized mechanisms through which the Basket of Measures can be realized. The EMS will enable KCAA to:

- Identify, prioritize and manage its significant environmental effects;
- Identify all legal and other requirements associated with the operational activities, products and services, and meet and exceed these requirements;
- Periodically evaluate legal compliance to identify and remedy non-compliances;
- Formulate and implement environmental policy commitments;
- Facilitate continual improvement of environmental performance; and
- Respond to future challenges presented by relevant stakeholders, government and international policy.

- An EMS follows a 'plan-do-check-act-review' cycle and incorporates written policies, procedures, and records associated with the significant environmental effects of an organization. A fully functional EMS is typically embedded within an organization's existing business processes such as its strategy and planning cycles, operational activities, marketing and communications, procurement and training functions.

Conclusions and Recommendations

Two of the most environmental beneficial ASBU modules in the Kenya context are B0-CDO *"Improved Flexibility and Efficiency in Descent Profiles using Continuous Descent Operations (CDOs)"* and B0-CCO *"Improved Flexibility and Efficiency Departure Profiles – Continuous Climb Operations (CCO)"*. Continuous Descent Operation (CDO) feature optimized profiles that allow aircraft to come in from high altitudes to the airport at minimum thrust settings, decreasing noise in local communities and using up to 30% less fuel than standard 'stepped' approaches. It is noted that the implementation of additional recommended evolutions such as AMAN (B0-RSEQ) and Merge Point will contribute to the full realization of these environmental benefits.

If this is implementable by older aircraft then the overall gain during the LTO cycle could be higher than 30% for the Kenyan situation since older aircraft are less fuel efficient. The Kenyan fleet mix, especially at JKIA still has some old aircraft which are noisy and less fuel efficient. As it is taking time to phase out these aircraft the biggest improvement will be in fuel savings and less CO_2 emissions since CCO is applicable even to general aviation aircraft. This notwithstanding the average improvements in fuel savings and reduction in CO_2 will continue to improve as the inevitable but gradual modernization of fleet mix in the Kenyan airspace continues. Operating at optimum flight levels and efficiency is a key driver to improve overall fuel efficiency and minimize carbon emissions.

The basket of measures currently being undertaken by KCAA overlap with several elements of ASBU modules proposed for implementation in the master plan and of which the quantification of environmental benefits have been done. Implementation of the basket of measures should imply that the estimated environmental benefits should potentially be already realized. However, there is still no clear quantification of actual environmental benefits accruing from these measures and so environmental benefits cannot be speculated. Nonetheless if the measures that have either already been implemented or are in progress are taken into consideration then the actual incremental benefits presented in the will be somewhat diminished.

To fully realize the potential benefits it is strongly suggested that KCAA prepares an Environmental Policy and an Environmental Management System that will drive the KCAA environmental aspirations. Furthermore it will help to monitor compliance of stakeholders to their commitments in these actions and also compliance with environmental legislation. On compliance to legislation, NEMA has advised that KCAA prepares a brief on the master plan and present to NEMA for advice whether a SEA will be required.

ANNEX 4: Notification to NEMA of Intent to Undertake SEA Study and Responses

KENYA CIVIL AVIATION AUTHORITY

efficiently managing air safety

KCAA/CONF/37/018A Vol 3. (14) **21st August 2019**

Mr. Mambo B. Mamo
Ag. Director General
National Environmental Management Authority
P.O. Box 67839 - 00200
Popo Road, off Mombasa Road
NAIROBI

Dear Sir,

CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

Reference is made to your letter ref: NEMA/SEA/5/2/068 dated 31st July 2019 on the above subject.

The Kenya Civil Aviation Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Plan will be implemented through a pre-determined programme with various projects. In order to achieve the above, KCAA has engaged Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA to prepare a comprehensive SEA report for the Master plan and identify the necessary approvals required for the implementation of the various Master Plan projects, taking into account the international and national safeguards. The consultants team is required to gather all the necessary information from the identified stakeholders.

The purpose of this letter, is to submit a brief (appendix 1) airspace master plan (stage 1- establishing the context), as requested in your letter and also request for nomination of an SEA expert officer from NEMA, who will be our **contact person** and will be required to participate throughout the SEA study process.

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERAL

P.O. Box 30163 - 0100 GPO Nairobi
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APPENDIX 1

INTENT TO UNDERTAKE STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE AIRSPACE MASTER PLAN 2015 – 2030

I. KCAA Mandate

The Kenya Civil Aviation Authority (KCAA) is a state corporation established under an Act of parliament enacted on the 24th of October 2002. The Act was reviewed as a KCAA Act 2013 and amended under the KCAA (Amendment) Act 2016. The sole mandate of KCAA include economically and efficiently plan, develop and manage as well as to operate, regulate safe civil aviation system in Kenya. It also provide civil aviation services. In order to achieve this mandate, KCAA is structured with 4 Key Directorates namely;

(i) Aviation safety and security regulations (ASSR)
(ii) Air navigation services (ANS)
(iii) East African School of Aviation (EASA) for training and capacity building,
(iv) Corporate services

Air navigation services (ANS) is in charge of the Kenyan Airspace and other delegated airspace by ICAO. The key services provided under ANS are;

(i) Air Traffic Services (ATS)
- ✓ Flight information services (FIS)
- ✓ Approach control services
- ✓ Aeronautical control services (ANS)

(ii) Aeronautical Information Services (AIS)
- ✓ Aeronautical data information and management
- ✓ Aeronautical Information Publications (AIP)
- ✓ NOTAM Management
- ✓ Pre-Flight and Post-Fight Information
- ✓ Aeronautical charts management

(iii) Engineering and Telecommunication Services (ETS) handing equipment and instruments including communication, landing navigation aids, surveillance radars and Air Traffic Control (ATC) systems

(iv) Search and Rescue Services (SAR) for locating accidents areas and coordination of rescue actions by all involved parties.

II. Airspace Master Plan 2015 – 2030

The Kenyan airspace is experiencing significant constraints arising from increasing traffic and hence increased demand on navigation space services. The country has a notable responsibility from International Civil Aviation Organization (ICAO) to control the entire

Nairobi Flight Information Region (FIR) extending from ground level to unlimited as well as portions of the Indian Oceanic airspace and other zones assigned by ICAO. Efficient planning and optimum utilization of the airspace requires a comprehensive policy guideline that addresses the local requirements, regional provisions and guidelines issued by ICAO.

The management of airspace will also require integration with the neighboring Flight Information Regions (FIR) as required by the ICAO. For Nairobi FIR the neighboring would include Entebbe FIR, Dar es Salaam FIR, Mogadishu FIR, Addis Ababa FIR and Khartoum FIR. Considering the integrated nature of aviation operations, order is very necessary in every action taken. This order in the Kenya Airspace is to be achieved through the Airspace Master Plan 2015 – 2030.

The objective of the Airspace Master Plan 2015 – 2030 is to institute order in the airspace planning and management through integration of infrastructure, regulatory and guidelines, institutional capacity as well as regional and international harmony. The Master Plan is designed to achieve the following objectives for Kenya;

(i) Efficient traffic and airports operations
(ii) Interoperability systems and data between operations functions and the stakeholders
(iii) Capacity and flexible flights
(iv) Efficient flight paths within and outside the Kenyan Airspace

III. The Strategic Environmental Assessment (SEA) Study

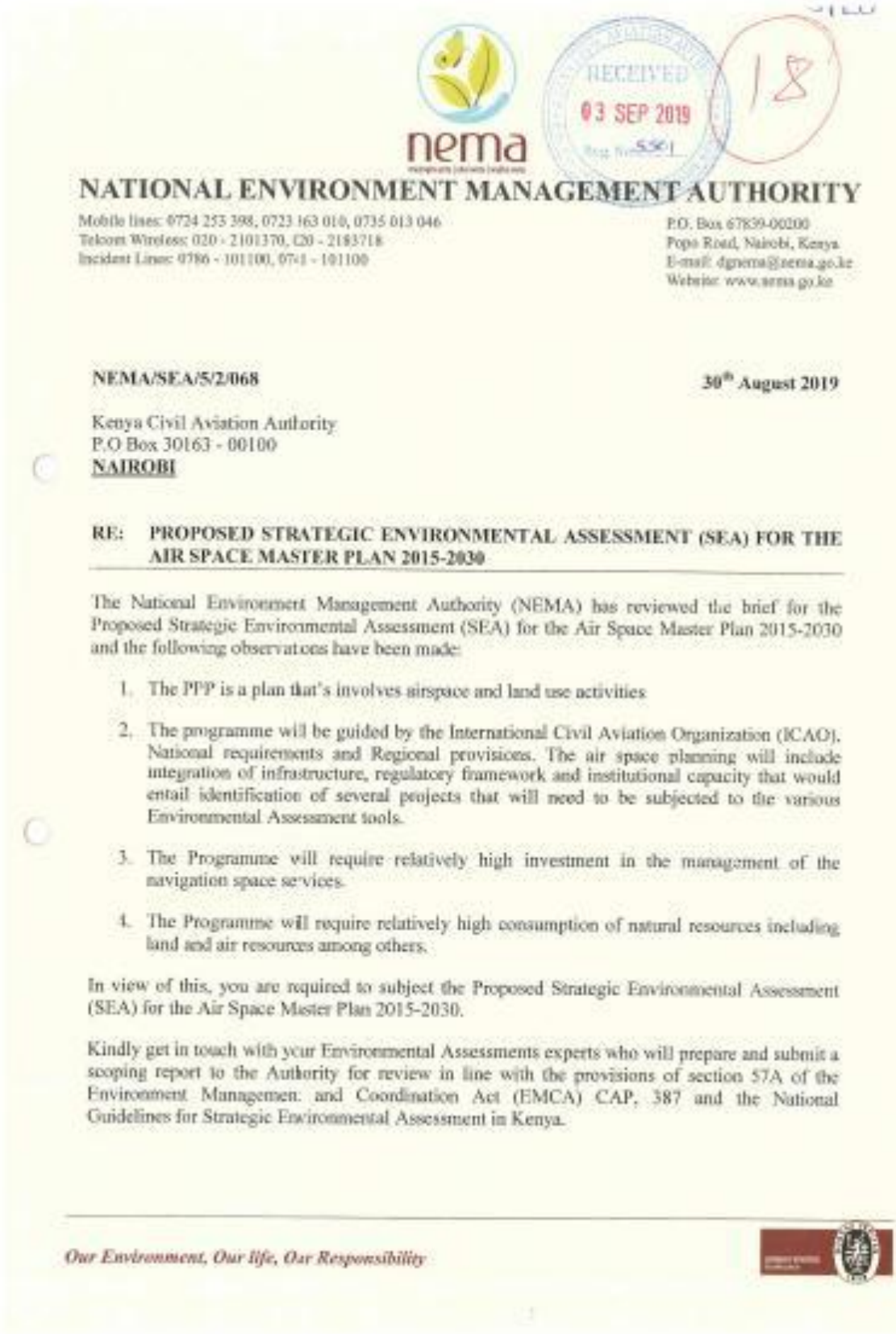
The Airspace Master Plan 2015 – 2030 as developed by KCAA has identified a series of intervention actions to be undertaken through the plan horizon period 2015 – 2030 with some of the issues carried over from the Airspace Master Plan 2005 – 2015. The actions proposed under the master plan are cross-cutting from environment, social, economic and safety aspects including among others;

(i) Safety around operation zones and within public areas
(ii) Air quality through aircraft emissions,
(iii) Noise and vibrations from aircraft operations
(iv) Land use conflicts involving the airspace activities and land use features on the ground,
(v) Social interactions (closely linked to land-use) associated to safety, noise and vibration,
(vi) Influences to climatic conditions(climate change)
(vii) Meteorological linkages as relates to aviation operations.

In order to address these implications through the Airspace Master Plan horizon period and beyond, a comprehensive strategic environmental action is necessary. The strategic environmental action as established through an Assessment of the Airspace Master Plan with a view to identifying the key linkages and appropriate preventive measures. The Strategic Environmental Assessmen: (SEA) will ensure that the Master Plan is sensitive to matter of environment and social interest throughout the implementation. It will also integrate compliance with the local regulatory provisions, regional sustainable initiatives and guidelines from ICAO.

IV. Intent to undertake Strategic Environmental Assessment (SEA)

In compliance with Section 49 of EMCA (Amendment 2015) that requires all policies, plans and programmes be subjected to Strategic Environment Assessment (SEA), KCAA intends to undertake Strategic Environmental Assessment (SEA) as provided under the National Guidelines for Strategic Environmental Assessment. This is, therefore, to seek guidance on the same from NEMA.



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NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile lines: 0724 253 398, 0723 163 010, 0735 013 046
Telcom Wireless: 020 - 2101370, 020 - 2183718
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P.O. Box 67839-00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website: www.nema.go.ke

NEMA/SEA/5/2/068 **30th August 2019**

Kenya Civil Aviation Authority
P.O Box 30163 - 00100
NAIROBI

RE: PROPOSED STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

The National Environment Management Authority (NEMA) has reviewed the brief for the Proposed Strategic Environmental Assessment (SEA) for the Air Space Master Plan 2015-2030 and the following observations have been made:

1. The PPP is a plan that's involves airspace and land use activities
2. The programme will be guided by the International Civil Aviation Organization (ICAO), National requirements and Regional provisions. The air space planning will include integration of infrastructure, regulatory framework and institutional capacity that would entail identification of several projects that will need to be subjected to the various Environmental Assessment tools.
3. The Programme will require relatively high investment in the management of the navigation space services.
4. The Programme will require relatively high consumption of natural resources including land and air resources among others.

In view of this, you are required to subject the Proposed Strategic Environmental Assessment (SEA) for the Air Space Master Plan 2015-2030.

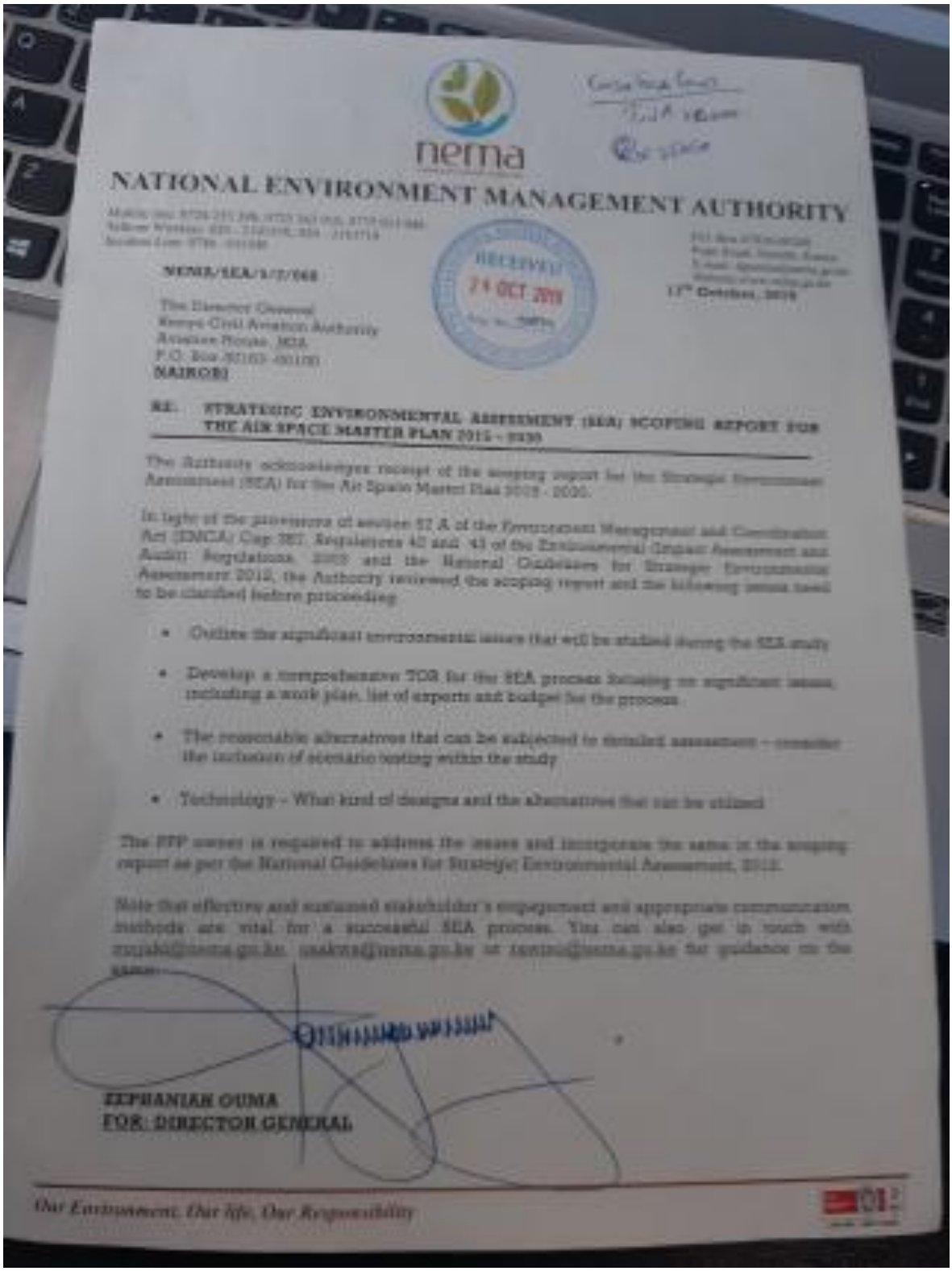
Kindly get in touch with your Environmental Assessments experts who will prepare and submit a scoping report to the Authority for review in line with the provisions of section 57A of the Environment Management and Coordination Act (EMCA) CAP, 387 and the National Guidelines for Strategic Environmental Assessment in Kenya.

Our Environment, Our life, Our Responsibility

The Authority has also nominated Ms. Oceanic Sakwa, a Senior Corrpliance and Enforcement Officer and Mr. Reagan Awino, a Senior Environment Officer to be the contact persons during the SEA process for your plan. Their contacts are; email addresses - osakwa@nema.go.ke, rawino@nema.go.ke and Mobile Numbers – 0720318948 and 0726985293 respectively.

Kindly be guided accordingly.

MARGARET NJUKI
FOR: DIRECTOR GENERAL



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NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

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NEMA/SEA/3/2/068

17th October, 2019

The Director General
Kenya Civil Aviation Authority
Aviation House, 3028
P.O. Box 30163-00100
NAIROBI

RE: STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) SCOPING REPORT FOR THE AIR SPACE MASTER PLAN 2015 - 2030

The Authority acknowledges receipt of the scoping report for the Strategic Environmental Assessment (SEA) for the Air Space Master Plan 2015 - 2030.

In light of the provisions of section 57 A of the Environment Management and Coordination Act (EMCA) Cap 387, Regulations 42 and 43 of the Environmental Impact Assessment and Audit Regulations, 2003 and the National Guidelines for Strategic Environmental Assessment 2012, the Authority reviewed the scoping report and the following issues need to be clarified before proceeding

- Outline the significant environmental issues that will be studied during the SEA study
- Develop a comprehensive TOR for the SEA process including on significant issues, including a work plan, list of experts and budget for the process
- The reasonable alternatives that can be subjected to detailed assessment – consider the inclusion of scenario testing within the study
- Technology – What kind of designs and the alternatives that can be utilized

The PPP owner is required to address the issues and incorporate the same in the scoping report as per the National Guidelines for Strategic Environmental Assessment, 2012.

Note that effective and sustained stakeholder's engagement and appropriate communication methods are vital for a successful SEA process. You can also get in touch with [illegible] for guidance on the same.

EZEKIANIAH OUMA
FOR: DIRECTOR GENERAL

Our Environment, Our life, Our Responsibility

KENYA CIVIL AVIATION AUTHORITY

efficiently managing air safety

KCAA/CONF/37/018A Vol 3. (23) **4th November 2019**

Mr. Mambo B. Mamo
Ag. Director General
National Environmental Management Authority
P.O. Box 67839 - 00200
Popo Road, off Mombasa Road
NAIROBI

Dear Sir,

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) SCOPING REPORT FOR THE AIR SPACE MASTER PLAN 2015-2030

Reference is made to your letter ref: NEMA/SEA/5/2/068 dated 17th October 2019 on the above subject.

In your letter, the followirg issues were requested for further clarification. The responses and clarifications drawn are shown in the table below;

No.	Comment	Response and Clarification
1.	Outline the significant environmental issues that will be studies during the SEA Study	The SEA Consultant has analyzed the Airspace Master Plan with particular regard on the proposed intervention projects. While appreciating that most of the projects are soft with none or low physical significance, the Consultant has focused on the projects implications from the overall environmental and social linkages of aviation operations. In addressing the comment, we refer to Chapter 7 (page 48) of the scoping report that has outlined areas of study focus as: (i) Environment ✓ Emissions and Climate Change ✓ Ecological Issues, ✓ Noise and vibrations ✓ Safety ✓ Fuel jettisoning

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Tel: +254 020 6827479 - 5, +254 734 600 491/492, +254 726 606 606/70, +254 709 726 000
Fax: +254 020 6827 888, 6822 300
Website: www.kcaa.or.ke
E-mail: info@kcaa.or.ke

<table>
<tr><th>No.</th><th>Comment</th><th>Response and Clarification</th></tr>
<tr><td></td><td></td><td>✓ Land use conflicts
(ii Social Issues
✓ Disruptions
✓ Anxiety
✓ Health
✓ Settlements and movements</td></tr>
<tr><td>2</td><td>Develop a comprehensive ToR for the SEA process focusing on significant issues including work plan, list of experts and budgets for the process</td><td>The scope of the SEA has been outlined under Chapter 5 (page 31) of the Scoping Report as a reflection of the ToR (ToR is presented below). Following clarifications are presented;

<u>Work Plan</u>
Strategic Environmental Assessment (SEA) process is an all-inclusive exercise requiring inputs from the Environmentalists, Sociologists, and Engineers, Physical Planner, Meteorologist and Economists as well as the participation of the relevant stakeholders. Participation of the mixed professional categories will be allowed adequate time and this process is anticipated to take an average of 6 calendar months. A detailed work plan with specific activities is included in this document.

<table>
<tr><th>Main Activity</th><th>Specific Activities</th><th>Timeline</th><th>Indicative Dates</th><th>Deliverable</th></tr>
<tr><td rowspan="3">Inception Activities</td><td>Initial Client Meetings</td><td>Week 1</td><td>3rd July 2019</td><td rowspan="3">Inception Report</td></tr>
<tr><td>Obtain and review appropriate documentation and data</td><td>Week 1 – 2</td><td>-</td></tr>
<tr><td>Preparation of Inception Report</td><td>Week 1 – 3</td><td>-</td></tr>
<tr><td></td><td>Submission and presentation of Inception Report</td><td>Week 4</td><td>3rd July 2019</td><td></td></tr>
<tr><td rowspan="2">NEMA Briefings</td><td>Prepare a brief statement of Intent for the Client</td><td rowspan="2">Week 5</td><td rowspan="2">Date to be set with NEMA</td><td rowspan="2">NEMA Opinion and Guidance</td></tr>
<tr><td>Assist the Client in the presentation to NEMA</td></tr>
</table>
</td></tr>
</table>

No.	Comment	Response and Clarification				
			Advise the Client on requirements of NEMA			
		Scoping Process	Early review of information and status of the Airspace	Week 6 – 8	-	Scoping Report
			Preliminary interactions with relevant aviation infrastructure	Week 6	-	
			Analysis of the Airspace Master Plan 2015 – 2030	Week 6 – 8	-	
			Preliminary analysis of environment and social linkages	Week 8 – 10	-	
			Scoping Report Preparation	Week 8 – 10	-	
			Submission of Scoping Report to Client and NEMA	Week 10	**29th July 2019**	
		SEA Assessments	Detailed study of Airspace Master Plan 2015 – 2030	Week 8 – 12	-	Data, Information, Scenario Analysis, Environment and Social Linkages, etc.
			Detailed documentary review and analysis	Week 8 – 12	-	
			Consultations with Master Plan Experts	Week 10	-	
			Detailed Review existing airspace management, , etc.	Week 10 – 12	-	
			Rapid Stakeholders Interactions and Interviews	Week 10 – 13	-	
			Site visits (to be identified with Client)	Week 12 – 13	**19th – 23rd August 2019**	
		SEA Reports	Draft SEA Report Preparation	Week 14 – 16	-	Strategic Environment Assess
			Draft SEA Report Submission	Week 16	**18th Sept 2019**	

No.	Comment	Response and Clarification			
					ment (SEA) Report
			Client Presentations of Draft SEA Report	Week 16	**20th Sept 2019**
			Stakeholders Workshop(s)	Week 16	**25th Sept 2019**
			Final SEA Report Preparation	Week 16 – 20	-
			Final SEA Report Submission	Week 20	**2nd October 2019**
		Study Tour	Learning visit to a Civil Aviation Authority where SEA has been undertaken or being implemented	**Details and timelines to be guided by the Client**	

Study Team

The Strategic Environmental Assessment (SEA) Study Team comprises of 6 Key staff drawn from different disciplines to address the key aspects of airspace management. This professional mix was constituted to enable focused identification and analysis of environmental and social issues associated with the Airspace Master Plan and providing appropriate 2-way mitigation measures (i.e. effects from the Master Plan and impacts to the Airspace Management). The key team includes the following:

- ✓ Environmentalists/Team Leader
  Harrison Ngirigacha (Master's Degree in Environmental Resources Management)
- ✓ Sociologist
  Augustine Mwenga (Master's Degree in Sociology
- ✓ Civil Engineer
  Eng. Harrison Mwangi (BSc. Degree in Civil Engineering)
- ✓ Safety and Health Expert
  Justus Nyakego (Master Degree in Safety Studies)
- ✓ Physical Planner
  Newton Karuri (BSc. Degree in Physical Planning)
- ✓ Meteorologist
  Vitalis Ahago (BSc. Degree in Metrological Studies)

No.	Comment	Response and Clarification
3	The reasonable alternatives that can be subjected to detailed assessment, consider including of scenario testing within the study	As mentioned under comment 2 above, airspace master plan is a unique situation whose systems control scenarios are partly determined by international factors leaving little room for local manipulation. It should also be appreciated that the projects proposed under the master plan are mainly soft system based interventions such as to improve the aviation performance and efficiency. The SEA Study, therefore, is looking at the implications of the improved systems as opposed to analysis of the proposed projects. We would like to indicate that the Consultant is applying existing traffic trends, land use practices, social patterns and other aspects for simple projection models for the prediction of implications of the intervention projects to environmental and social issues including emissions and noise. This is to be expounded in the main SEA scoping Report chapter 7.
4	Technology – What kind of designs and alternatives that can be utilized.	Airspace operations comprises of airways (including flight tracks, approach corridors and holding areas), aerodromes (as the link points with the ground) and infrastructure (mainly ground equipment including control towers). SEA studies for the Master Plan are, therefore, involves appreciation and observations of the operations and potential effects. This informs strict adherence to systems requirements.
5	Stakeholders engagement and communication	Chapter 5, Section 5.4 (page 35) outlines the level of stakeholder consultations with the initial communication samples (correspondences, proceedings and list of participant) illustrated in the annex. This is being sustained and improved through the process.

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERAL
Attach.

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile line: 0724 253 398, 0723 563 016, 0735 013 046
Telkom Wireless: 020 - 2101370, 020 - 2183718
Incident Line: 0786 -101100

P.O. Box 67839-00200
Popo Road, Nairobi, Kenya
E-mail: dgnema@nema.go.ke
Website:www.nema.go.ke

NEMA/SEA/5/2/068

12th November, 2019

The Director General
Kenya Civil Aviation Authority
Aviation House, JKIA
P.O. Box 30163-00100
NAIROBI

REVIEW AND APPROVAL OF THE SCOPING REPORT FOR THE STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE AIRSPACE MASTER PLAN 2015 – 2030.

The National Environment Management Authority (NEMA) has reviewed the scoping report that was submitted to the Authority on 7th November, 2019 that addressed issues that had been raised in an earlier letter dated 17th October, 2019.

In light of the provisions of section 57 A of the Environment Management and Coordination Act (EMCA) CAP 387, Regulations 42 and 43 of the Environmental (Impact Assessment and Audit) Regulations, 2003 and the National Guidelines for Strategic Environmental Assessment 2012, the Authority reviewed the scoping report and hereby informs you the scoping report has been approved.

As you prepare to undertake the SEA Study, the Authority informs you that effective and sustained stakeholder's engagement and appropriate communication methods are vital for a successful SEA process.

Ensure that linkages between the Master Plan and other Regional, National and Local plans are taken into consideration. You are informed to engage the SEA experts who shall conduct the SEA process and prepare the draft SEA report which should be subjected to quality assurance procedure before it is submitted to NEMA.

Submit ten hard copies and one electronic copy of the draft SEA report (which should include a non-technical summary and the submission form).

SALOME MACHUA
For: DIRECTOR GENERAL

Our Environment, Our life, Our Responsibility

ANNEX 5: Study Correspondences

KENYA CIVIL AVIATION AUTHORITY

efficiently managing air safety

KCAA/CONF/37/018A Vol 3. (5) **10TH July 2019**

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

INTRODUCTION LETTER FOR KCAA CONSULTANT CONDUCTING STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

The Kenya Civil Aviation Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Plan will be implemented through a pre-determined programme with various projects. Implementation of the master plan anticipates various environmental and social linkages manifested through the proposed projects that require standard approaches for adoption during the process of the Master Plan implementation. It is the desire of KCAA to comply with the National Environmental Management Authority (NEMA) requirements under the Environmental Management and Coordination Act 1999 and the Environmental Management and Coordination (Amendment) Act, 2015.

In order to achieve the above, KCAA has engaged Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA to prepare a comprehensive SEA report for the Master plan and identify the necessary approvals required for the implementation of the various Master Plan projects, taking into account the international and national safeguards. The consultants team is required to gather all the necessary information from the identified stakeholders.

The following are the key Professional Experts from Ms. Aquaclean Services Limited who will be working in this assignment:

1. Harrison Ngirigacha (Environment/Team Leader)
2. Augustine Mwenga (Sociologist)
3. Eng. Harrison Mwangi (Civil Engineer)
4. Justus Nyakego (Safety and Health Expert)

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Fax: +254 020 6827 606, 6822 300
Website: www.kcaa.or.ke
E-mail: info@kcaa.or.ke

5. Newton Karuri (Physical Planner)
6. Vitalis Ahago (Meteorologist)
7. Eric Murimi (Environmental Planner/Cumulative Impacts)
8. Joy Wanjohi (Environmental Planner)
9. Amos Gikonyo (Sociologist)

Please accord the Team any necessary assistance in regard to the SEA exercise.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERAL

KENYA CIVIL AVIATION AUTHORITY

efficiently managing air safety

KCAA/CONF/37/018A Vol 3. (6) **10TH July 2019**

Mr. Jonny Andersen
Managing Director
Kenya Airports Authority
P.O. Box 19001- 00501
NAIROBI.

Dear Sir,

CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

The Kenya Civil Aviaton Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Plan will be implemented through a pre-determined programme with various projects. Implementation of the master plan anticipates various environmental and social linkages manifested through the proposed projects that require standard approaches for adoption during the process of the Master Plan implementation. It is the desire of KCAA to comply with the National Environmental Management Authority (NEMA) requirements under the Environmental Management and Coordination Act 1999 and the Environmental Management and Coordination (Amendment) Act, 2015.

In order to achieve the above, KCAA has engaged Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA to prepare a comprehensive SEA report for the Master plan and identify the necessary approvals required for the implementation of the various Master Plan projects, taking into account the international and natonal safeguards. The consultants team is required to gather all the necessary information from the identified stakeholders.

The purpose of this letter, is therefore to request for nomination of an environmental office from KAA, who will be our **contact person** and will be required to participate throughout the SEA study process, since KAA is key Partners in this regard.

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P.O. Box 30163 - 00100 GPO Nairobi
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Fax: +254 020 6827 606, 6822 366

Website: www.kcaa.or.ke
E-mail: info@kcaa.or.ke

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERAL

KENYA CIVIL AVIATION AUTHORITY

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KCAA/CONF/37/018A Vol 3. (7) **10TH July 2019**

Prof. Geoffrey Wahungu
Director General
National Environmental Management Authority
P.O. Box 67839 - 00200
Popo Road, off Mombasa Road
NAIROBI

Dear Sir,

CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

The Kenya Civil Aviation Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Plan will be implemented through a pre-determined programme with various projects. Implementation of the master plan anticipates various environmental and social linkages manifested through the proposed projects that require standard approaches for adoption during the process of the Master Plan implementation. It is the desire of KCAA to comply with the National Environmental Management Authority (NEMA) requirements under the Environmental Management and Coordination Act 1999 and the Environmental Management and Coordination (Amendment) Act, 2015.

In order to achieve the above, KCAA has engaged Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA to prepare a comprehensive SEA report for the Master plan and identify the necessary approvals required for the implementation of the various Master Plan projects, taking into account the international and national safeguards. The consultants team is required to gather all the necessary information from the identified stakeholders.

The purpose of this letter, is therefore to request for nomination of an environmental officer from NEMA, who will be our **contact person** and will be required to participate throughout the SEA study process. Secondly we wish to seek for a meeting with NEMA to present the key aspects of the Master Plan and

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Website: www.kcaa.or.ke
E-mail: info@kcaa.or.ke

our intent to undertake the Strategic Environmental Assessment (SEA). We propose 24th July 2019 as the date of the meeting, where relevant KCAA officers and Consultant will visit NEMA from 9.00a.m.

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERAL

KENYA CIVIL AVIATION AUTHORITY

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KCAA/CONF/37/018A Vol 3. (20) **26th September 2019**

Mr. Mambo B. Mamo
Ag. Director General
National Environmental Management Authority
P.O. Box 67839 - 00200
Popo Road, off Mombasa Road
NAIROBI

Dear Sir,

SUBMISSION OF SCOPING REPORT ON CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

Reference is made to your letter ref: NEMA/SEA/5/2/068 dated 30th August 2019 on the above subject.

The Kenya Civil Aviation Authority (KCAA) and Environmental Assessments Experts from Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA have prepared a comprehensive scoping report for SEA.

The purpose of this letter, is to submit three copies of scoping report for SEA study for the Air Space Master Plan for review by NEMA in line with the provisions of section 57A of the Environmental Management and Coordination Act (EMCA) CAP, 337 and the National Guidelines for Strategic Environmental Assessment in Kenya.

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Dr. Mugambi G.K. M'Nchebere
FOR: DIRECTOR GENERAL

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CANS-PIN
Note DTA
DANS
13/08/19

DANS
TJA!
DS 9AUG19

MINISTRY OF DEFENCE

Telegrams: "DEFENCE", Nairobi
Telephone: Nairobi 020 - 2721100
When replying please quote

DEFENCE HEADQUARTERS
ULINZI HOUSE
P. O. Box 40668,
NAIROBI, KENYA

RECEIVED
07 AUG 2019

MOD/01/2A

29th July, 2019

The Director General
Kenya Civil Aviation Authority
Aviation House, JKIA
P.O. Box 30163-00100
NAIROBI

RE: CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

Refer to your KCAA/CONF/37/018A Vol 3. (8) dated 10th July, 2019, on the above subject.

The Ministry's nominee to participate throughout the Strategic Environmental Assessment study process is as indicated below:

Major David Wando
Email address: wandoray@gmail.com
Mobile No.: **0721 272 214**

Please take the necessary action.

FRANCIS M. MUTIR, EBS
For: PRINCIPAL SECRETARY

REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT AND FORESTRY
KENYA METEOROLOGICAL DEPARTMENT
Dagoretti Corner, Ngong Road, P. O. Box 30259, 00100 GPO, Nairobi, Kenya
Telephone: 254 (0) 20 3867880-7,
e-mail: director@meteo.go.ke, **Website:** http://www.meteo.go.ke

When replying please quote
Our Ref: MET/13/14/1 **Date:** 23 August 2019

Managing Director
Aquaclean Services Limited
P.O.Box 1902-00100
NAIROBI

Dear Sir,

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN (2015-2030)

I have the honor to refer to your letter Ref: ASL/KCAA/ASMP/SEA/2019 dated 14th August 2019 requesting Kenya Meteorological Department (KMD) to be part of the Strategic Environment Assessment process that will be followed later by a stakeholder's workshop for the presentation of findings and recommendations.

I appreciate your recognition of KMD as one of the key stakeholders in the Kenyan airspace operations and wish to assure you of our participation in this activity.

Accept, **Sir**, the assurances of my highest consideration.

Yours faithfully,

Edward Muruki
FOR: DIRECTOR OF METEOROLOGICAL SERVICES

Please address all replies to the Director of Meteorological Services

Kenya Airports Authority

Head Office, Airport North Road
P.O. Box 19001 - 00501 Nairobi, Kenya
Tel: +254 - 020 - 822111 / 6611000 / 6612000
Fax: +254 - 020 - 822078, 827304
Email: info@kaa.go.ke
www.kaa.go.ke

KAA/9/01 VOL. I (83)

AQUACLEAN SERVICES LTD
RECEIVED
20 AUG 2019
P. O. Box 1902 - 00100
NAIROBI

19th August 2019

Managing Director
Aquaclean Services Limited
P.O BOX 1902-00100
NAIROBI, KENYA

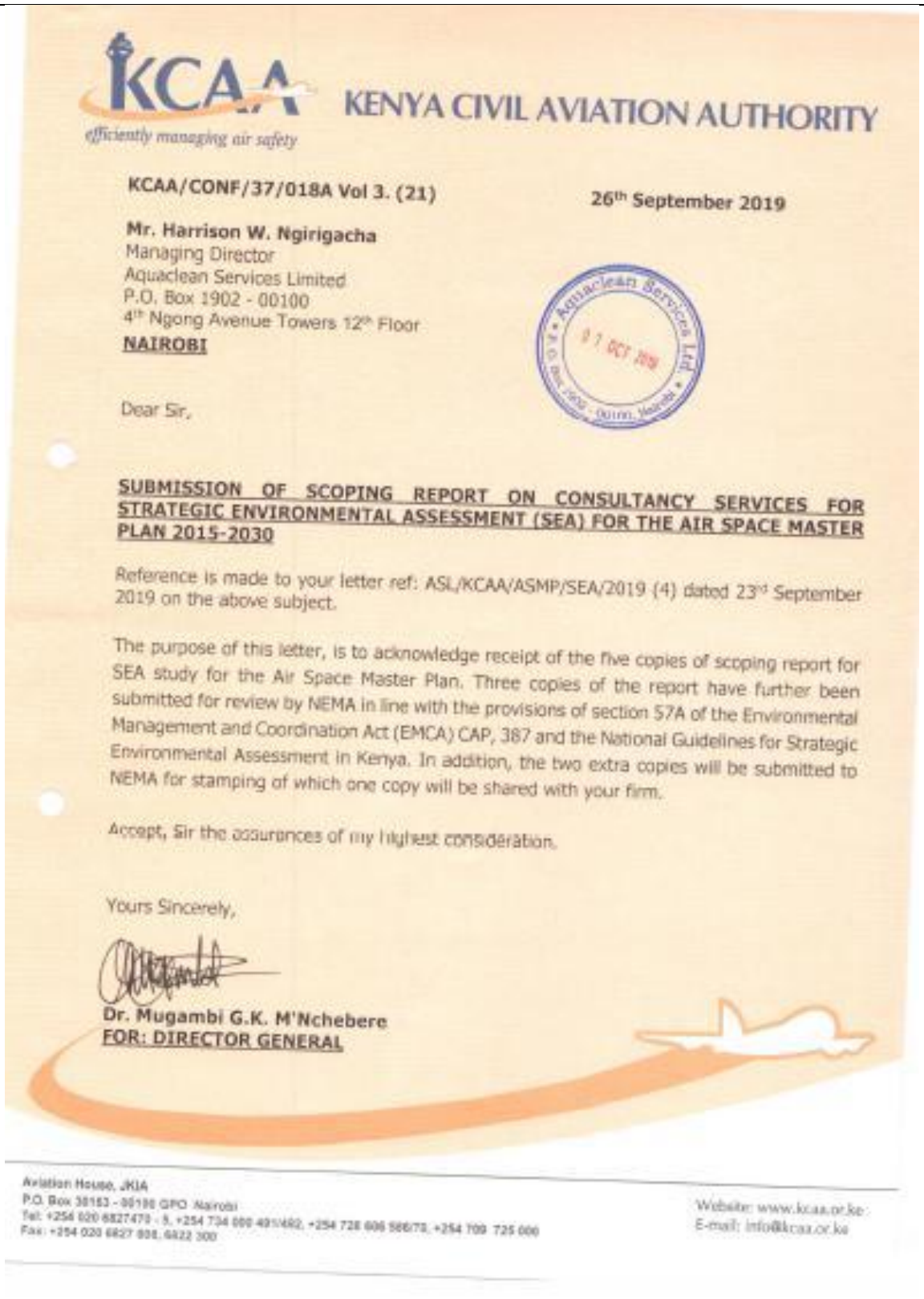
RE: STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE AIR SPACE MASTER PLAN 2015-2030

We acknowledge receipt of your letter dated 14th August 2019 on the above subject matter.

This is to advice that your request to have Kenya Airports Authority key departments as part of the Strategic Environmental Assessment process has been approved.

The requisite Departments have been notified and will cooperate with your team in the assessment.

H. P MACHIO
GENERAL MANAGER, OPERATIONS AND SAFETY
FOR: MANAGING DIRECTOR/CEO



KCAA
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KENYA CIVIL AVIATION AUTHORITY

KCAA/CONF/37/018A Vol 3. (21)

26th September 2019

Mr. Harrison W. Ngirigacha
Managing Director
Aquaclean Services Limited
P.O. Box 1902 - 00100
4th Ngong Avenue Towers 12th Floor
NAIROBI

Aquaclean Services Ltd
P.O. Box 1902 - 00100, Nairobi
01 OCT 2019

Dear Sir,

SUBMISSION OF SCOPING REPORT ON CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

Reference is made to your letter ref: ASL/KCAA/ASMP/SEA/2019 (4) dated 23rd September 2019 on the above subject.

The purpose of this letter, is to acknowledge receipt of the five copies of scoping report for SEA study for the Air Space Master Plan. Three copies of the report have further been submitted for review by NEMA in line with the provisions of section 57A of the Environmental Management and Coordination Act (EMCA) CAP, 387 and the National Guidelines for Strategic Environmental Assessment in Kenya. In addition, the two extra copies will be submitted to NEMA for stamping of which one copy will be shared with your firm.

Accept, Sir the assurances of my highest consideration.

Yours Sincerely,

Dr. Mugambi G.K. M'Nchebere
FOR: DIRECTOR GENERAL

Aviation House, JKIA
P.O. Box 30163 - 00100 GPO Nairobi
Tel: +254 020 6827470 - 5, +254 734 600 491/492, +254 728 606 586/73, +254 709 725 000
Fax: +254 020 6827 808, 6822 300

Website: www.kcaa.or.ke
E-mail: info@kcaa.or.ke

ANNEX 6: Stakeholder's Forums and Proceedings

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR KCAA AIRSPACE MASTER PLAN

MINUTES FOR KICK-OFF MEETING AND INCEPTION REPORT PRESENTATION

3rd JULY 2019.

Members present

Below is a list of those in attendance:

No.	Name	Organization	Position
1.	Francis K. Mwangi	KCAA	Ag. Chairman
2.	Faith Kasyoki	KCAA	Procurement
3.	Wilson C. Ndiwa	KCAA	Finance
4.	Alice Kandira	KCAA	Project secretary
5.	Harrison Ngirigacha	ASL	Team Leader
6.	Amos Gikonyo	ASL	Sociologist
7.	Newton Karuri	ASL	Physical planner
8.	Justus Nyakego	ASL	OSH Practitioner
9.	Augustine Mwenga	ASL	Sociologist
10.	Vitalis Ahago	ASL	Meteorologist
11.	Eric Murimi	ASL	Environmental Planner
12.	Eng. Harrison Kiarie	ASL	Civil Engineer
13.	Joy Wanjohi	ASL	Environmentalist

AGENDA

1. Introductions
2. Remarks from KCAA
3. Remarks from the Consultant
4. Presentation and discussions
5. AOB

Item	Deliberations	Comments
Min 1/2019	**Introduction and Opening Remarks** All members convened in the boardroom at around 10:00 am. The meeting was called to order by Ms. Alice Kandira on behalf KCAA and opened the meeting with a word of prayer. The Chair (Francis Mwangi) opened the meeting by welcoming all members present and called upon the members present to a self-introduction and states their position.	All Experts, their support staff as well as the KCAA team was present.

Item	Deliberations	Comments
	He then invited the Consultant's Team Leader, Mr. Ngirigacha to give a brief on the purpose of the meeting. Mr. Ngirigacha explained a brief background and the purpose and importance of SEA process to the Airspace Master plan of SEA as well as the approaches and key steps that will be flowed in the study. He presented the team to KCAA through introduction of their roles and outputs illustrating the multi-disciplinary nature of the SEA Study. Fransis Mwangi of KCAA reminded the team to keep the project timeline of 6 months.	
Min 2/2019	**<u>Presentation and discussions of the Inception Report</u>** Team leader took the members present through the presentation pointing out the critical areas and gave an illustration of the current Airspace status. **<u>Environmental Aspects</u>** The Team Leader went through the associated environmental aspects relevant to the Airspace Master Plan including ✓Climate change issues ✓Air quality and in relation aircraft emissions and fuel dumping ✓Noise and vibrations from aircraft operations ✓Safety with respect to Occupational and Public safety aspects ✓Impacts of Land use practices ✓Ecological issues including birds migration corridors He also gave a general SEA approach and scope which will include; ✓Review of the Aviation Policies and other regulatory framework, ✓Descriptive of baseline conditions, information and data, ✓Sample visits to strategic locations and installations of aviation operations, ✓Consultations and discussions, ✓Preparation of the Strategic Environmental Assessment Report, **<u>Social Aspects</u>** Mr. Augustine Mwenga, the sociologist, gave a briefing on the social component that will include; ✓Stakeholder`s analysis and categorization to ensure all relevant parties have being engaged. ✓Reviewing of the existing documents including the KCAA Strategic Plan to ensure unity of the plans.	This was the outline of the Inception Report and emergent issues The list of stakeholders was to be reviewed for completion in the Scoping Report. Each Expert outlined their respective areas of interest during the study process.

Item	Deliberations	Comments
	✓ He also indicated that the potential social impacts will be identified associated with the key operation areas. He also stated the need to have KCAA representation during stakeholder engagement sessions so as to give the impression of a united team. **Meteorological Aspects** Mr. Vitalis Ahago, the Meteorological Expert, stated that as air traffic increases carbon emission increases as well is going up and it is a critical point in the global airspace. He noted that the MET-ASBU is lacking in the Master Plan and there is need to address the same through the SEA process. It will also be necessary to analyze all the models under the ASBUs Blocks (with a particular focus on Block 0) with a view to establishing current and projected environmental issues. **Land Use Aspects** Mr. Newton Karuri, land use expert, noted that all air navigation routes need to be placed on a special land use map so that the team can get to know what is on the ground and also for the public knowledge. He indicated that the incompatibility of land uses is very high and that implementation is lacking in the development control sector. **OHS Aspects** Mr. Justus Nyakego, the OHS expert, observed that that there was need to review the safety policies at KCAA so that they can be enhanced in the Master Plan. The team leader presented a list of documents that are needed in order to carry out the assignment. And later gave the deliverables that will be undertaken in the course of the project.	Regarding the workshops Madam Alice stated that KCAA will be able to assist on that.
Min 3/2019	**AOB** Mr. Ngirigacha spoke on submission of the Inception Report to KCAA and that the comments captured after its review will be integrated into the Scoping Report which is a requirement by NEMA. Later the scope report will be submitted to NEMA. A clarification of the procedure used in submitting deliverables was made to match the projects activities specifically for the draft and final reports.	There was assurance and commitment to collectively deliver this unique exercise

Item	Deliberations	Comments
	KCAA team was informed of the NEMA briefing as a requirement to show intent of the Master plan and formal letter of appointment was to be drafted to that effect. Eng. Kiarie elaborated the important drafts to be made by KCAA to facilitate future interactions with other key players in the project; ✓ KAA and NEMA nomination letters for liaison persons ✓ Introductory letters to be used by the consultants team when engaging sensitive stakeholders such as KDF, NEMA, KMD ✓ Appointment letter to NEMA for the briefing ✓ Invitation letters to the relevant stakeholders in the project. The list of stakeholders is outlined in the inception report for KCAA's consideration.	
Min 4/2019	**<u>Adjournment</u>** Madam Alice Kadira thanked the members present and welcomed comments from the members. A closing prayer was made by Mr. Amos Gikonyo.	Next meeting at NEMA Briefing and later a scoping meeting at KCAA

There being no other business, the meeting was adjourned at 1.00 pm

Francis Mwangi
Chair

Date:

Harrison Ngirigacha
Team Leader – Consultant

Date:

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR KCAA AIRSPACE MASTER PLAN

MINUTES OF NEMA BRIEFING MEETING

24TH JULY 2019.

Members Present

	Name	Organization	Position
1.	Francis K. Mwangi	KCAA	Senior Planning Officer
2.	Oceanic Sakwa	NEMA	SCEO (Chair)
3.	Selelah Okoth	NEMA	PCEO
4.	Rose Acquiline Odek	NEMA	C&E
5.	Diana Nyangweso Bosire	NEMA	SEA
6.	Mgor Tallam	KCAA	Planning Officer
7.	Scolastica Valusi	KCAA	Planning Officer
8.	Harrison Ngirigacha	ASL	Team Leader
9.	Amos Gikonyo	ASL	Sociologist (Taking Minutes)
10.	Joy Wanjohi	ASL	Environmentalist (Taking minutes)
11.	Newton Karuri	ASL	Physical planner
12.	Augustine Mwenga	ASL	Sociologist
13.	Vitalis Ahego	ASL	Meteorologist
14.	Eric Murimi	ASL	Environmental Planner
15.	Eng. Harrison Kiarie	ASL	Civil Engineer
16.	Naomi Gitau	KAA	Manager, Environment

AGENDA

1. Pronounce Intent to Undertake SEA Study for the Airspace Master Plan 2015 – 2030
2. Introduction of the SEA Consultant
3. An outline of the Airspace Master Plan 2015 – 2030
4. Presentation of the SEA principles on Airspace Master Plan 2015 – 2030
5. Comments and Discussions
6. AoB
7. Adjournment of the meeting

Item	Deliberations	Comments
Min. 1 – 2	**Assembly, Introductions and Agenda** The meeting was called to order and started with a word of prayer by one of the members from NEMA. Self-introductions of the all participants present followed by welcome by NEMA	Informing NEMA of the intent to undertake SEA Study and presentation of the brief is a

Item	Deliberations	Comments
	Mr. Francis Mwangi from KCAA explained the main aim of the Airspace Master Plan as ensure order and compliance with the international practices for the airspace under Nairobi and other areas designated under its jurisdiction. This also include enhancing the global initiatives towards the reduction of greenhouse gases from aviation operations including carbon dioxide. He expressed the desire of KCAA to comply with the established regulatory provisions requiring that Master Plans get subjected to Strategic Environment Assessment (SEA). The briefing was meant to notify NEMA of this intention. Mr. Mwangi then introduced Aquaclean Services limited to the meeting and briefed the members present on the assignment as the Strategic Environmental Assessment (SEA) Consultant on the Airspace Master Plan for KCAA. He also asked if there can be a liaison/contact person from NEMA when the stakeholders meeting will be done and also during the field visits. He then handed over to Mr. Harrison Ngirigacha of Aquaclean Services Limited (Team Leader) to run the presentation to the NEMA team.	requirement under the SEA Regulations.
Min. 2 – 2	**<u>Background</u>** Mr. Ngirigacha introduced the whole study team with their respective responsibilities. He started the presentation by declaring the practicing compliance status of Aquaclean Services Ltd. and the Team Leader before outlining the Master Plan components as well as what the airspace management and planning links to the environment and social aspects. Environment and social aspects are an emerging fields in Kenyan aviation industry with limited references not only in the Master Plan itself but also in the Kenya regulatory framework. NEMA, therefore, appreciated that it requires keen attention and understanding to clearly identify areas of attention.	The team leader sated that they are working with KCAA, on the priority stake holders and stated that at the moment there is no consultant who can easily define the airspace apart from the KCAA team

Item	Deliberations	Comments
	Presentation and Discussions He observed that there is a progressive increase of air traffic in the Kenya Airspace terms of aircraft movements requiring continuous upgrade of aviation facilities and systems to meet the demand on services. The presentation focused on the following key areas; ✓ Safety, ✓ Air quality, ✓ Noise and vibrations, ✓ Land use linkages. ✓ Social interactions, ✓ Ecological Linkage Issues ✓ Climate change, ✓ Metrological linkages and, He also gave the challenges facing KCAA airspace and outlined Performance Improvement Areas (PIAs) for interventions that shall be carried out under the Master Plan as; ✓ Efficient airport operations, ✓ Global interoperability systems, ✓ Optimum capacity and flexibility flight and ✓ Efficient flight path. The Presenter outlined the provisions of ICAO towards seamless airspaces at state and regional levels through the implementation of Global Air Navigation Plan (GANP) and the associated Aviation System Block Upgrades (ASBUs) initiatives in the achievement of the PIAs. The Team experts emphasized their respective areas	
Min. 3 – 2	**Comments and Observations** It was noted that there is need to have initiatives that relates land use practices and airspace management so as to ensure compatibility at key aviation operations zones including holding areas and flight corridors. This SEA is, therefore, introducing an important aspect, not only to the Master Plan but also to NEMA evaluation criteria for development projects. NEMA also suggested that a stakeholder briefing will be necessary at the scoping stage before the Draft SEA report is submitted so that the concept of the Airspace Master Plan is made clear to enable	This was an open forum to improve the scope of the study as well as indicating areas of compliance with the SEA Regulations.

Item	Deliberations	Comments
	effective participation. KCAA will advise on the plan this forum early in the process. Planning and design of flight tracks requires an GIS expert who can related the aircraft routes with ground cadastral and land use maps for ease of interpretation of possible conflicts. The Consultant have engaged a Physical Planner with a mapping background to support in this regard. For enhances safety, sharing of information between operators and stakeholders would be important, especially with regard to planning of social, economic and land use development projects. In this regard, disclosure of the Airspace Master Plan and the SEA Report would be crucial. It was confirmed that both documents are public documents.	
Min 3/2019	**AOB** NEMA instructed that the SEA Brief be submitted in writing as a formal notification for the intent to undertake SEA Study for the Airspace Master Plan 2015 – 2030. This would then be followed by the submission of the Scoping Report and subsequent commencement of the full SEA Study process. For purposes of sequential correspondence, KCAA requested NEMA to respond to the request on nomination of a contact staff for the SEA exercise and also instruct on the submission of the NEMA Brief.	The Team Leader gave an undertaking to prepare and submit of the NEMA brief before the submission of the Scoping Report.
Min 4/2019	**Adjournment** There being no other business, the meeting was adjourned with a word of prayer at 11.30am	

Chair

KCAA/Consultant

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR KCAA AIRSPACE MASTER PLAN

MINUTES FOR STAKEHOLDERS BRIEFING WORKSHOP

KCAA AUDITORIUM – 3rd SEPTEMBER 2019.

AGENDA

1.Arrival and registration,
2.Introduction and objective of the meeting/workshop
3.Speeches
   a. Director General KCAA
   b. Head of compliance and enforcement – NEMA
4.Workshop presentation
   a. KCAA – ANS department
   b. Consultant – Aquaclean
5.Question and Answer session
6.Adjournment

Item	Deliberations
Min 1/9/2019	**Arrival and registration** Participants registered as they arrived. A total of – attended the workshop from different institutions. Agencies and organizations. (See attached attendance register)
Min 2/9/2019	**Introduction and objective of the meeting/workshop** The meeting was called to order at 10:15 by the MC of the meeting, Mr. Mwadime Wakesho. He requested the participants to introduce themselves, and thereafter he invited Mr. Augustine to open the meeting with a word of prayer. Mr. Wakesho went ahead to expound on the growth experienced in the aviation industry and the probability of further expansion in the future. He also justified the need for the KCAA Airspace Master Plan 2015-2030. He invited Mr. Hitler Adikin who invited Mr. Gilbert Kibe (Director General KCAA) to give his opening speech.
Min 3/9/2019	**SPEECHES** **Mr. Gilbert Kibe (Director General-KCAA)** The DG gave an introductory speech that highlighted the following areas: ▪ Importance of the aviation industry to the economic status of the country and of the world. ▪ Increase of air transport sector in the country; including support services by 18%; passenger numbers by 9.5%, domestic and international air traffic, transit traffic by 8.2%, in the recent past. ▪ The sound and resilient management of the aviation industry and strong government investment contributed to the immense growth of the aviation industry in Kenya.

Item	Deliberations
	▪ Upgrades of aviation infrastructure and security led to Kenya receiving a Category 1 status by United States Federal Aviation Administration after a safety assessment. ▪ The Master Plan is backed by the Kenya Vision 2030 as aviation is one of the drivers of the economic growth and wealth creation. ▪ Kenya is up to date on compliance to ICAO standards on safety and aviation practices. ▪ United States SDGs are meant to stimulate implementation of actions that sustainably improve our societies. Specifically, Goal 13 on combating climate change and its impacts globally with emphasis on reducing emissions associated with aviation operations. ▪ The worrying trend in the world climate change causing extreme weather conditions that directly impact on aviation operations. ▪ Kenya Climate Change Act No. 11 of 2016 and ICAO SAPs annex 16 on Environmental consideration and protection incorporated into aviation and growth in a sustainable manner inform the Master Plan and SEA process ▪ KCAA's organizational restructuring with introduction of offices of environment and consumer protection, shows KCAA seriousness on environmental considerations. ▪ CORSIA scheme 2021-2023 to be incorporated by KCAA with the formulation process of CORSIA regulations for Kenya underway. ▪ Environmental considerations with a case study of the Solar and Gauge Pilot Project in Moi International Airport (Mombasa) as a mitigation measure for $C0^2$ emission (the use of clean energy strategies - solar power to start up aircraft engines) funded by the Kenya Environment Action Plan and European Union. ▪ Airspace planning and management with considerations of the capacity of handling the doubling of air traffic. ▪ Role of the SEA to the Master Plan in identifying key environmental and social linkages and propose appropriate mitigation measures in order to ensure that environmental sensitivity and social interest were taken into consideration throughout the Master Plan implementation period. **Ms. Oceanic Sakwa (Senior Compliance and Enforcement Officer- NEMA, Head of Strategic Environmental Assessment)** She briefly outlined the following ▪ Subjecting the Master Plan to a SEA process was a requirement under EMCA and is mandatory to consider the implications of the plan to the environment and its specific receptors. ▪ And that environmental consideration by KCAA into the Airspace Master Plan was of key interest in the SEA process and it is highly encouraged by NEMA.
Min 4/9/2019	**<u>PRESENTATIONS ON THE AIRSPACE MASTER PLAN 2015-2030</u>** **KCAA ANS Department presentation by Mr. Hitler Adikin - Manager Air Traffic Services** He took the members through the ANS Master Plan highlighting the following: - ▪ Presented an overview of the development of the Airspace Master Plan which was anchored on Kenya Vision 2030 and GANP which is a global initiative that trickles down to the regional initiative AFI plan. Under the GANP there was formulation of Aviation System Block Upgrades which were Block 0 to Block 2, which were intended to have a global upgrade of the aviation industry.

Item	Deliberations
	▪ Shift from Non beacon directional navigation to satellite based navigation which was much more accurate and reduces on airspace used and minimized on conflict. ▪ The master plan was guided by elements of Block 1 (running from 2019 to 2023) which will gauge environmental considerations. ▪ The Master Plan objectives were informed by the GANP and ASBUs using latest technologies available to optimize airspace utilization. ▪ Safety initiatives that brought about environmental benefits, e.g. Nairobi – Mombasa parallel air routes, CCO and CDO, ▪ Objectives of the Master Plan; ✓ To institute order throughout the airspace planning and management. ✓ Integrate infrastructure both regulatory and guidelines. ✓ Identify cross-cutting interventions. ▪ Work packages; ✓ Airspace designs and management systems ✓ Preview of the preliminary environmental impacts and benefits ✓ Institutional and regulatory guidelines ✓ Assessment, implementations and linkages between aviation and environmental and social settings ▪ The main concerns identified included; safety, air quality, noise and vibrations, land use, social interactions and linkages, meteorological linkages, climate change ▪ The Key Performance Improvement Areas included; ✓ Airport Operations, ✓ Globally Interoperability systems and data, ✓ Optimum Capacity Flexible Flight, ✓ Efficient Flight Paths **Aquaclean Services Limited (Experts' Team) presentation;** **Environmental Aspect- Mr. Harrison Ngirigacha (Team Leader)** ▪ He explained the extent of the Kenyan airspace with extension into the Indian Ocean as delegated by ICAO and highlighted further on; ▪ The objective of the Airspace Master Plan 2015–2030 being to institute order through the airspace planning and management. ▪ The Master plan identifying a series of intervention actions that have cross-cutting environment, social, economic and safety aspects: ✓ Safety around operation zones and within public areas ✓ Air quality through aircraft emissions, ✓ Noise and vibrations from aircraft operations ✓ Land Use Zoning Issues, ✓ Social interactions (closely linked to land-use associated to safety, noise and vibration ✓ Climate change ✓ Meteorological linkages (free flow of information and data relative to operations). ▪ He also highlighted the environmental issues brought out of the Master Plan: ✓ Noise and Vibrations

Item	Deliberations
	✓ Safety Aspects ✓ Emergent drones and hot air balloons ✓ Implications of the land use patterns ✓ Ecological interactions and conflicts ✓ Fuel Consumption and Fuel Jettisoning ✓ Climate Change ✓ Air quality ▪ He explained that further studies will be done for each of the 73 development projects listed under the Master Plan and that the SEA guidelines will give intervention measures for each specific project and especially those with anticipated impacts to the environment. **Social Aspect- Mr. Augustine Mwenga** ▪ Mr. Mwenga stated that interventions or development activities including the KCAA airspace master plan have social considerations and implications on peoples, therefore, impacting on their lives. The main social objective was to establish the role and level of involvement of the different aviation related stakeholders, the impacts of the Master plan related activities on livelihoods of the people ▪ He stated that the team was identifying the roles of different actors or stakeholders in the aviation industry. These included the community and institutions neighbouring the airports and along the flight paths, holding areas, the settlement patterns and security and land use practices. ▪ He also said that they were interacting the stakeholder to identify how the activities in the master plan impacted on them, and what they expect from KCAA as they implement the master plan. ▪ Also reviewing of the existing documentation with the objective of establishing the impact on the social-economic and livelihoods of the people. ▪ Informed the participants that a validation workshop targeting key stakeholders will be organized towards the end of the exercise, in which the study findings will be present. **Meteorological Aspect- Mr. Vitalis Ahago** ▪ He explained that aeronautical meteorology is a key factor in the Master Plan and Intergovernmental Panel on Climate Change (IPCC) report indicates that aviation is responsible for 2% of total global CO_2 emissions hence due to the increase of traffic the level of carbon dioxide will increase proportionally, therefore impacting the environment. **Land use Aspect- Mr. Newton Karuri** ▪ He stated that Safety and efficient operation of aircrafts should be considered in planning land use abutting the airports. ▪ He also gave land use planning and zoning regulations that include: ▪ Buffer zones, Controlled development, height control of possible obstacles and hazards, and Public sensitization. ▪ He explained that all land use actors and authorities must consider and incorporate: ▪ Birds' migratory routes and national parks/reserves, aircraft holding areas, Flight path, Aeronautical installations, Trans boundary areas and coordinate other land use that will enhance aviation compatibility for efficient land use patterns.

Item	Deliberations	
Min 5/9/2019	**Question and answer/comment session** Mr. Wakesho took over after the presentations and ushered in a session for comments, questions and responses. The members were urged to contribute to the master plan presentations. The comments and questions with their respective responses were recorded and compiled.	
Stakeholder Name and Organization	**Question/Comment**	**Responses**
1. Chinga Mazletese- ICAO	▪ Fuel consumption had major environmental impacts ▪ She requested the consultant to refer to ICAO documentation on air traffic and operations ✓ ICAO 10031 (Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes) ✓ ICAO 9184 (Airport Planning Manual – Master) ▪ Efficiency factors should be looked at to improve aviation operations	Consultant's team is in possession of the documents from ICAO that is guiding the SEA report writing with relevant information.
2. Wlfred Koech – KPLC	▪ KPLC operates low flying crafts which interacts with pylons, therefore need to coordinate with KCAA ▪ Terrorism and air safety challenges	▪ KCAA is in constant interaction with KPLC and KETRACO on their plans regarding the airspace and vice versa especially when it comes to locating of pylons. ▪ The Kenyan Defense Forces is highly involved in the safety aspects of the airspace.
3. Benedict Omondi – KFS	▪ The forest and conservation areas are essential for Carbon Sequestration hence aviation developments should minimize degradation of vegetation cover. ▪ KCAA disaster management and search and rescue should involve KFS as a key partner ▪ Consultation between KFS and KCAA in terms of aviation installations should be key ▪ Policy regulations on drones ▪ Needed to understand aviation operations, fuel dumping and forests (with heavy wildlife presence) ▪ The role of vegetation to the aviation operations, and the expansion initiatives under the Master Plan especially in areas with sensitive ecological habitats	▪ Polluter Pay Principle should be used to address pollution in aviation ▪ KCAA contributes to the coordination of Disaster Management (aviation related) when it comes to SAR missions within the forests. ▪ Formulation of regulations for Drones in Kenya is underway with stakeholder engagements taking place from 16th to 21st of September 2019. ▪ Jettisoning is done at high altitudes further from land with human interaction (3000ft for petrol powered aircrafts and 2000ft for diesel powered aircrafts) and is done at designated zones. ▪ Vegetation reduces the noise, vibration and vortices getting to the ground.

4. Gad Kamau- WAP AOC	Wanted to understand how construction approvals of aviation and non-aviation developments within airports and along the flight paths (KCAA Regulations on developments)	Measures are being put in place by KAA to ensure that approvals are executed as per the set airport regulations.
5. Ima- ANS Wilson Airport	Management of Airport expansions and capacity to hold non-serviceable aircrafts	Airport operations are under the control and coordination of Kenya Airports Authority.
6. Danson- KCAA (ANS) Malindi	Effects of concentrated aviation activities in the airspace (consider de-concentrating to less active areas)	Decongesting busy airports is not viable economically because of the nature of the demography using aviation services and the flights landing and taking off.
7. Wilson Gichuru- Pioneer International University	Are there regulations on unmanned and manned aircrafts in the airspace especially in the age of technology?	Regulations for manned aircrafts cannot be similar to those of unmanned aircrafts especially for drone operating above 500ft outside of airports.
8. Naomi Gitau- KAA	KCAA should come up with a model to show the current status and foresee the impacts of the changes under the Master Plan to the aviation industry.	Comment taken into consideration by the Aquaclean team.
9. Hitler Adkins- KCAA (ANS) Nairobi	He said that for a comprehensive implementation process there was a need for incorporation of the Airport Collaborative Decision Making (ACDM) tool to merge the ANS Master Plan and KAA Master Plan	The two should work together to enhance efficiency and effectiveness of aviation industry.
Min 6/9/2019	**AOB** A Second stakeholders' workshop meeting will be held after the draft SEA report was ready. This will be necessary to share the findings and recommendations of the Final report. Invitations will be sent out from KCAA to all stakeholders including members of the public.	
ADJOURNMENT There been no other business the meeting was closed at 2:30pm with a word of Prayer		

Mr. Francis Mwangi
Chair

Date:

Harrison Ngirigacha
ASL – Team Leader

Date:

ANNEX 7: Stakeholder's Invitations and List of Attendance

KENYA CIVIL AVIATION AUTHORITY

efficiently managing air safety

KCAA/CONF/37/018A Vol 3. (15) **21st August 2019**

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The Principal Secretary
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Works
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Director
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Director General
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P.O.BOX 49712-00100
NAIROBI

Dear Sir/Madam,

INVITATION FOR STAKEHOLDER BRIEFING FORUM ON CONSULTANCY SERVICES FOR STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030

The Kenya Civil Aviation Authority (KCAA) has developed an Airspace Master Plan for the period 2015 – 2030. The Plan will be implemented through a pre-determined programme with various projects. Implementation of the master plan anticipates various environmental and social linkages manifested through the proposed projects that require standard approaches for adoption during the process of the Master Plan implementation. It is the desire of KCAA to comply with the National Environmental Management Authority (NEMA) requirements under the Environmental Management and Coordination Act 1999 and the Environmental Management and Coordination (Amendment) Act, 2015.

In order to achieve the above, KCAA has engaged Ms. Aquaclean Services Limited, a Firm of Experts Licensed by NEMA to prepare a comprehensive SEA report for the Master plan and identify the necessary approvals required for the implementation of the various Master Plan projects, taking into account the international and national safeguards. The consultants team is required to gather all the necessary information from the identified stakeholders.

The purpose of this letter is therefore to request for nomination of a technical officer to participate in the stakeholders' briefing forum on the SEA study to be held at KCAA HQ's at Aviation House in JKIA on the **3rd September 2019 from 9.00am to 1.00pm.**

In order to assist us in planning for the meeting with the consultant please confirm your nomination to jaryambaka@kcaa.or.ke and copy to fmwangi@kcaa.or.ke by 2nd of September 2015.

Yours Sincerely,

Capt. Gilbert M. Kibe
DIRECTOR GENERERAL

KCAA

KENYA CIVIL AVIATION AUTHORITY

Strategic Environmental Assessment (SEA) for Airspace Master Plan (2015 – 2030)

Stakeholders Engagement Register **Venue**......KCAA AUDITORIUM **Date:** 3rd September 2019

No.	Name	Organization	Email Address	Tel. No.	Signature
1	Carolyn Mbiti	KCAA	cmbiti@kcaa.or.ke	0720423711	[signature]
2	Mola Duba	NCA	m.duba@nca.go.ke	0721351157	[signature]
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9	Williams Koech	KPLC	WKoech@kplc.co.ke	0722690119	[signature]
10	Chiga Mbelekese	ICAO			[signature]
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16	CAPT. GILBERT M.KIBE	KCAA – DG	gmkibe@kcaa.or.ke	0722514167	[signature]
17					

KCAA

KENYA CIVIL AVIATION AUTHORITY

Strategic Environmental Assessment (SEA) for Airspace Master Plan (2015 – 2030)

Stakeholders Engagement Register Venue: KCAA AUDITORIUM Date: 3rd September 2019

No.	Name	Organization	Email Address	Tel. No.	Signature
1	Stephen Cheruiyot	Pilot	[illegible]	0722382079	[signature]
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4	Harrison Ngirigacha	Aquaclean Services	aquaclean2008@gmail.co	0722 809026	[signature]
5	ERIC MURIMI	Aquaclean Services Ltd	emurimi90@gmail.com	0722968532	[signature]
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KCAA

KENYA CIVIL AVIATION AUTHORITY

Strategic Environmental Assessment (SEA) for Airspace Master Plan (2015 – 2030)

Stakeholders Engagement Register Venue: KCAA AUDITORIUM Date: 2nd September 2019

No.	Name	Organization	Email Address	Tel. No.	Signature
1	Nimat Khan	ALS LTD.	nimat.khan@als.co.ke	0722215[illegible]	[signature]
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3	Amos Gikonyo	Aquaclean Services Ltd	amosgikonyo2@gmail.com	0700441132	[signature]
4	James K. Nduja	KEFRI	Jkndufa@yahoo.com	0722-983238	[signature]
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8	Fulius M Nzioka	KCAA	fnzioka@kcaa.or.ke	0721397321	[signature]
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10	Oscar Sakwa	NEMA	osakwa@nema.go.ke	0720318948	[signature]
11	Ivy Okundo	KAA	ivyokundo@gmail.com	072[illegible]	[signature]
12	JOB MUWOKI	KAA	jmuwoki@gmail.com	0722674453	[signature]
13	NEWTON KARURI	Aquaclean	spatialds@gmail.com	0724513351	[signature]
14	Martha Lipake	KCAA	mlipake@kcaa.or.ke	0724177219	[signature]
15	Naomi Gitau	KAA	Naomi.Gitau@kaa.go.ke	0720705150	[signature]
16	Reuben Kiama	KCAA	rkiama@kcaa.or.ke	0722599558	[signature]
17	Mike Mutoko	Astral Aviation	mm@astralaviation.com	0721513172	[signature]

KENYA CIVIL AVIATION AUTHORITY

Strategic Environmental Assessment (SEA) for Airspace Master Plan (2015 – 2030)

Attendance Register

Venue: NEMA

Date: 24/7/19

No.	Name	Organization	Position	Signature
1	Harrison Ngiriyaki	Aquaclean Services	Team Leader	[signature]
2	[illegible]	KCAA	[illegible]	[signature]
3	Seldah Okoth	NEMA	PCEO	[signature]
4	Rose Acquiline Odek	NEMA	C&E	[signature]
5	Augustine [illegible]	A.S. Ltd	[illegible]	[signature]
6	Amos Gikonyo	AS Ltd	Sociologist	[signature]
7	JOY WARIOHI	A.S.L	ENVIRONMENTAL PLANNER	[signature]
8	ERIC MURIMI	Aquaclean Service	Environmentalist	[signature]
9	Mgr Tallam	KCAA	Planning Officer	[signature]
10	Gelatius Valui	KCAA	Planning Officer	[signature]
11	NEWTON G. KAGURI	Aqua Clean	Physical Planner	[signature]
12	Vitalis Ahago	Aquaclean	Meteorologist	[signature]
13	Diana Nyangweso Bosire	NEMA	SEA	[signature]
14	Deanne Sahwa	NEMA	SCEO	[signature]
15	Eng. Mwangi H. Kiarie	Aquaclean Services	Civil Engineer	[signature]
16	Naomi Gitau	KAA	Manager Environment	[signature]
17				

KAA Kenya Airports Authority

WILSON AIRPORT

ATTENDANCE REGISTER

Meeting Title:	**MEETING ON STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) FOR THE AIR SPACE MASTER PLAN 2015-2030 (WAP) WITH THE CONSULTANT AQUACLEAN SERVICES LTD**
Date:	**26TH AUGUST, 2019**
Venue:	**PREFAB CONFERENCE ROOM**
Time:	**0900HRS**

NO.	*NAME*	*ORGANIZATION*	*DESIGNATION*	*CELL CONTACT*	*EMAIL*	*SIGN.*
1	Dm Kaliva	KAA	[illegible]	[illegible]	[illegible]	
2	Carol Mwithiga	KCAA (WAP)	CATCO	0729 517 322	cmwithiga@kcaa.or.ke	
3	Sulaiman Masinde	KAA	SCP30	[illegible]	[illegible]	
4	[illegible]	KAA	O/C C.F.S.	0720976978	[illegible]	
5	Gad Karan	AOC	CHAIR	[illegible]	[illegible]@gmail.com	
6	Joseph Ebonga	KAA	SO	0722282051	[illegible]	

1

ITEM	NAME	ORGANIZATION	DESIGNATION	CELL CONTACT	EMAIL	SIGN.
7	LEONARD NZIOKI	KAA	ACFO	0725954107	Leonard.Nzioki@Kaa.go.ke	
8	JOSEPH MBITO	KAA	MABS	0728777402	joseph.mbito@Kaa.go.ke	
9	NEWTON G. KAAWA	Aquaclean	Land Use Planner	0721518261	spatialdcegmail.com	
10	ERIC MURIMI	ASL	Environmental Planner	0725961582	emurimi90@gmail.com	
11	Amos Gikonyo	ASL	Sociologist	0708114832	amosgikonyo2@gmail.com	
12.	JOY WANJOHI	AS-	Environmentalist	0711677424	joywanjohi28@gmail.com	

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Strategic Environmental Assessment (SEA) for air space master plan 2015 – 2030

REGISTRATION FORM — Stakeholder Consultation meeting 21st August 2019

NO	NAME	INSTITUTION	DESIGNATION	TEL	EMAIL	SIGNATURE
1.	Peter N. Mwangi	KWS	[illegible]	0722497341	[illegible]	
2	Vitalis Alaigo	Aqua	Team Member	0722722204	[illegible]	
3.	Hussein Ali	KWS	RA-EA	0710551357	hshurmo@kws.go.ke	
4	Elphas Bitok	KWS	RSI	0721554401	[illegible]	
5	[illegible]	KAA	[illegible]	[illegible]	[illegible]	
6	Eric Murimi	ASL	Env. [illegible] planner	0725922522	emurimi90@gmail.com	
7.	Joy Wanjohi	ASL	Env. Planner	0711677424	joywanjohi25@gmail.com	
8.	James Kiprono	KWS	Warden	0721872923	jkiprono@kws.go.ke	
9	Johnson [illegible]	KAA	[illegible]	0722211424	[illegible]	
10	John M. Kariuki	KWS	RS1	072083151 3	jmachaira@kws.go.ke	
11	Mauring Mumbi	KWS	Warden	0720581559	[illegible]@kws.go.ke	
12	Samuel Kariba	KWS	H/Safety	0722476776	[illegible]@kws.go.ke	
13.	Charles Amolo	KWS	[illegible]	0722659647	camolo@kws.go.ke	
14	Elema W. Saru	KWS	Dpty Planner AD Parks	0722579666	[illegible]@kws.go.ke	
15	Harrison Ngirigacha	ASL	Land Expert	0722809026	aquaclean2008@gmail.com	

KCAA

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) STUDY ON THE AIRSPACE MASTER PLAN 2015 – 2030 FOR KENYA CIVIL AVIATION AUTHORITY (KCAA)

Stakeholders Questionnaire

Public and Stakeholders Consultation

NATIONAL LANDS COMMISSION

Date 28/08/2019

No	Name	Represented Institution/ /Residential/Home Area	Designation/Occupation	Phone No.	Sign
1	Benard Opac	NLC	Ag. Director [illegible]	[illegible]	
2	ERIC MURIMI	ASL	Env Planner	[illegible]	
3	TEDY MUMBE	Spatial Design Planner	Physical planner	0790719555	
4	Amos [illegible]	[illegible]	Sociologist	[illegible]	
5	JOY WANJOHI	ALS	ENVIRONMENTALIST	0711877424	
6	[illegible]	ALS	Sociologist	[illegible]	
7	Harrison [illegible]	ASC	TL	[illegible]	
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KCAA

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) STUDY ON THE AIRSPACE MASTER PLAN 2015 – 2030 FOR KENYA CIVIL AVIATION AUTHORITY (KCAA)

Stakeholders Questionnaire

Public and Stakeholders Consultation

Date 21/8/2019

No	Name	Represented Institution/ /Residential/Home Area	Designation/Occupation	Phone No.	Sign
1	Harrison Ngivigachu	ASL-E	Lead Expert	0722 809026	
2	[illegible]	ASL	[illegible]	[illegible]	
3	Tedy Mumbe	Spatial designs solutions	Planner	0190719555	
4	Eric Murimi	ASL	Environmental planner	0725762552	
5	ARCH. STEPHEN MUNIU	NCA	Ag. GM, RTACS/MRO	0722684767	
6	Ms. Nicky Duba	NCA	Snr. Compliance officer	0721231557	
7	Eric Rabongo	NCA	Officer, Research and Business Development	0706636786	
8	JOY WANJOHI	ASL	ENV. PLANNER	0711677424	
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KCAA

STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) STUDY ON THE AIRSPACE MASTER PLAN 2015 – 2030 FOR KENYA CIVIL AVIATION AUTHORITY (KCAA)

Stakeholders Questionnaire

Public and Stakeholders Consultation

Date 19/8/2019

No.	Name	Represented Institution/ /Residential/Home Area	Designation/Occupation	Phone No.	Sign
1	ROBINSON KAKAMA	[illegible]	INCHARGE	0726892765	
2	KEVIN NYAMWENYA	PEFA CHURCH	RECEPTIONIST	0713710406	
3	Carolyne Simiyu	Carmel	Residency	0768754658	
4	[illegible]	[illegible]	Residency	0795596300	
5	[illegible] WANJIKU	Fahari	Resident	0718168958	
6	PHEBBIO ERIMA	ASST. CHIEF'S OFFICE	ASST. CHIEF [illegible]	0725262263	
7	KENNEDY OMONDI	SYOKIMAU ACADEMY	TEACHER	0721164852	
8	Caroline Muthoka	Fountain of Hope Rehab	Administrator	0724483724	
9	Isaac D. Mbuga	Syokimau SDA East	Elder	0722666066	
10	MARY MUCHUNGA	UHURU GARDENS PRIMARY	SENIOR TEACHER	0721624014	
11	JOEL NETIA	LANGATA HOSPITAL	ADMINISTRATOR	0724897512	
12					
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KCAA

efficiently managing air safety

ATTENDANCE REGISTER FOR STRATEGIC ENVIRONMENTAL ASSESMENT (SEA) WITH THE CONSULTANT TEAM AND THE KENYA AIR FORCE, HELD AT THE KCAA ENGINEERING CONFRENCE ROOM ON FRIDAY, 22ND NOVEMBER, 2019 AT 10.00AM:

	NAME	COMPANY NAME	TEL: CONTACT	EMAIL ADDRESS	SIGNATURE
1.	Hamson Ngirigacho	ASL	0722809026	aquaclean2008@gmail.com	
2.	Augustine Muhenya	ASL	0722464782	[illegible]	
3.	JOY WANJOHI	ASL	0711627424	joywanjohi25@gmail.com	
4.	ERIC MURIMI	ASL	0725763532	emurimi90@gmail.com	
5.	VITALIS AHAGO	ASL	0722220209	vitalisahago.... @gmail.com	
6.	JOEL NYAMBASA	KCAA	0722758242	jnyambasa@kcaa.or.ke	
7.	MAJOR JOHN KWAMBAI	KENYA AIR FORCE	0722588007	jikwambai@yahoo.com	
8.	Alice Kondiva	KCAA	0721959233	akondiva@kcaa.or.ke	
9.					
10.					

Specific Persons Consulted and their Institutions.

1. Eng. James Nderitu	KCAA Head of Engineering Department (JKIA Control Tower)
2. Beth Mengech	KCAA Aeronautical Information Systems (JKIA)
3. Judy Macera	KCAA Air Traffic Control (JKIA)
4. Eng. Walter	KCAA Engineer (Wilson Airport)
5. Peter Mwangi	KCAA Control Tower – Wilson Airport
6. Peter Gikwa	KCAA Air Traffic Control (MIA)
7. Mercylene Mwangila	KCAA Aeronautical Information System (MIA)
8. Henry Tanui	KCAA Engineering (MIA)
9. Robert Omusoga	KCAA Chief Officer (KIA)
10. Mr. Ben Shiashia	KCAA Air Traffic Control (KIA)
11. Eric Ngolo	KCAA Air Traffic Control (Control Tower – KIA)
12. Kennedy Wafula	KCAA Air Traffic Control (Control Tower – KIA)
13. Ronald Sigei	KCAA Engineering (KIA)
14. Reuben Kiema	KCAA Chief Officer (EIA)
15. Musa Kosgei	KCAA Aeronautical Information System (EIA)
16. Andrew Kutol	KCAA Air Traffic Control (EIA)
17. Lubanga Ochoi	KCAA Engineering (EIA)
18. Charles Kingo	KCAA Air Traffic Control (Control Tower – EIA)
19. Julius Guchuru	KCAA Air Navigation Services
20. Enoch Kiplangat	KCAA Aeronautical Information Systems (KIA)
21. Mr. Ben Opaa	National Lands Commission (NLC)
22. Naomi Gitau	Kenya Airports Authority (KAA HQ)
23. Suliman Masinde	Kenya Airports Authority KAA (Wilson Airport)
24. Josphat Mutungi	Kenya Airports Authority KAA (Wilson Airport)
25. Joseph Edonga	Kenya Airports Authority KAA (Wilson Airport)
26. Dominic Kaliva	Kenya Airports Authority KAA (Wilson Airport)
27. Joseph Mbito	Kenya Airports Authority KAA (Wilson Airport)
28. Leonard Nzioki	Kenya Airports Authority KAA (Wilson Airport)
29. Architect Stephen Mwilu	National Construction Authority (NCA)
30. QS Molu Duba	National Construction Authority (NCA)
31. Eile Rabongo	National Construction Authority (NCA)
32. Dr. Peter Njoroge	National Museums of Kenya (Ornithology Department)
33. Dr. Joel Netia	Lang'ata Hospital (Administrator)
34. Tr. Mary Muchunga	Uhuru Gardens Primary school, Lang'ata
35. Tr. Kennedy Omondi	Syokimau Blessed Assurance Academy
36. Stella Aura	Kenya Meteorological Department
37. Major Joan Kwambai	Kenya Air Force (KAF) – (Kenya Defense Forces (KDF))
38. Gad Kamau	Aircraft Operators Committee (AOC)
39. Benedict Omondi	Kenya Forest Service (KFS)
40. Peter Mwangi	Kenya Wildlife Services (KWS)
41. Hussein Ali	Kenya Wildlife Services (KWS)

42. Elphas Bitok	Kenya Wildlife Services (KWS)
43. James Kiptarus	Kenya Wildlife Services (KWS)
44. John Kariuki	Kenya Wildlife Services (KWS)
45. Maurine Musimbi	Kenya Wildlife Services (KWS)
46. Elema Saru	Kenya Wildlife Services (KWS)
47. Jonathan Kirui	Kenya Wildlife Services (KWS)
48. Samwel Kariba	Kenya Wildlife Services (KWS)
49. Charles Omolo	Kenya Wildlife Services (KWS)
50. Stellah Okoth	National Environment Management Authority (NEMA)
51. Oceanic Sakwa	National Environment Management Authority (NEMA)
52. Reagan Owino	National Environment Management Authority (NEMA)
53. Diana Nyangweso	National Environment Management Authority (NEMA)
54. Rose Odek	National Environment Management Authority (NEMA)
55. George Obura	Meteorological department (KIA)
56. Pastor Daniel Ganda	Saints Cerebration Church – Utawala
57. Keving Nyangweso	PEFA Church, Utawala
58. Phoebe Erima	Assistant Chief Utawala
59. Caroline Musyoka	Fountain of Hope Centre