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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT (ESIA) AND RESETLEMENT ACTION PLAN (RAP)

FOR THE PROPSED MALINDI AIRPORT RUNWAY EXPANSION PROJECT

TENDER NO. KAA/OT/MLD/1507/2018/2019

NOVEMBER, 2020

CERTIFICATION

This ESIA study report has been prepared in accordance with the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003 for submission to the National Environment Management Authority (NEMA). The following experts conducted the study and prepared this report on behalf of Eco-solutions Limited:

FOR

Eco Solutions Limited,
P.O. BOX 20492 – 00100,
NAIROBI, KENYA.
TEL: +254 722 273935.
Email: ecosolutions2015@gmail.com

iPlan Consult (Int'l) Limited,
P.O BOX 28634-00100
NAIROBI.
TEL: +254 721891005.
Email: iplanconsult1@gmail.com

Name	Designation	NEMA REG. NO.	Date & Signature
1. SHADRACK K. MBUTA	EIA LEAD EXPERT	6315	
2. WALLACE ISABOKE	EIA LEAD EXPERT	2622	
3. CYNTHIA OTARA	ASS. EXPERT	11450	

The Proponent;
Kenya Airports Authority (KAA),
P.O. Box 19001-00501,
Nairobi.

Signature_____ Date_____

Designation: Environment Manager

Disclaimer:

This ESIA Report is confidential to Kenya Airports Authority (KAA), and any use of the materials hereof should be strictly in accordance with the contractual agreement between Eco-solutions and Kenya Airports Authority (KAA). It is, however, subject to conditions spelt out in the Environmental (Impact Assessment and Audit) Regulations, 2003.

EXECUTIVE SUMMARY

1. Introduction

This section presents a general summary of the findings of the Environmental and Social Impact Assessment (ESIA) study for the proposed construction of Malindi Airport Runway Extension Project. The objective of this ESIA was to evaluate the environmental and social impacts associated with the construction and operation of the proposed project. In this report, measures have been proposed to mitigate environmental and social impacts that are likely to emanate from the proposed development to make it more sustainable.

2. The Proposed project

The proposed project lies along Latitude -3.194645, -3.223703 and Longitude 40.093106, 40.100199. The site to be acquired measures approximately 2263m by 425m to the North and 204m by 894m to the West of the primary runway (Runway 17-35). The section to the North will extend the total length of the runway to 2.4 km from the current 1.4 km, whilst the expansion to the West will create an additional safety/security buffer zone to the airport (A site layout plan has been attached herewith in Annex 2). The main works involving the proposed project include the site clearance, runway construction, marking and signage, fencing (chain link and barbed wire fence) and associated crash gates and storm water drainage works.

3. Overall objective of the project

The overall objective of the project is to expand the current runway to allow for direct international flights and operation of larger aircrafts at the airfield. For the realization of this objective, an Environmental and Social Impact Assessment report (ESIA) and a Resettlement Action Plan (RAP) has been prepared for submission to NEMA for approval and issuance of the requisite permissions for the construction of the proposed project.

4. Specific objectives of the study.

(i) To highlight environmental issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental elements within the project area;
(ii) To review existing legal, institutional and policy framework relevant to the proposed project;
(iii) To find out impacts associated with the proposed project with an objective of suggesting mitigation measures for the negative impacts;
(iv) To assess the relative importance of the impacts of alternative plans, design and sites;
(v) To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures are being implemented during the project operation period;

(vi) Develop an Environmental and Social Management Plan (ESMP) to guide in decision making and for future auditing;
(vii) Raise stakeholder awareness on the impact of the project on the environment with a view to making them understand the implication of the project in their environment; and
(viii) Develop an ESIA report in conformity with the EMCA 1999 and Environmental (Impact Assessment and Audit) Regulations 2003.

5. Scope of the project

The scope of works for the proposed project includes the following:

(i) The runway rehabilitation works to bitumen surfacing

- Site clearing
- Runway earthworks to detail
- Gravel sub-base, base and wearing course construction
- Bituminous surface treatment and surface dressing
- Marking and signage

(ii) Fencing (chain link and barbed wire fence) and associated crash gates

(iii) Storm water drainage works

i) Land Ownership

The proposed project sites belong to the local community and are composed of two sections that measure approximately 2263m by 425m to the North and 204m by 894m to the West of the primary runway (Runway 17-35). The Kenya Airports Authority (KAA) is in the process of formally acquiring the land and has entered into negotiations with the local community. The land has already been surveyed and valued in readiness for acquisition and compensation.

7. Methods Used to Evaluate and Assess the Impacts

The study methodologies used include: collection, identification and analysis of environmental baseline data, identification of impacts, analyses and evaluation of impacts, formulation of mitigation measures for significant negative impacts, development and analysis of project alternatives and development of environmental management and monitoring plans. Socio-economic data was collected using a variety of methods including field assays, questionnaires, discussions with stakeholders; neighbouring community elders and leaders and other key professionals. Other relevant

data was obtained from records and documents availed to our ESIA team from relevant sources and through consultation.

8. Public Consultation

Public participation was mainly achieved through meetings with area administration and leaders, public meetings, direct interviews, observations and questionnaire administration. Those contacted during this study have welcomed the project because of the benefits associated with its implementation. A summary of their views and recommendations have been included in the report (Chapter 8).

9. Project output

The output of the study is the production of this ESIA project report with recommendations for submission to NEMA for purposes of seeking an EIA license.

10. Positive Impacts

(i) Employment opportunities will be generated during both construction and operation phases of the project. These opportunities will mainly benefit the local people.
(ii) The economy of the area will improve as a result of increased revenue collection that is expected directly as a result of the upgrading of the facility.
(iii) It is expected that the development will attract more investment to the region and property values within the area will go up and this will benefit the local community.

11.0 Potential Negative Environmental Impacts and Mitigation measures

The project will have negative environmental and social impacts during the construction and operational phase. A summary of the anticipated impacts and mitigation measures have been given in the table below.

11.1 Summary of Mitigation Measures for Negative Environmental Impacts

POTENTIAL IMPACT	MITIGATION MEASURES
Impacts of obtaining construction materials	• Strip and stockpile topsoil from borrow pits and quarries for use in site restoration. • Close all borrow pits and quarries in accordance with an approved plan to maximize future use and minimize health and safety hazards • Re-use excavated materials from the works as fill.

POTENTIAL IMPACT	MITIGATION MEASURES
Impacts on businesses and traffic flow	• Avoid transporting materials during periods of peak traffic activity • Provide alternative routes for traffic where total closure of roads is expected during trenching • Erect appropriate road signs to warn road users of the construction activities. • Construct an additional lane to the airport to decongest traffic along the adjacent Mombasa – Malindi Road • Vehicles should be controlled at entry and departure points from the airport by traffic police to avoid traffic jams at the adjacent Mombasa – Malindi Road • Increase parking slots at airport parking section to accommodate increased traffic
Air pollution	• Service and maintain machinery according to manufacturer's instructions to improve fuel combustion and reduce exhaust emission to the atmosphere. • Spray water on access roads, stockpiles and cleared areas to minimize dust pollution. • Cover all vehicles ferrying construction materials such as sand or aggregate to avoid dispersal of particles/dust along the roads • Provide personal protective equipment gear such as dusk masks to workers who may exposed to excess dust • Impose vehicle speed limits to 10 km/h in all areas within the site boundaries. • Set up air quality monitoring program at the airport as basis for further mitigation measures
Noise Pollution	• Schedule road traffic movements to normal working hours (08H00 – 17H00). However one can apply to NEMA for permit to construct beyond this period • Proper maintenance and servicing of equipment and machinery used during construction and operation phase • Provide personal protection equipment such as ear muffs to workers operating in noisy places • Avoid unnecessary hooting and revving of engines • Conduct regular noise monitoring at the airport to detect deviations from predicted noise levels and enable corrective measures to be taken where necessary.

POTENTIAL IMPACT	MITIGATION MEASURES
Solid and liquid Wastes	• Develop a Waste Management Plan to guide the handling, storage, transport and disposal of solid and hazardous wastes in compliance with Solid Waste Regulations 2006 • Recycle or re-use solid wastes where applicable in line with sound environmental management practices • Solid wastes generated should be handled and disposed offsite by licensed waste handlers and at designated dumpsites by the Malindi Municipal Council • Employ standard best practices in refuelling, storage and handling of fuel to prevent the risk of spillages. • Train staff on control of emergency oil spill containment and communication procedures.
Surface and ground water contamination	• Construct oil-water interceptors or spill trays to capture discharge of oils, fuels and other polluting liquids • Provide pit latrines/portable toilets at the camp and construction sites for use by workers • Sensitize workers not to dump waste generated from camps and construction sites into rivers/wells • Proper siting of waste disposal or fuel storage areas away from storm water impacts • Hazardous materials must be stored in a specific and secured area to prevent pollution from spillages and leakages. • Stabilize storm water discharge points through robust designs to avoid soil erosion and siltation.
Storm water impacts	• Construct efficient and effective storm water management structures to avoid flooding at the airfield during construction and operation phase .
Impact on physical infrastructures	• The proponent (KAA) should liaise with the service providers (electricity, water, sewage and roads) to plan for the re-routing and reconnection of the services before project construction commences. • The service providers should ensure that infrastructure and services are restored within the shortest time possible to avoid disruption of businesses. • Any land to be acquired as way-leeve for re-routing infrastructure or damage to property shall be adequately compensated in compliance to the existing national laws. • Adequate and appropriate road signs should be erected to warn road users of closure of roads and direct them to alternative roads.

POTENTIAL IMPACT	MITIGATION MEASURES
Occupational Safety and Health hazards	• The Contractor shall conform to all the requirements of the Occupational Health and Safety Act, 2007. • The contractor shall provide ample warning signs and protection around the construction site. • Train workers on the use of firefighting equipment and first aid • Ensure that persons handling vehicles, equipment and materials are suitably trained and supervised • Ensure that emergency contact numbers of the police, fire brigade and ambulance are available at the construction sites. • Provide sanitary facilities at construction sites and potable drinking water • The construction sites should be properly fenced and guarded with controlled exit and entry points • Employees should be properly vetted and supervised to weed out any criminal agents within the work force • Prohibit incompatible land uses adjacent airport areas
Displacement of people and loss of livelihood	• Undertake a detailed valuation of land and property likely to be lost and prepare a report on compensation before project commencement. • Compensation for loss of land or property should be done promptly and should be based on market rates • Constitute a grievance redress mechanism comprising of representatives of all stakeholders • Resettlement and compensation should be implemented in accordance to National and International guidelines • Prepare a detailed report on compensation which shall be made public to avoid corruption and unfairness. Such a report shall contain the list of the PAP, property affected, terms and rates of compensation among other details. • The consultants should prepare livelihood restoration strategies and measures necessary to assist people affected by the project improve or restore their livelihoods.
Socio-economic impact	• Give priority to locals when hiring workers for the project • Ensure gender balance in employment as far as possible. • Develop and implement an HIV/AIDS awareness and prevention program targeting workers and local residents • Constitute a committee to handle social conflicts arising from the project • Develop and implement livelihood restoration strategy for the displaced

12. CONCLUSION AND RECOMMENDATIONS

12.1 Conclusion

The proposed extension of Malindi Airport runway will improve the operational status of the airport and open up the region for more business opportunities. Tourism related businesses are expected to flourish as a result of the planned introduction of direct international flights to the airport upon completion of the project. Apart from the anticipated economic benefits, the project will create more employment opportunities both during construction and operation phases.

In order to safeguard the health of both the public and the environment, the proponent and contractor shall ensure that the environmental and social management and monitoring plan contained in this study report should be strictly followed. The project team has already prepared a Resettlement Action Plan to facilitate the relocation and resettlement of people who will be affected by the project. It is important that compensation be done before the project commences. The process should be conducted in a transparent and accountable manner and in accordance to applicable national and international laws.

12.2 Recommendations

- The proponent and contractor shall ensure that worker's occupational health and safety standards are maintained through capacity building, proper training and provision of protective clothing.
- The design and construction of the proposed runway should strictly comply to ICAO runway design standards and operation regulations.
- KAA should initiate a monitoring program to control and manage the expected increase in noise and air pollution due to increased aircraft activity at the airport.
- KAA in liaison with Malindi Municipal Council shall ensure that Land Use Zoning and Building codes are strictly followed to prevent incompatible activities around the airport.
- The design and construction engineers should ensure that drainage designs consider ground geometry and integrate and streamline all drainage channels so as to avoid flooding at the airport grounds.
- Work schedule should be planned in such way that It will not interfere with flight schedules at the airport. Normal flight operations should be allowed to continue without any interruptions.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

AEZ	Agro Ecological Zones
ATC	Air Traffic Control
ATMS	Air Traffic Movements
CEC	County Executive Committee
CO_2	Carbon dioxide
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
FOD	Foreign Object Debris
IATA	International Airline and Transport authority
ICAO	International Civil Aviation Organization
KAA	Kenya Airports Authority
KBS	Kenya Bureau of Standards
KCAA	Kenya Civil Aviation Act
KERRA	Kenya Rural Roads Authority
KNASP	Kenya National Airport System Plan
KPLC	Kenya Power and Lighting Company
KRA	Kenya Revenue Authority
MAWASCO	Malindi Water and Sewerage Company
MCA	Member of County Assembly
M&E	Monitoring and Evaluation
NEMA	National Environment Management Authority
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
OHS	Occupational Health and Safety
PAPI	Precision Approach Slope Indicators
PAP	Project Affect Persons
RAP	Resettlement Action Plan
TOR	Terms of Reference
UN	United Nations
WB	World Bank
WHO	World Health Organization

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ACKNOWLEDGEMENTS

We wish to acknowledge our deep gratitude for the support accorded the consultant by various institutions and individuals during the execution of the assignment. First and foremost, we wish to thank the Kenya Airports Authority (the Client) for providing the facilitation necessary for the Consultant to execute his duties. Many thanks to the Malindi Airport Manager for the support he accorded the team in the identification of the proposed project site, various field activities and provision of documents and liaison with other government departments and agencies. We also wish to register our gratitude to the Kilifi County Commissioner, Malindi sub county assistant commissioner, the chiefs and village elders for support in the mobilization and sensitization of the local communities. We highly appreciate the insights and valuable advice from the County Executive Committee Members in charge of Roads and Transport, Physical planning & Lands, Health Services, Water and Environment and Trade and Tourism. Last but not least, we wish to thank the local communities and their representatives for participating in meetings and assisting in various field work activities.

CHAPTER 1

1. INTRODUCTION

1.1 General

Environmental Impact Assessment has been identified as a key tool in the planning and management of key development projects all over the world. EIA aids in decision-making as it identifies potential environmental impacts of proposed project, evaluation of alternative approaches, design and incorporate appropriate prevention, mitigation, management and monitoring measures. Environmental impact assessment cannot be divorced from social impacts of proposed projects, hence the latter is considered as a key dimension of the EIA process. It's therefore in this light that the Kenya Airports Authority (KAA) has commissioned the undertaking of an Environmental and Social Impact Assessment (ESIA) to pave way to the construction of the proposed Malindi Airport Runway extension project. Effective implementation of environmental management instruments is critical in realizing a clean, safe and healthy environment.
It is also worthy to take note that KAA plans to acquire additional land from the community to create room for the extension project. A Resettlement Action Plan (RAP) has been undertaken and a comprehensive RAP report is annexed herewith.

1.2 Project background and rationale of ESIA study

The Malindi Airport Runway extension project is a project of the Kenya Airports Authority (KAA), an autonomous body established in 1991 through an Act of Parliament. Its mission is to provide efficient and effective airport facilities and services in a sustainable environment. KAA is mandated with the responsibility of constructing, operating and maintaining aerodromes, providing rescue and firefighting equipment and services and approves the establishment of private airstrips and controls their operations among other functions. KAA therefore intends to extend the airport runway to meet the current and future market demands. The Authority has therefore contracted Eco-Solutions Limited to carry out the ESIA pursuant to the legal requirements contained in the Environmental Management and Coordination Act, EMCA (1999). This study seeks to evaluate the potential and foreseeable impacts of the proposed development to the surrounding environment and come up with mitigation measures to manage the adverse impacts identified while enhancing the positive ones.

1.3 Objectives and scope of the project

1.3.1 Overall objective

The overall objective of the project is to expand the current runway to allow for direct international flights and operation of larger aircrafts at the airfield. For the realization of this objective, an Environmental and Social Impact Assessment report (ESIA) and a Resettlement Action Plan (RAP) has been prepared for submission to NEMA for approval and issuance of requisite permissions for the construction of the proposed project.

1.3.2 Scope of works

The scope of works for the proposed project includes the following:

ii) The runway rehabilitation works to bitumen surfacing

- Site clearing
- Runway earthworks to detail
- Gravel sub-base, base and wearing course construction
- Bituminous surface treatment and surface dressing
- Marking and signage
- Installation of wind sock

iii) Fencing (chain link and barbed wire fence) and associated crash gates

iv) Storm water drainage works

1.4 Justification of the project

It is significant to note that Kilifi County is one of the counties located along the coast of Kenya that is richly endowed with unique tourist resources. The county has world class tourist destinations that include the white beaches of Watamu, Watamu Marine National Park, the spectacular Marafa Depression/Hell's Kitchen, rare endemic birds and mammals of Arabuko Sokoke Forest, the Kaya Forests and Gede Ruins among other attractions. Malindi Town hosts world class resorts and guest houses. The town is also a major commercial and economic hub of the region. Travel to the town is mainly by road. The airport mainly supports small local flights with a few chartered international flights. **Figure 1** shows an increasing trend of domestic passenger movement from 2007 – 2019 at the Malindi Airport. The increasing passenger numbers is an indication that there is an urgent need for the expansion of facilities at the airport.

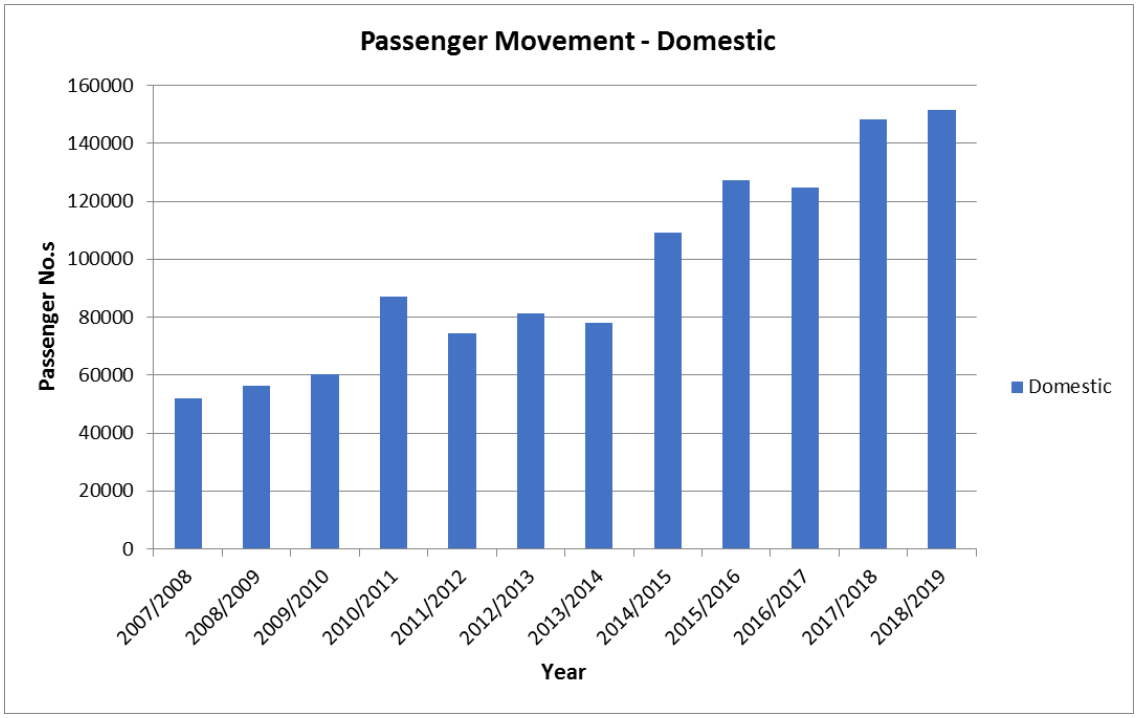

Figure 1: Domestic Passenger Movement at Malindi Airport

In terms of accessibility, the airport is located about 2.5 kilometres from Malindi Town and this will provide the convenience required for quick transportation of goods and people to and fro the airport. Although land for expansion is not readily available, KAA is negotiating with the neighbouring community to give out land for expansion.

The proposed Extension of Malindi Airport runway is therefore expected to spur tourism, commercial and economic growth in the region. Neighbouring counties such as Tana River and Kwale are also likely to benefit from the new planned expansion of facilities that will permit larger cargo airplanes to operate via the route. This will make it easy to travel and transport goods and services to and from the region with reduction in losses.

1.5 Significance of the project

There are a number of positive benefits that will be experienced as a result of implementation of the proposed project. These benefits will be experience both by the local community and the region in general. They include the following among others:

(i) Employment opportunities will be generated during both construction and operation phases of the project. These opportunities will mainly benefit the local people.
(ii) The siting of better airport facilities in Malindi will be prestigious to Malindi town and its surroundings.

(iii) The economy of the area will improve as a result of increased revenue collection that is expected directly as a result of the development of the facility.
(iv) It is expected that the development will attract more investment to the region and property values within the area will go up and this will benefit the local community.

1.6 Objectives of ESIA study

1.6.1 General Objective

The general objective of the ESIA study is to carry out a systematic examination of the likely environmental and social impacts of the project to determine whether the proposed project will impact adversely on the physical and biological elements of the environment within the project area. This is in line with Section 58 (1) of EMCA 1999 that requires proponents to carry out EIA on projects that appear in the Second Schedule of the Act.

1.6.2 Specific Objectives of ESIA Study

(i) To highlight environmental issues of the proposed project with a view to guiding policy makers, planners, stakeholders and government agencies to help them in understanding the implications of the proposed project on environmental elements within the project area;
(ii) To review existing legal, institutional and policy framework relevant to the proposed project;
(iii) To find out impacts associated with the proposed project with an objective of suggesting mitigation measures for the negative impacts;
(iv) To assess the relative importance of the impacts of alternative plans, design and sites;
(v) To generate baseline data for monitoring and evaluation of how well the proposed mitigation measures are being implemented during the project operation period;
(vi) Develop an Environmental Management Plan (EMP) to guide in decision making and for future auditing;
(vii) Raise stakeholder awareness on the impact of the project on the environment with a view to making them understand the implication of the project in their environment; and
(viii) Develop an ESIA report in conformity with the EMCA 1999 and Environmental (Impact Assessment and Audit) Regulations 2003.

1.7 Scope of the ESIA study

The consultant will be required to prepare an ESIA report that will entail a range of issues including but not limited to the following;

- Waste management – collection, handling, storage, transportation and disposal

- Disaster preparedness and management
- Noise and excessive vibration
- Additional land requirements if any and the subsequent effects of displacement of people
- Energy management
- Occupational Health and Safety during the construction and operational phase of the project
- Storm water management and storm water quality
- Effects of increased traffic (vehicular, aircraft and passenger)
- Socio-economic impacts
- Ecological impacts including impacts on biodiversity
- Environmental emergencies e.g. oil spills
- Levels of sanitation, water supply and water pollution
- Fire hazards and bird strike hazard management
- Air quality and air pollution (local air quality and general effects of aircraft and other vehicular emissions)
- Dust pollution
- General effects on the landscape and natural environment

1.8 Overall Approach

The study team's overall approach to the assignment included a comprehensive ESIA study in accordance with both international and Kenyan standards. Impact assessment is a well-established process with standardized terminology and methods. Within this overall framework, key features of the Consultant's approach is to use a multidisciplinary team of experienced Kenyan professionals, stakeholder consultations, use of qualitative and quantitative methods and learning from previous experience in Kenya, Sub-Saharan Africa and elsewhere in the world (methodology is discussed in chapter 2). The purpose of the study is to assist the client in decision-making. This requires that issues are presented in a clear, objective and accurate manner.

1.9 Environmental Impact Assessment Outputs

The output from this environmental impact assessment exercise is a detailed Environmental and Social Impact Assessment report outlining environmental and social impacts and mitigation measures. A comprehensive environmental management Plan has also been prepared as part of this report.

CHAPTER 2

2. ESIA APPROACH AND METHODOLOGY

2.1 General

In order to achieve the objectives of the ESIA study, a mixed method approach was adopted. These involved literature reviews, interviews, questionnaire administration, socio-economic survey and stakeholder public meetings among others. The approach and methods employed have been described in details below.

2.2 Field reconnaissance visit/Scoping

Initial introductory meetings were held between the client and the ESIA team to chat the way forward. The main objective of these meetings was to agree on expectations of the assignment, its execution procedure, focal and reference points of the proposed project and work plan. A field reconnaissance trip was then organized and undertaken to determine the range of issues to be addressed in the ESIA. Significant issues that would need detailed study were identified and these led to the preparation of an Inception Report and TORs for submission to NEMA.

2.3 Literature review

The ESIA team undertook a desk top review of the available reports, development plans and maps in order to compile relevant information about the project and study area. These pieces of information were obtained from libraries, project documents in the custody of the proponent and from other relevant sources. The information sought mainly concerned climate, hydrology, geology, water resources and socio-economics of the project area. Both local and international legislation, policies and procedures applicable to the project were also reviewed.

2.4 Baseline data collection

Field visits were conducted in the study area in order to collect and evaluate site specific information. These included information on the existing physical infrastructures within

the project area, topography; flora and fauna; soils and geology; existing land uses and settlement trends; surface and ground water resources; ambient air quality and noise levels (qualitative); waste management practices; water supply systems, natural resources and cultural heritage of the project areas.

2.5 Stakeholder Consultations

A stakeholder analysis was carried out to identify key participants to be informed and consulted about the project. The purpose of stakeholder consultations was to seek the views and opinions of affected persons, key informants and the public in general so as gain new insights and support for the project. Consultations were conducted through face to face interviews, questionnaire administration and stakeholder meetings. Various stakeholders, among them members of the provincial administration (County Commissioner, Deputy County Commissioner, Chiefs, Assistant Chiefs and village elders), County government officials and Project Affected Persons (PAPs), as well as the general public, were contacted during these consultative meetings.

2.6 Ecological Investigations

Assessment of the existing ecological conditions was carried out by the ESIA team through observations and recordings, photography and engaging the local community members in discussions. Representative transects cutting across the proposed project area were done to give an overview of the ecological conditions.

2.7 Socio-economic survey

The ESIA team conducted a socio-economic survey that targeted households living within the various villages of the proposed airport expansion sites. The survey employed a mix of sampling methods including random, stratified, quota and purposive methods. These techniques helped us determine a representative sample size for different categories of respondents. A sample size of 179 respondents was selected based on geographical location (villages or any other applicable criteria) and type of stakeholders (land owners, traders, among others). A household questionnaire was developed to capture data on demographics, sources of income, assets such as land, buildings and utilities and access to amenities, attitude towards the project and preferred mode of compensation on the loss of land and livelihoods (Sample filled questionnaire has been attached in Annex 9). Key informant interviews were also conducted. The results of the survey are discussed in detail in Chapter 4 of this report.

2.8 Photography

Photographs of various features and land marks within the project and the surrounding environs were taken for record purposes and have been included in various sections of this report.

CHAPTER 3

3. PROJECT DESCRIPTION

3.1 Introduction

Malindi airport is located in the rich historical town of Malindi which is within the sea front of Indian Ocean. Administratively, the airport is located in Malindi sub-county in Kilifi County. Malindi Sub-county covers an area of approximately 627.2 km^2. The airport is located at the western border of the town, directly beside the Mombasa – Malindi Road about 2.5 Kilometres from Malindi Town. It lies along Longitude 031323.679S and Latitude 0400601.891E. The airport currently serves domestic routes and international charters mainly for the purpose of tourism activities. The proposed project is meant to extend the current runway to allow higher capacity airplanes and direct international flights to operate at the airport. Land for the planned extension has been identified and the Kenya Airport Authority (KAA) has made arrangements for acquisition of the same. Besides the planned Environmental and Social Impact Assessment (ESIA), a Resettlement Action Plan (RAP) shall be prepared to guide land acquisition and compensation process. This project is being funded by KAA.

3.2 Existing infrastructural facilities

The main infrastructure at the Malindi airport consist of the following

3.2.1 Terminal building

The main terminal building houses various offices including the KAA administrative offices, Airline offices, Restaurants, KRA and immigration offices, Check-in area, Departure and arrival lounges.

3.2.2 Runways

There are two runways in the airport - Primary and Secondary Runways. The Primary Runway (Runway 17-35) is 1.4 Kilometers long and 30 meters wide while the Secondary runway (Runway 08-26) is 1.1 kilometers long and 20 meters wide. Runway 17-35 is equipped with edge lights of yellow colour. It is also equipped with end lights of colour

red and threshold lights of green colour. Runway 08-26 has no edge lights. Most of the landings and departures are done on runway 17. Runway 35 is used primarily for light aircraft landing.

3.2.3 Apron

This is the area used for parking and refueling of aircraft. The airport apron is 4500m^2 and has two parking bays for medium aircraft. It has a pavement classification of PCN 35/F/A/W/U.

3.2.4 Taxiways

There is one taxiway that connects the apron to the runway facility. Its pavement classification is also PCN 35/F/A/W/U.

3.2.5 Hangers.

There are three hangers in the airport. These hangers are owned by KAA but operated by private operators. Light aircraft maintenance activities are carried out in these hangers.

3.2.6 Navigational facilities

Navigational facilities available at the airport include a Non-directional Beacon, Precision Approach Slope Indicators (PAPI) lights, VOR, DME and runway lighting system.

3.3 The proposed project

3.3.1 Administrative setting

The proposed project expansion site falls under the Malindi Town Location and cuts across Barani and Malindi Central sub-locations. Land to be acquired for the expansion will affect six villages that include Furunzi Barani, Furunzi Central, Bondeni, Ziwani, Majivuni and Mtangani JCC

3.3.2 Geographical location and project characteristics

Geographically the proposed project lies along Latitude -3.194645, -3.223703 and Longitude 40.093106, 40.100199. The site to be acquired measures approximately 2263m by 425m to the North and 204m by 894m to the West of the primary runway (Runway 17-35). The section to the North will extend the total length of the runway to

2.4 km from the current 1.4 km, whilst the expansion to the West will create an additional safety/security buffer zone to the airport (A site layout plan has been attached herewith in Annex 2).

The proposed sites are generally residential areas with high population settlement patterns. There are permanent houses, semi-permanent and mud structures. There are no public facilities like schools and hospitals but a few private schools exist.

Figure 2: Google Earth map showing Proposed Airport Expansion area marked in red

Plate 1: A section of the proposed project site

3.4 Runway Design and Operations (International Standards (ICAO)

Annex 14 to the Convention of Civil Aviation has highlighted several international standards and best practices that may be followed in the design and operations of aerodromes. The standards and specifications mentioned therein shall apply to all aerodromes open to public use in accordance with the requirements of Article 15 of the Convention. The interpretation and application of the specifications requires the exercise and discretion of the competent authority which in this case is KAA. The following specifications and standards are discussed in relation to the construction and design of the extension of the current runway at Malindi Airport.

3.4.1 Length of runways

The ICAO regulations state that except where a runway is associated with a stopway or a clearway, the actual runway length to be provided for a primary runway should be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and should be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes.

When designing a runway, local conditions that may need to be considered include elevation, temperature, runway slope, humidity and the runway surface characteristics. Both take-off and landing requirements need to be considered when determining the length of runway to be provided and the need for operations to be conducted in both directions of the runway. When performance data on aeroplanes for which the runway is intended are not known, guidance on the determination of the actual length of a primary runway by application of general correction factors is given in the Aerodrome Design Manual (Doc 9157), Part 1.

3.4.2 Width of runways

The width of a runway should be not less than the appropriate dimension specified in the following tabulation:

Table 3.1: Runway recommended width (ICAO)

	Code Letters					
Code number	A	B	C	D	E	F
1_a	18m	18m	23m	-	-	-
2_a	23m	23m	30m	-	-	-
3	30m	30m	30m	45m	-	-
4	-	-	45m	45m	45m	60m

a - The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.

Note — The combinations of code numbers and letters for which widths are specified have been developed for typical airplane characteristics.

3.4.3 Slopes on runways

It is recommended that longitudinal slopes on runways be computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length should not exceed:

- 1 per cent where the code number is 3 or 4; and
- 2 per cent where the code number is 1 or 2.

Along no portion of a runway should the longitudinal slope exceed;

- 1.25 per cent where the code number is 4, except that for the first and last quarter of the length of the runway the longitudinal slope should not exceed 0.8 per cent;
- 1.5 per cent where the code number is 3, except that for the first and last quarter of the length of a precision approach runway category II or III the longitudinal slope should not exceed 0.8 per cent; and
- Per cent where the code number is 1 or 2.

3.4.4 Strength of runways

The surface of a runway shall be constructed without irregularities that would impair the runway surface friction characteristics or otherwise adversely affect the take-off or landing of an aeroplane. Surface irregularities may adversely affect the take-off or landing of an aeroplane by causing excessive bouncing, pitching, vibration, or other difficulties in the control of an aeroplane. The surface of a paved runway should be evaluated when constructed or resurfaced to determine that the surface friction characteristics achieve the design objectives.

Measurements of the surface friction characteristics of a new or resurfaced paved runway should be made with a continuous friction measuring device using self-wetting features. The average surface texture depth of a new surface should be not less than 1.0 mm.

When the surface is grooved or scored, the grooves or scorings should be either perpendicular to the runway centre line or parallel to non-perpendicular transverse joints, where applicable. Refer to ICAO Aerodrome Design Manual (Doc 9157), Part 3 for more details.

3.4.5 Runway shoulders

Runway shoulders should be provided for a runway where the code letter is D or E, and the runway width is less than 60 m. Runway shoulders should be provided for a runway where the code letter is F. The runway shoulders should extend symmetrically on each side of the runway so that the overall width of the runway and its shoulders is not less than:

- 60 m where the code letter is D or E; and
- 75 m where the code letter is F.

The surface of the shoulder that abuts the runway should be flush with the surface of the runway and its transverse slope should not exceed 2.5 per cent.

Strength of runway shoulders

A runway shoulder should be prepared or constructed so as to be capable, in the event of an aeroplane running off the runway, of supporting the aeroplane without inducing structural damage to the aeroplane and of supporting ground vehicles which may operate

on the shoulder. Guidance on characteristics and design of runway shoulders is given in in the ICAO Aerodrome Design Manual (Doc 9157), Part 1.

3.4.6 Runway end safety area

A runway end safety area should be provided at each end of a runway strip where the code number is 1 or 2 and the runway is a non-instrument one. A runway end safety area should, as far as practicable, extend from the end of a runway strip to a distance of at least:

i) 240 m where the code number is 3 or 4; or a reduced length when an arresting system is installed;
ii) 120 m where the code number is 1 or 2 and the runway is an instrument one; or a reduced length when an arresting system is installed; and

30 m where the code number is 1 or 2 and the runway is a non-instrument one

3.4.7 Landing direction indicator

Where provided, a landing direction indicator shall be located in a conspicuous place on the aerodrome. The landing direction indicator should be in the form of a "T". The colour of the landing "T" shall be either white or orange, the choice being dependent on the colour that contrasts best with the background against which the indicator will be viewed. Where required for use at night the landing "T" shall either be illuminated or outlined by white lights.

3.4.8 Runway markings

Runway markings shall be white. At aerodromes where operations take place at night, pavement markings should be made with reflective materials designed to enhance the visibility of the markings.

A runway centre line marking shall be provided on a paved runway. A runway centre line marking shall consist of a line of uniformly spaced stripes and gaps. The length of a stripe plus a gap shall be not less than 50 m or more than 75 m. The length of each stripe shall be at least equal to the length of the gap or 30 m, whichever is greater

3.4.9 Touchdown zone marking

Chapter 5 Annex 14, chapter 5 provides that a touchdown zone marking be provided in the touchdown zone of a paved precision approach runway where the code number is 2, 3 or 4. A touchdown zone marking shall consist of pairs of rectangular markings

symmetrically disposed about the runway centre line with the number of such pairs related to the landing distance available

3.4.10 Perimeter fencing

ICAO Annex 14, Chapter 9 requires that suitable means of protection be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome. A fence or other suitable barrier shall be provided on an aerodrome to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft.
The specific recommendations concerning airport perimeter fencing, contained on page I-4-42 of Chapter 4 of the latter manual, state that the fencing should have a minimum height of 2.13 metres with a total height of 2.44 metres including several strands of barbed wire. The fencing should be metal chain link supported by reinforced concrete posts, steel stanchions or the fence should be steel-rodded.

3.4.11 Pavement Maintenance

Chapter 10 of Annex 14 further recommends that the surfaces of all movement areas including pavements (runways, taxiways and aprons) and adjacent areas shall be inspected and their conditions monitored regularly as part of an aerodrome preventive and corrective maintenance programme with the objective of avoiding and eliminating any foreign object debris (FOD) that might cause damage to aircraft or impair the operation of aircraft systems.

3.5 Site Ownership

The proposed project site is owned by the local community but the Kenya Airports Authority (KAA) is engaging the community in negotiations to acquire the land. The land has already been surveyed and valuation of individual land and property completed. Compensation shall be effected before relocation and commencement of project construction.

3.6 Runway Construction Activities and Inputs

Proposed activities for the construction of the runway to bitumen surface will involve site clearance, runway earthworks to detail, gravel sub-base, base and wearing course construction, bituminous surface treatment and surface dressing, markings and signage, installation of culverts, gabions and storm water drainage works. Other works include fencing (chain link and barbed wire fence) and associated crash gates. These activities

will be actualized upon the availability and mobilization of certain inputs as discussed in this subsection.

3.6.1 Inputs during construction

Land is necessary for the extension of the proposed runway. KAA is in the process of acquiring land for expansion from the local community. The proposed site has been surveyed and mapped. The valuation process has also been done to give way for compensation and resettlement. Water for construction activities will be sourced from the Malindi Water and Sewerage Company water supply network while both skilled and unskilled labour is available within the project area. Materials such as building sand, gravel, natural stones, timber, iron sheets for roofing, among others, will be required during the construction stage. Other materials required include concrete blocks for constructing selected internal and external pavements, precast units for drains, double arm poles for overhead lighting, PVC pipes for sewer and water reticulation, barbed wires and chain link for security fence, water tanks and aluminum gutters. Construction tools and equipments including vehicles and earthmoving machinery will also be required at this stage.

3.6.2 Inputs during operation.

During operation stage, input required will be those that are consistent with airport operations. Fuel (both vehicle and jet fuel) power generators, firefighting equipment, meteorological devises, aircraft communication equipment, security surveillance equipment, among others are some of inputs that will be required at this stage.

3.6.3 Project activities

Activities to be carried out during implementation of the proposed project include the following:

(a) Site Mobilization activities

This will involve the transportation of plants, vehicles and personnel to the construction site. Major plants that will be required in this project include earthmoving plant, concrete mixers, welding machines and transmission machines. The contractor will also mobilise human resources to the site.

(b) Site Clearance

The site being a settled area has several items that will require clearance, re-routing or re-aligning. These include electric poles and wires, underground water pipes, debris and material from buildings, vegetation and tree stumps among others. This will be restricted to project alignment areas so as to ensure minimum disturbance to the environmental elements within the vicinity of the project site.

(c) Construction Regulations and Standards

The project shall follow all industry regulations, standards and best practices during the implementation of construction activities. Engineering designs and approved drawings and specifications shall be implemented in accordance to an approved programme of work and industry standards. The construction works will be supervised by a competent engineers' representative who will be approved in writing by the engineer, provided that the construction of the works shall not proceed without first obtaining the necessary approval from NEMA.

3.7 Existing Technology

The construction will involve earthworks and normal civil engineering construction procedures. The construction is expected to conform to the design drawings, specifications, bills of quantities, and the conditions of contract for engineering works. Expected programme of operations may be as follows:

(i) Signing of the contract, and receiving the order to commence from the engineer
(ii) Provision of the required guarantees and insurances
(iii) Construction work in accordance to the design and specifications
(iv) Inspection of construction works and issuance of substantial completion certificate by the engineer
(v) Defects corrections during defects liability period (DLP)
(vi) Handing over of the completed works, and issuance of completion certificate by the engineer

3.8 Products and by-products

The facility, being an Airport, will offer air travel services for both passengers and cargo. There are no by-products associated with the project

3.9 Wastes

There will be several categories of waste from the project site. The main categories of waste will be solid waste, liquid waste and gaseous waste, all emanating from construction, operation and decommissioning phases of the project. Whereas human waste will be disposed of on-site (pit latrines), solid waste will need to be properly managed to avoid attracting scavenging birds and animals.

3.9.1 Solid waste generation

3.9.1.1 Solid waste generation during construction process

Solid wastes during construction period will emanate mainly from excavation and trenching works during construction of Runway and access roads. Construction will result in the creation of various solid wastes, principally surplus earth and rock, metal scraps, plastics (wrappings and containers), cardboard, paper, wood, office wastes including e.g. kitchen (canteen) wastes, workshop wastes including e.g. used oil filters, and waste concrete. The generated solid wastes associated with this phase of the project can be summarised as follows:

(i) Organic wastes including food remains, vegetation due to landscaping etc
(ii) Papers and other stationeries
(iii) Workshop wastes e.g. used oil filters etc
(iv) Non- biodegradable wastes, plastics, polythene, glass, metal,
(v) E-waste, batteries, other electronics
(vi) Waste oil from vehicles, machines,

3.9.1.2 Solid waste generation during operation period

With the expansion of the runway, it's anticipated that airplane traffic volumes will increase. Wastes during operation phase of the project will then be associated with increased volume of passengers and may include packaging wastes from the various packaging materials, trash from offices of airport operators and organic wastes from food remains at the facility.

3.9.2 Wastewater generation

3.9.2.1 Wastewater generation during construction phase

These will be mainly water used in the construction activities and may be contaminated by construction materials including sand and cement. Storm water runoff from the site is expected to contain suspended sediments, some petroleum hydrocarbons, etc. Rapid

runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding stream beds and banks.

3.9.2.2 Wastewater generation during operation phase

At operation phase, wastewater will emanate from airport operations including in the restaurant and other areas. It may also contain suspended sediments and petroleum hydrocarbons.

3.9.3 Dust/ air pollution

3.9.3.1 Gaseous emission during construction stage

Dust emission is expected during construction when dust from traffic, construction activities and construction machinery will be emitted. The principal dust sources will be vehicles travelling on unpaved roads and tracks, and dust from exposed, non-vegetated surfaces. Some dust will also be generated during excavation works, by blowing from dump truck loads, and possibly from project borrow pits and quarries.

3.9.3.2 Gaseous emissions during operation stage

During operation stage, there shall be gaseous emissions from aircrafts and vehicles that shall use the airport.

3.10 Estimated project cost

The construction of the proposed runway extension and associated works are estimated to cost Ksh. 1,000,000,000.

CHAPTER 4

4. BASELINE INFORMATION

4.1 Physical Environment

4.1.1 Geographical Location

The Malindi airport is located at the western border of Malindi Town, directly beside the Mombasa –Malindi Road. The site lies along lies along Latitude -3.194645, -3.223703 and Longitude 40.093106, 40.100199. Within the national context, the airport is located in Kilifi County, one of the six counties in the Coast region of Kenya. The County lies between latitude 2020" and 400" south, and between longitude 39005" and 40014" East. It borders Kwale County to the South West, Taita Taveta County to the West and Tana River County to the North, Mombasa County to the South and Indian Ocean to the East. The county covers an area of 12,370.8km2

4.1.2 Climatic characteristics

Malindi sub-county as in the rest of Kilifi County has two main rainy seasons with average annual precipitation ranging from 300mm in the hinterland to 1,300mm in the coastal belt. The short rain season is experienced in the months of October, November and December while the Long rains are experienced in the months of March–April and May. The annual temperatures range between 21°C and 30°C in the coastal belt and between 30°C and 34°C in the hinterland. The county experiences a very important wind field with relatively moderate wind speeds ranging from 4.8Km/h along the coastal strip to 12km/h in the hinterlands.

4.1.3 Topography and Geology

Malindi sub-county rises from the coastal plains through a foot plateau to a low coastal range up to the Nyika plateau to an elevation of 300 m.a.s.l. The coastal plain comprises a limestone coral reef and a narrow belt, varying in width between 3 km and 20 km, and lying below 30 m above mean sea level.

Malindi town could be divided into three broad landscape units: the beach, the coral landscape and the plateau. The beach is characterized by coral cliff, sandy soil and is an unstable new dune formation. The coral landscape consists of higher situated old reefs and lagoons. It is characterized by depressions with clayish soils and areas susceptible to

water logging. The plateau is a prominent area of shallow sandy clay soils underlain by coral limestone rock. It is located above the 4.5 m contour. Through the old town from the old market until the Lawfords Hotel stretches a depression, which was an old lagoon and a geological sea arm. Most of the surface run off and storm water of Malindi West and North catchments with an area of approximately 10.56 km^2 drains towards this central lagoon and ultimately into the sea.

4.1.4 Drainage and storm water run off

Preliminary site assessment revealed that the proposed project site has poor drainage system. There are no storm water management facilities within the area and rain water was seen stagnating on various locations. Construction and extension of runway, taxi ways, access roads and other airport facilities increase hard surfaces that will generate high volumes of storm water and runoff. This will need to be planned and managed through appropriate drain design and installation of appropriate drain components in consideration of the receiving environment. Storm water management should not be confined to the Airport. Emphasis should be made to ensure storm water generated from the expanded airport is taken beyond the airport boundaries. KAA and Malindi sub-county engineers to work together to find a route to take the storm water from the airport to the ocean but ensuring no oil contamination as well.

4.1.5 Water Resources

The main sources of water in the sub-county are river Sabaki, seasonal streams, boreholes and water pans. The Baricho well field, which is located in Lango Mbaya location, along River Sabaki in Malindi Sub County constitutes the main water supply system. Outside the Baricho water supply and a few boreholes, the quality of water is poor, leading to water borne diseases. However, access to clean drinking water is a major problem across the sub-county. The average distance to water sources for both people and livestock under normal circumstances is 0-3.5 km. Another significant water body in the sub county is the Indian Ocean whose water is not used for domestic purposes due to salinity.

4.1.6 Ecological Conditions

The county is divided into five Agro-Ecological Zones (AEZ) defining areas with similar production related characteristics such as annual mean temperatures, vegetation and humidity. These zones include the following:-

a) Coconut-Cassava Zone: This zone covers the coastal uplands and the low-level coastal plains and has the highest potential for crop production in the county. The

zone receives an average annual precipitation of 1,300mm per annum and a mean annual temperature of 24°C.

b) Cashewnut-Coconut zone: this zone stretches northwards along the coastal plain up to Arabuko Sokoke forest. The zone receives an average precipitation of 900mm and mean annual temperature of 240C.
c) Livestock-Millet Zone: The zone is of lower agricultural potential with annual precipitation ranging from 700mm to 900mm. The area is suitable for dry land farming supporting drought tolerant crops and ranching activities.
d) Lowland Ranching: This zone varies in altitude from 90m to 300m with annual mean temperature of 270 Celsius and annual precipitation of 350mm to 700mm. The major activities within this zone are ranching and wildlife.
e) Coconut Cashew Nut – Cassava Zone: this zone is mainly found in Kilifi South and North constituencies and is the smallest of all the zones. It lies in the altitude between 30m to 310m above mean sea level with mean temperature of 270 Celsius and annual precipitation of 900mm per annum.

4.1.7 Ambient air quality

The state of ambient air quality at Malindi Airport is a complex issue that is influenced by a myriad of factors apart from aircraft emissions. The airport is in close proximity to Malindi town where transport, industrial and agricultural activities may negatively contribute to atmospheric air quality. However, with the planned extension of the current runway, there will be a change in the pattern and type of aircraft operating within the airport, since the airport will be able to handle more and larger aircraft. Air pollutants such nitrogen oxides, carbon monoxide, carbon dioxide, shoot and other fine particles emitted by aircraft may increase. These may affect air quality at local, regional and global environments especially through global warming. These pollutants can also pose danger to human health.

According to a forecast done by the Kenya National Airport System Plan (KNASP) 2010, the amount of CO2 emissions from Malindi Airport will increase substantially by 2030. However with the outbreak of Covid 19 disease, both domestic and international flights have been affected. The number of domestic and international flights have substantially reduced meaning that the air pollutants anticipated from aircrafts have also reduced. KAA should initiate an air quality monitoring program at the airport to give an accurate picture of air quality at the airfield.

4.1.8 Noise environment

The existing noise environment at the Malindi Airport mainly consists of noise from aircraft movement and operation and the vehicular transport along the highway, and to and from the airport. Noise is an important consideration in relation to airport development. With the planned expansion of the airport, bigger aircrafts with more powerful engines will be permitted to operate to and from the airport. Additionally, the noise impact will be amplified with the increasing frequency of aircraft landings and take-offs.

4.2 Biological Environment

The project site is covered mainly by planted vegetation which includes fruit trees such as mangoes, palm trees and crops such as cassava, cashew nuts and coconuts. Natural vegetation consists of acacia trees, bushes and grasses useful for livestock grazing. The site is also home to birds and insects of various types.

At the sub county level, vegetation can be divided into three major vegetation zones: Lowland dry forest (Arabuko-Sokoke Forest), mangroves and swamps. Arabuko-Sokoke Forest covers the coastal strip stretching some 1 to 1.5 km from the shoreline inward and from the Mida Creek in Watamu all the way to Sabaki River Delta. The hinterland of Malindi mainly consists of three different vegetation zones, namely: Acacia Euphorbia bush land; Tropical monsoon forest and Manilkara-Acacia Savannah.

The Sokoke forest is home to a wide diversity of both flora and fauna. Both small and large mammals can be found here including rare and unique birds such as the East Sokoke Akalat, Amani Sunbird, the Clarke Weaver and the Sokoke Scops Owl.

4.3 Socio-economic environment

This section presents the key findings of the household socio-economic survey of the project affected persons. It is also worthy to note that a literature review was conducted to inform and augment the results of the socio-economic survey. Among the household characteristics covered include land use and ownership, water and sanitation services and access, health services and access, transport and communication, education services and access.

4.3.1 Population Size

The recently concluded Kenya Population and Housing Census of 2019, gives the population of Kilifi County as 1,453,787 composed of 704,089 male and 749,673 Female. Malindi sub-county has a population of 333,226, whereby 163,351 are male and 169,866 are female. The airport is located within the Malindi urban area which has a population of 119,859 comprising of 58,113 males and 61,742 females (KNBS 2019).

There is a significant growth in population of Malindi urban which according to KNBS 2009 census had a total of 84,150 people in 2009 but had 119,859 people in 2019.

4.3.2 Sources of Livelihoods

Assessment of the source of employment considered seven broad categories of gainful employment for the adult population (excludes children). The findings of the sources of livelihoods are presented in Table 4.1

Table 4.1: Respondents sources of income

		Frequency	Valid Percent	Cumulative Percent
Valid	Civil servant	8	4.5	4.5
	Private sector employee	22	12.3	16.8
	Casual labour	28	15.6	32.4
	Self-employed	85	47.5	79.9
	Unemployed	32	17.9	97.8
	Student	1	.6	98.3
	Church Pastor	3	1.7	**100.0**
	Total	**179**	**100.0**	

Results of data analysis presented in Table 4.1 shows that 47.5 percent of the households earned their living from self-employment. This was followed by casual labourer (15.6%), private sector employee (12.3%) and civil servants (4.5%).

4.3.3 Household Income

The study sought to understand the levels of household incomes in the study sites. Table 4.2 provides a summary of the income ranges in the overall samples.

Table 4.2: Income Range for Households in the area

		Frequency	Valid Percent
Valid	Below 10,000	52	30.8
	10,001-20,000	48	28.4
	20,001-30,000	30	17.8
	30,001-40,000	21	12.4
	40,001-50,000	9	5.3
	Above 50,000	9	5.3
	Total	**169**	**100.0**

The results of the data analysis as presented in Table 4.2 show that 30.8% of households either have an income of KShs 10,000 or less or no regular income at all. This suggests that majority of the households (HH) are poor. Those earning between KShs 10,000 and KShs 20,000 form 28.4% of the population. 17.8% of the HH earn between KShs 20,000 and KShs 30,000 while 12.4% earn between KShs 30,000 and KShs 40,000. The remaining 5.3% earn between KShs 40,000 to KShs 50,000 and above KShs 50,000.

4.3.4 Land Use and Ownership

According to the socio-economic survey conducted at the project site, 69.7% of the land use is under buildings. This was followed by trees that comprised of 26.9% of the land use. There is very minimal use of land for pasture and arable farming as only 2.3% and 1.1% respectively reported land use under these categories. Only 5.7% of the land use is purely on commercial use.

Different types of land ownership were recorded during the survey in the Project Area. These were, ownership of land through Freehold title (4.5%), leasehold title (10.1%), leasing/rental (3.4%), squatter (41.3%), bought through agreement (38.5%) and ownership of the ancestral land (2.2%). Majority of the land parcels in the project area fall in the category of squatter that comprise 41.3% of the sample survey. Table 4.3 gives a summary of the different types of land ownership in the area.

Table 4.3: Land Ownership/Occupancy in project area

		Frequency	Valid Percent
Valid	Freehold title	8	4.5
	Leasehold title	18	10.1
	Leasing/rental	6	3.4
	Squatter	74	41.3
	Bought through agreement	69	38.5
	Ancestral	4	2.2
	Total	**179**	**100.0**

4.3.5 Transport Network

a) Road Transport

There are two principal roads in Malindi sub-county, which include the 45 km tarmac road coming from Mombasa/ Kilifi and passing through Malindi town to Garsen (B 8), and the 185 km road coming from Malindi town to Sala Gate (Tsavo Road) in east-west direction (C 103). There is a Bus Park located within Malindi Town that serves a number of buses and Matatus. There are frequent bus service connections to Mombasa, Watamu and Nairobi. Apart from a small part of the Ganda Road that cuts across the project site, the rest of the roads are earth roads. 65.7%% of the respondents rated the condition of access roads as average while 26.4% rated them as being in poor condition. The most common mode of travel in the area is motor cycle (79.3%) and the use of Tuk Tuk (11.7%).

b) Air Transport

The Malindi Airport situated to the western border, directly beside the Mombasa – Malindi Road, is the main airport with flights to Nairobi, Mombasa, Malindi and Lamu.

c) Marine Transport

In marine transport, Kilifi County has a total of five jetties located at Mtwapa, Kilifi, Ngomeni, Malindi and Takaungu. Malindi has a port that consists of a pier in sound condition, used as a landing site in the unsheltered sea mainly serving the local fish industry. There is a jetty for fish landing on the beach handling approximately 1,250MT per year and 8000 tourist boat moves.

4.3.6 Tourism and wildlife

With the expected expansion of Malindi Airport the economy of the area is expected to grow significantly through an increase of tourist flow numbers. Malindi is a popular tourist destination as evidenced by the presence of several hotels registered as tourist Class hotels. Malindi and Watamu Marine Parks are UNESCO designated biosphere reserves that are a critical habitat for some indigenous and migratory bird species. Tourist flow to Malindi and Watamu Marine Parks stood at 27,650 in 2017.
Generally Kilifi County is rich in endemic flora and fauna, attractive physiographic features and tropical climate, and sites of historical importance that makes it a unique tourist destination. The County is endowed with sunny and sandy beaches, magnificent landscapes, tropical and marine forests and swamps that are home to endemic flora and fauna. Further, the County has a rich cultural and historical heritage that includes Swahili/Arab and Mijikenda cultures, world heritage sites like the Kaya forests and archaeological monuments such as those in Gede, Malindi, Takaungu, Mnarani and Rabai, dating back to the slave trade period.

4.3.7 Health Access

Malindi has numerous public and private health facilities. Some of the health facilities that are within the immediate vicinity of the airport include the Malindi sub-county hospital, the Star hospital, the Tawfique hospital, Galana hospital and St. Peters hospital. There are also several private health clinics and medical facilities within the town. Malindi Sub County hospital has a total bed capacity of 158 beds. The health facilities are adequate and are able to meet the needs of the local population as well as handle any medical emergencies arising from Malindi Airport. Table 4.4 presents study results on

the most common diseases that were reported among the area residents. The most common disease in the area is common cold (41.5%) followed by Malaria (17%) and skin diseases(11.3%).Other diseases were only minor and accounted for less than 10% of the reported cases.

Table 4.4: Common diseases in the area

Some common diseases in the area			
		Frequency	Percent
	Malaria	9	17.0
	Diarrhea	1	1.9
	Amoeba/typhoid	5	9.4
	Skin disease	6	11.3
	Accident patient	3	5.7
	Common cold	22	41.5
	Kidney problem	1	1.9
	Tooth pain	1	1.9
	Ulcers	3	5.7
	Pregnancy problems	2	3.8
	Total	**53**	**100.0**

4.3.8 Education

Pwani University is the only public university in Kilifi County with an enrolment of approximately 8,000. There are also campuses of four universities including Mt. Kenya University and Nairobi University, located in Malindi town, offering different market driven courses. Additionally county has nine private accredited colleges; one middle level college (KMTC Kilifi) and 28 youth polytechnics. These institutions offer youth a chance to further their skills to make them competitive in the labor market. As for school attendance, 63.4% of respondents stated that their children attend public schools while 35.9% attend private schools. The biggest challenge facing school attendance in the area is the high cost of fees as reported by 74% of respondents. Parents who do not want their children to attend school is another challenge that account for 14.2% of responses.

4.3.9 Water and Sanitation

The survey revealed that majority of the PAPs relies on public tap as a source of drinking water (58.8%). Those that reported to have piped water inside the house comprised of 35.6% of respondents. The significant quantity of piped water use reflects the urban nature of the project area. The 5.1% who use other sources largely rely on water

purchased from water vendors. Majority (89.3%) of households spend less than 15 minutes to access water for drinking.

The most commonly used type of sanitation facility at the site is Flush toilet (50.6%), followed by pit latrine 30.2%, while VIP account for 12.2% of respondents. A paltry 5.2% do not have any developed sanitary facility (use the bush) to answer the call of nature. Most solid wastes (48.6%) is dumped on dump site, 26.3% on dust bin while 21.1 % through their solid waste outside the house. Improper waste disposal leads to environmental pollution and attracts scavenging birds that may cause harm to the planes using the airport. Table 4.5 shows the distribution of type of sanitation facility from the 172 household surveyed.

Table 4.5: Distribution of Sanitation facility by household

		Frequency	Valid Percent
Type of Toilet facility			
Valid	None	9	5.2
	Open pit latline	3	1.7
	pit latline with raised slap	32	18.6
	pit latline with no raised slap	20	11.6
	VIP	21	12.2
	Flush	87	50.6
	Total	**172**	**100.0**
Solid Waste Disposal			
Valid	Private service provider	5	2.9
	Dump site	85	48.6
	Bin	46	26.3
	Outside the house	37	21.1
	Open waste drainage	2	1.1
	total	**175**	**100.0**

Liquid waste disposal is a major environmental challenge in the Malindi Urban area. This is because there is no central sewerage treatment system in Malindi Municipality. Sewage management is through septic tank systems. The water used at the airport and its environs is obtained from the piped supply system of MAWASCO. There is no surface water source within 300metres of the Airport, apart from a swampy area nearby (Ziwa la Furunzi).

4.3.10 Energy sources

The respondents were interviewed regarding their energy sources for cooking, lighting and for sound equipment and the resultant analysis are as shown in Table 4.6. The main source of cooking energy is from charcoal that represents 58.4% with firewood being the second main source at 23.1%. LPG is used by 15% of respondents. With regard to energy source for lighting, 66.7% use electricity, 12.6% use kerosene while solar use is

also reasonable and account for 19.5%. Electricity and solar are two main sources of energy for sound equipment and account for 76.8% and 17.2 % respectively.

Table 4.6: Household Energy sources

		Frequency	Valid Percent
	Main source of energy used for Cooking		
Valid	LPG	26	15.0
	Electricity	2	1.2
	Firewood	40	23.1
	Charcoal	101	58.4
	Kerosene	4	2.3
	Total	**173**	**100.0**
	Main source of energy used for lighting		
Valid	Electricity	116	66.7
	Kerosene	22	12.6
	Solar	34	19.5
	Pressure lamp	2	1.2
	Total	**174**	**100.0**
	Main source of energy used for sound Equipments		
Valid	Electricity	116	76.8
	Solar	26	17.2
	Battery	2	1.3
	Dry cell	7	4.6
	Total	**151**	**100.0**

Malindi airport is connected to KPLC electricity supply grid and has a standby backup generator in case of power failure.

4.3.11 Attitudes towards the project

In regard to awareness, 97.8% of respondents were aware of the proposed project while only 2.2%% were not aware. The main benefits pointed out are job creation (56.3%) and increase in the number of tourists (19.2%). Respondents are also aware that the proposed project is likely to pose some challenges. These problems include relocation of the people from their land (38.3%), disruption of social life (19.1%), and increased level of crime when people are moved (14.2%) and noise pollution from the aircrafts using the airport.

4.3.12 Security, Law and Order

There exist cases of radicalization of youths in various areas of Kilifi County notably Mariakani, Kikambala, Kilifi, Watamu, Malindi and Mambrui. Youth radicalization for terrorism activities seems to be on the rise. It is therefore important that adequate

resources are mobilized and allocated to ensure safety and social order at the airport at all times. Generally, Kilifi County seem to be a haven of Violent Extremism and radical groups recruitment and pockets of cells of organized criminal and outlawed groups (including terrorist groups). However, the last terrorist attack in the County occurred in Kikambala in November 2002 (KCIDP 2018 - 2022).

4.4 Socio-cultural environment

The only cultural sites noted at the proposed project site were graves. Some families had up to seven graves while others did not have. The graves were valued for compensation during relocation. There were no historical or sacred places within the proposed project site.

CHAPTER 5

5. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

5.1 General

This chapter presents a discussion of the various national policies, rules and regulations that are applicable to the implementation, operation and decommissioning phases of the proposed project. In addition, relevant international conventions, agreements, protocols and World Bank policies have also been discussed. A review of the various policies, rules, regulations guides the proponent to carry out project activities in adherence to the law governing the various sectors linked to the project.

5.2 National Policies Relevant to the proposed Project

Table 5.1: Constitution of Kenya and National Policies

Policy	Requirements	Relevance to the proposed project
The Constitution of Kenya	The Constitution of Kenya, 2010 provides a broad framework along which all national and sectoral legislative documents are drawn. In relation to the environment, article 42 of chapter four, *The Bill Of Rights*, confers to every person 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 measures, particularly those contemplated in Article 69, and to have obligations relating to the	In conformity with the Constitution of Kenya, every activity or project undertaken within the republic must be in tandem with the state's vision for the national environment as well as adherence to the right of every individual to a clean and healthy environment. The proposed project is a central development activity that utilizes sensitive components of the physical and natural environment hence need for a clearly spelt out environmental management plan to curb probable

	environment fulfilled under Article 70. Chapter 5 of the document provides the main pillars on which the environmental statutes are hinged. Part 1 of the chapter dwells on land, outlining the principles informing land policy, land classification as well as land use and property. The second part of this chapter directs focus on the environment and natural resources. It provides a clear outline of the state's obligation with respect to the environment.	adverse effects to the environment.
The National Environment Policy, 2013	This policy framework was formulated to ensure sustainable management of the environment and natural resources for sustainable development. Objectives of the policy includes the provision of a framework for integrated approach to planning and sustainable management of Kenya's environment and natural resources; Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; and ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods.	The project shall be implemented guided by the core principles of the policy of a clean and healthy environment and a duty to safeguard and enhance the environment, the right to development in consideration of sustainability, resource efficiency and economic, social and environmental needs. Environmental resources will be utilized in a manner that does not compromise the quality and value of the resource or decrease the carrying capacity of supporting ecosystems and in support of the stakeholders
Vision 2030 Kenya	The development blueprint, states that the	The expansion of Malindi Airport is in line with

	Government aims at making Kenya the aviation hub in the African region through construction and modernization of aviation facilities and targets an annual capacity of 45 million passengers.	the government policy of modernization and expansion of aviation facilities countrywide by the year 2030.
National Land Policy of 2009	The policy recognizes that land is critical to the economic, social, and cultural development of Kenya and that the use of land in urban and rural areas as well as in the land/water interface has been a major area of concern to all Kenyans. Problems of rapid urbanization, inadequate land use planning; unsustainable production, poor environmental management, inappropriate ecosystem protection and management are commonplace and require appropriate policy responses. The policy further recognizes that land use planning is essential to the efficient and sustainable utilization and management of land and land based resources and gives guidelines on development of land in urban and peri-urban areas. It also recognizes that sustainable land use practices are key to the provision of food security and attainment of food self-sufficiency and that Kenya faces a number of environmental problems including the degradation of natural resources such as forests, wildlife, water, marine and coastal resources as well as soil erosion and the pollution of air, water and land. To	The planning principles outlined in this policy should guide the process of implementation of the proposed project and public participation, a major component environmental assessment and audits should always be carried out to ensure that all stakeholders are aware of any planned project activity.

	conserve and manage the environment, measures on conservation and sustainable management, ecosystem protection, urban environment management, environmental assessment and audits, shall be undertaken. The policy recognizes Environmental Assessment and Audit as Land Management Tools	
The National Environmental Action Plan (NEAP) 2009 - 2013.	The NEAP was a deliberate policy effort to integrate environmental Considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources are an integral part of societal decision making. The NEAP proposes interventions of identifying environmental problems and issues, raising environmental awareness, building national consensus, defining policies, legislation and institutional needs and planning environmental projects.	The proposed project will interact with the various elements and components of the physical, social and economic environments in ways that could lead to negative impacts. Issues of environmental integrity will be addressed through robust environmental assessment processes and public participation.
Kenya Airports Authority Group Environment Policy	Kenya Airports Authority (KAA) is fully committed to achieving the highest possible standards of environmental management across all areas of its business, as part of the Authority's	The proposed project falls within the mandate of Kenya Airports Authority and this Environmental and Social Impact Assessment has been carried out to ensure that construction and operation of the

	mandate of ensuring the safe and efficient operation of its airports. All KAA activities are planned and managed in an environmentally responsible manner and the Authority works within the principles of Sustainable Development to ensure that their activities do not compromise environmental integrity. In operating, maintaining and developing airports, the Authority is committed to among others complying with relevant environmental legislation, regulations and standards; identifying, preventing, controlling and minimizing adverse impacts on the environment caused by KAA's operations by taking appropriate action(s) by taking appropriate actions to mitigate the same and implementing specific measures and setting environmental objectives and targets to prevent pollution, minimize energy and materials consumption, conserve water and reduce waste at source. The Authority has dedicated the staff and resources necessary to meet these policy commitments.	proposed airport does not in any way compromise the integrity of the neighbouring environment. In compliance with this policy, the Authority will continually measure, monitor and report the performance of the airstrip's environmental management programme and identify opportunities for continual improvement

5.2 Legal Framework

The proponent (KAA), project implementing agencies and state lead agencies have a legal duty and responsibility to ensure that the various national statutes and regulations are strictly adhered to, to safeguard the environment, public health and safety. Table 5.2 gives a brief discussion of the key national and sectoral laws that have direct relevance to the proposed project.

Table 5.2: Relevant Legal Framework

Legislation / Act	Requirements	Relevance to the proposed project
Environmental Management and Coordination Act, 1999 (EMCA)	The Environmental Management and Coordination Act 1999 was amended in 2015 and provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. Section 58(1) of the Act states that "notwithstanding any approval, permit or licence granted under this Act or any other law in force in Kenya, any person being a proponent of a project shall, before carrying out, executing, or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the second schedule to this Act submit an Environmental Impact Assessment Project report"	Environmental Management and Coordination Act provide a legal and institutional framework for the management of the environment- related matters. This report has been prepared pursuant to section 58 (1) of this Act. The proponent is expected to comply with Part II on General principles by ensuring that environmental conservation and protection are given the priority throughout project's life span. Other sections that the proponent should comply with include Part VII Section 71 (1) on water quality Standards, Section 78 on air quality standards, Section 86 on standards for waste, and Section 101 on standards for noise. These should be done by avoiding acts of pollution of water, air; ensuring that proper infrastructure for solid waste management is developed and noise levels especially during construction period are within regulatory limits stipulated in the Noise and Excessive Vibrations Pollution (Control) Regulations 2009.
Kenya Airports Authority Act Cap 395	The Act established the Kenya Airports Authority in 1992. It provides for the powers and functions of the Authority. It mandates KAA to among other things	The Authority should comply with Part III that gives the board several functions under subsection 1 including administering, control and

	manage civilian airports and airstrips efficiently and profitably; provide, develop and maintain such services and facilities that are necessary or desirable for the efficient operation of the aircrafts; provide rescue and firefighting equipment and services at the airports and approve the establishment of private airstrips and control the operations thereof.	management of aerodromes and any other property vested in it; provision of rescue and firefighting equipment and services at aerodromes; and subsection 2 to construct, alter or maintain buildings at aerodromes or elsewhere among other things. The Authority should comply with Section 12 of the Act which gives the Authority powers to construct, operate and maintain aerodromes and other related facilities; and to provide such other amenities or facilities for passengers and other persons making use of the services or the facilities provided by the Authority as may appear to the board necessary or desirable.
The Civil Aviation Act No. 21 of 2013	The Civil Aviation Act 2013 (amended in 2016) provides for the control, regulation and orderly development of civil aviation in Kenya and for matters incidental thereto or connected therewith. The Act establishes the Kenya Civil Aviation Authority KCCA under Section 4 (1) whose role is to plan, develop, manage, regulate and operate a safe, economical, and efficient civil aviation system in Kenya in accordance with the provisions of the Act. The Act empowers the Cabinet Secretary in charge of Transport, under Part V section 56 (1) of the Act to	KAA should comply with Part V on provisions relating to prohibitions, offences, exemptions, etc and should comply with several sections within this part. Section 56 (1) on restriction of building above a height specified in declared areas in the interests of the safety of air navigation should be adhered to. The authority should also comply with Section 57 on control of structures etc. on or near aerodromes in the interest of civil aviation safety and security or efficiency of air navigation The Authority should also comply with Section

	prohibit the erection of buildings or structures above a certain height in declared areas; where he considers it to be necessary in the interests of the safety of air navigation, by order published in the Kenya Gazette. Part V section 57 gives the Director- General of KCAA powers to Control structures, etc., on or near aerodromes if the Director-General considers that provisions for the safety or efficiency of air navigation ought to be made by lighting or otherwise for giving aircraft warning of the presence of any building, structure, tree or natural growth or formation on or in the vicinity of an aerodrome; or by the removal or reduction in height of any such obstruction. Section 58. (1) stipulates that any person who trespasses on any land forming part of a Government aerodrome or an aerodrome licensed under regulations made under this Act commits an offence and shall be liable on conviction to a fine not exceeding five hundred thousand shillings or imprisonment for a term not exceeding one year or to both provided that at the material time, notices warning trespassers of their liability under this section were posted so as to be readily seen and read by members of the public.	58 (1) on Trespass which stipulates that any person who trespasses on any land forming part of a Government aerodrome or an aerodrome licensed under regulations made under this Act commits an offence. Subsection 2 prohibits domestic animals

	Subsection 2 prohibits domestic animals from trespassing into the airstrip and the sniffer dogs to be used at the facility must be kept under adequate restriction.	
The Physical and Land Use Planning Act, 2019	In consideration to relevant national and county policies; Section 56 of the Act gives County Governments the power within their jurisdiction to: (a) prohibit or control the use and development of land and buildings in the interests of proper and orderly development of its area; (b) control or prohibit the subdivision of land; (c) consider and approve all development applications and grant all development permissions; (d) ensure the proper execution and implementation of approved physical and land use development plans; (e) formulate by-laws to regulate zoning in respect of use and density of development; (f) reserve and maintain all the land planned for open spaces, parks, urban forests and green belts in accordance with the approved physical and land use development plans; and Section 57 & 58 requires a person to apply for a development permit from the respective county executive committee member before carrying out any development within a county.	The proponent should adhere to the provisions of this Act and any regulations thereof for the proper and orderly development of the area. The proponent should apply for the relevant development permits and pay requisite permit fees as required by the Act before commencement of the development.

	The Act under section 59(1) requires a person applying for development permission to ensure that any documents, plans and particulars submitted in the application have been prepared by the relevant qualified, registered and licensed professionals. Section 75(1) states that the National Physical and Land Use Planning Liaison Committee shall— (a) advise the Cabinet Secretary on broad physical and land use planning policies, strategies and standards; and (b) hear and determine appeals under this Act or as may be provided for under any other written law.	
County Government Act 2012	It provides for county governments' powers, functions and responsibilities to deliver services. The Act contains Principles of Citizen Participation in counties and stresses protection and promotion of the interest and rights of minorities, marginalized groups and communities and their access to relevant information. Section 102 on Principles of Planning and development facilitation in a County stresses the need to protect and integrate rights and interest of minorities and marginalized groups and communities and protect and develop natural resources in a manner that aligns national and county government's policies. The planning process should serve as a basis for engagement between county government and the	This piece of legislation stresses the need to bring everyone on board in planning and execution of development projects at the County level. Principle of public participation ensures that all stakeholders are made part of the planning and implementation process of any project and this ensures social acceptability of the project in question. Conservation and protection of natural resources within the area must therefore be a significant component of this project to ensure sustainability. Cooperation in planning shall be undertaken in the context of the law governing inter-governmental relations.

	citizenry, other stakeholders and interest groups.	
The Water Act 2016	The Act declares that every person in Kenya has the right to clean and safe water in adequate quantities and at reasonable standards of sanitation. Pollution of water resources is prohibited in Part VIII, section 143 of the Act. Any rubbish, dirt, refuse, effluent or any other offensive matter shall not be allowed near or in water resources. Section 144 states that a person who pollutes will be required to clean up the pollution caused or remedy any harm caused. The act states that a permit is required for the discharge of a pollutant into any water resource.	The proponent shall ensure that no waste, effluent or offensive matter is allowed near or in water resources. A permit shall be obtained for any water abstraction for use in the project in accordance to the provisions of this Act.
The Land Act 2012	The Land Act vests the procedures for compulsory acquisition of land in the National Land Commission on behalf of an entity requiring land for a public purpose or public interest, and provides under Section 111(1) states that if land is acquired compulsorily," just compensation shall be paid promptly in full to all persons whose interests in the land have been determined". Section 148(1) provides for compensation for a way leave in case of private land to any person in lawful or actual occupation as assessed by a qualified valuer in respect of:	Land for the extension of the proposed airport runway will be acquired from the neighboring community. The proponent shall ensure that proper consultations are done and land to be acquired and all property affected is justly compensated. A Resettlement Action Plan should be developed to guide the process of land acquisition.

	1. The use of the land 2. The damage suffered in respect of trees, crops, buildings on the route of the way leave 3. The damage suffered during any preliminary work undertaken in connection with surveying or determining the route of that way leave. Section 148(5) provides for recourse to Land and Environment Court for a person entitled to compensation for way leave who is dissatisfied with the amount, mode of payment and time taken to make payment.	
The Environmental Management and Coordination (Air Quality) Regulations 2014	Part II of the regulations stipulates that no person shall emit any liquid, solid, or gaseous substance or cause emission of priority air pollutants to exceed ambient air quality limits prescribed in the First Schedule. Part VI Regulation 25 sub-regulation (2) and (5) requires every operator or owner of a mobile emission source including road, rail, air, marine and inland water transport and conveyance equipment, to control the emission of priority air pollutants set out in the Second Schedule. Any person who causes emissions from a mobile source in excess of the	It's the duty of the proponent and the contractor to ensure that the Air Quality regulations are strictly adhered to during construction, operation and decommissioning phases of the project. These will ensure that quality of the environment is safeguarded as well the safety and health of workers and the public.

	prescribed standards commits an offence. Part VII regulation 29 (1) requires the occupier or operator of premises to ensure that exposure of indoor air pollutants does not exceed the exposure limits stipulated under the Factories and Other Places of Work (Hazardous Substances) Rules or under any other relevant law. Part VIII regulation 32 prohibits any person from operating construction equipment or handling construction material to allow emission of particulate matter during the demolition of structures, buildings, or parts of buildings in such a manner as to adversely affect the limits set out in the First schedule Regulation 34 further prohibits any person not to cause or allow stockpiling or other storage of material in a manner likely to cause ambient air quality levels to be destroyed.	
Occupational Safety and Health Act (OSHA), 2007 Cap 514 Laws of Kenya	The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons employed in the factory and other places of work from any injury. The provisions of the Act are also relevant to the management of hazardous and non hazardous wastes, which may arise at the project site. The Act provides that all measures should be taken to	Activities associated with construction such as excavation of trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site increase the risk of occupational injury. The contractor should formulate safety rules which all employees must comply with. An emergency response plan, warning signs, machinery safety provisions and construction safety provisions

	ensure safety, health and welfare of all the stakeholders in the work place.	must be in place to avoid or minimize injuries at the work place.
Environmental Impact Assessment and Audit regulations 2003.	The EIA and Audit Regulations 2003 were amended in 2016. These regulations stipulate how an ESIA study report should be done. They highlight stages to be followed, information to be made available, role of every stakeholder and rules to observe during the whole ESIA process	The proponent shall undertake the ESIA study as outlined in Part III of the regulations. The TORs shall be prepared and socio-cultural and economic issues related to the project considered. The proponent shall prepare the study report according to regulations stipulated under Part IV on the contents of the study report.
Environmental Management and Co-ordination (Water Quality) Regulations, 2006	These Regulations apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife, and water used for any other purposes. The Regulations provide for prevention of water pollution. They require every person to refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution. The regulations also require that no person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.	Soil erosion may arise due to uncontrolled excavation of trenches during rainy seasons, from inadequacies in backfilling construction works and improper drainage of storm water may lead to contamination of surface water bodies. These regulations are meant to guard against pollution of water resources and require individuals to take the necessary precautions in an attempt to avoid water pollution. Water quality monitoring and analysis requirements of these regulations should be strictly complied with.
The Environmental Management and Co-	Part III section 16-17 states that every owner, occupier or user of land which is adjacent or	The proponent and contractor should take special measures to prevent soil erosion, siltation and

ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009	contiguous to a wetland shall undertake special measures, including prevention of soil erosion, siltation and water pollution for the protection of river banks, lake shores and the seashore.	pollution of river banks and sea shores from the proposed construction and operation activities
The Penal Code Cap 63	Chapter XVII on "Nuisances and offences against health and convenience" contained in the Penal Code strictly prohibits the release of foul air into the environment which affects the health of the persons. It states "Any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way is guilty of a misdemeanor",	The proponent should comply with the provisions of the Code prohibiting fouling of air (section 192 by ensuring that operation of the proposed facility does not lead to releases of pollutants into the local atmosphere. Noise and air pollution should be avoided throughout the lifespan of the project through institution of the necessary mitigation measures.
The Public Health Act Cap 242 Laws of Kenya	The Act contains a comprehensive provision on discharges of pollutants into watercourses. The Act makes it the duty of every local authority (in the capacity of "health" authority) to take all lawful, necessary and reasonably practicable measures to safeguard and promote public health. Section13 Part IX of the Act deals with sanitation and housing, and is of most significance for the control of polluting discharges. Section 116 imposes a duty on every local authority to maintain its district in a clean and	The proponent, the contractor and airport operators should comply with this Act by implementing the various provisions of Part IV on Prevention and Suppression of infectious diseases. The proponent should also put in place measures to mitigate all forms of nuisance in compliance with Part IX Sections 115 and 118 of the Act. In this regard, noise level, water quality and, air quality should be maintained at stipulated levels during construction and operation

	sanitary condition, to prevent nuisances and prosecute those responsible for nuisances. Nuisances include drains and sewers for the discharge of pollutants into watercourses and lakes. Section 126 of the Public Health Act empowers the Minister to make rules on among others the drainage of lands, streets or premises, the disposal of offensive liquids, and the removal of, *inter alia*, waste matters and the standards of purity of any liquid which, after treatment in any purification works, may be discharged as effluent; The Act also makes provision for protecting from pollution sources of drinking water supply. Section 129 makes it the duty of the local authorities to prevent such pollution, to purify a pollution source and to prosecute the polluters. The Minister may make, and require local authorities to enforce rules for preventing polluting activities threatening such drinking water supply, and for purifying polluted water.	processes of the project. Solid waste arising from project related activities should be managed in compliance with provisions of this Act.
National Construction Authority (NCA) Regulations 2014	Part II – Contractor must be registered by NCA and with the Association of contractors, employ qualified persons. Part IV- All construction works or projects whether in private or public must be registered with NCA as	The proponent should ensure that the contractor awarded construction tender is registered and accredited by NCA. All the provisions of the regulations must be followed to ensure safety and the quality of construction work

	soon as the tender for construction is awarded Part V – all construction workers and site supervisors must be accredited and certified under the NCA Regulations 2014	
Noise and Excessive Vibration Pollution (Control) Regulations of 2009.	Under Part II , section 3 on 'General prohibitions', the Regulations provide 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. In determining whether noise is loud, unreasonable, unnecessary or unusual; various factors including time of the day; proximity to residential area; whether the noise is recurrent, intermittent or constant; and the level and intensity of the noise among others may be considered. Any person who contravenes the provisions of this Regulation commits an offence.	The proponent should comply with these regulations by ensuring that noise levels both during construction and operation phases of the project do not exceed those stipulated in the First Schedule of the regulations. Where the levels are exceeded, mitigative measures including wearing ear protection and carrying out construction activities during daytime should be put in place.
Environmental Management and Co-ordination (Waste Management) Regulations 2006	These Regulations apply to all categories of waste including solid waste, industrial waste, hazardous waste, pesticides and toxic substances, biomedical wastes and radioactive substances Part II of the Regulations prescribes responsibility of waste generators. It states that no person shall dispose of any waste on a public highway, street,	The proponent should comply with this regulation by obeying stipulations of the general provisions of the regulations including responsibility of waste generators and segregation of waste by generator. The Proponent and contractor should engage licensed solid waste handler to dispose of solid waste generated at the premises both during

	road, recreational area or in any public place except in a designated waste receptacle. The regulations also require any person whose activities generate waste to collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under the Regulations. The Regulations also provide for any person who owns or controls a facility or premises which generates waste to minimize the waste generated by adopting cleaner production principles which includes among others: improvement of production process through conservation of raw materials and energy; eliminating the use of toxic raw materials within such time as may be prescribed by the Authority and reducing toxic emissions and wastes, monitoring the product cycle from beginning to end.	construction and operation phases in compliance with provisions of this regulation.
The Energy Act 2019	Under section 148 of the act, a person who wishes to carry out electrical installation work must be licensed as an electrical contractor by the Authority (The Energy and Petroleum Regulatory Authority). Section 149 further prescribes the requirements of persons who wish to be certified as electrical installation workers. Section 153 and 154 requires that the amount of electrical energy supplied to the consumer shall be ascertained by the use of approved meters by Kenya	The proponent should engage workers and contractors that are qualified and duly certified by the authority for any electrical work along the runway and in workers' residential areas at the campsites. The contractor should ensure that electrical energy supplied is metered as required by the act. Alternative renewable energy sources such as solar lamps should be provided for use by the workers at the campsites during the construction phase. The Malindi Airport

	Bureau of Standards (KBS). Part IV Section 75 provides for the development and use of renewable energy technologies, including but not limited to biomass, biodiesel, bioethanol, charcoal, fuelwood, solar, wind, tidal waves, hydropower, biogas and municipal waste.	management should explore and adopt the use of renewable energy at the airport as an alternative to electric energy.

5.3 Regulatory Framework

5.3.1 National Environment Management Authority, NEMA

NEMA is the regulatory body charged with management and coordination of environmental issues. The object and purpose for which the Authority was established is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment.

Regulatory function

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects.

- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under this Act;

- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities.

5.4 International Conventions and Protocols

5.4.1 The Kyoto Protocol

The goal of Kyoto Protocol is to lower overall emissions of greenhouse gases. The protocol initially covered a five-year period from 2008-12 but was extended until 2020 during climate talks in Doha. Much as most of the provisions of this protocol apply to developed countries, emissions of these substances especially carbon dioxide would still occur at the airport due to various activities. Kenya, as a signatory to Kyoto protocol is bound to observe its provisions.

5.4.2 Basel Convention

The Basel convention on the control of Transboundary movement of hazardous wastes and their disposal is an international treaty that was designed to reduce the movement of hazardous wastes between nations and specifically prevent transfer of hazardous waste from developed to less developed countries. The convention is also intended to minimize

the amount of toxicity of wastes generated to ensure their environmentally sound management as closely as possible to the source of generation and to assist the less developed countries in environmentally sound management of hazardous and other waste they generate.

5.4.3 Convention on International Civil Aviation (Annex 14)

Annex 14 to the Convention on International Civil Aviation has enumerated several international standards and best practices that may be followed in the design and operations of aerodromes. The standards and specifications mentioned therein shall apply to all aerodromes open to public use in accordance with the requirements of Article 15 of the Convention. The interpretation and application of the specifications requires the exercise and discretion of the competent authority which in this case is KAA. Chapter 3, Volume 1 of Annex 14 gives detailed specifications and standards for the design of runways and associated features. They include standards and specifications for:

i) Length of runways
ii) Width of runways
iii) Longitudinal slopes and slope changes of runways
iv) Runway strength
v) Surface of runways
vi) Runway shoulders, turnpads, strips, clear ways and stop ways
vii) Runway end safety areas

These specifications, standards and recommendations are applicable to the proposed extension of the Malindi Airport runway since Kenya is party to the convention.

5.5 World Bank Policies

5.5.1 OP 4.10 - Indigenous Peoples

The World Bank policy on indigenous peoples underscores the need for Borrowers and Bank staff to identify indigenous peoples, consult with them, ensure that they participate in, and benefit from Bank-funded operations in a culturally appropriate way - and that adverse impacts on them are avoided, or where not feasible, minimized or mitigated. Indigenous Peoples are identified as possessing the following characteristics in varying degrees: self-identification and recognition of this identity by others; collective attachment to geographically distinct habitats or ancestral territories and to the natural resources in these habitats and territories; presence of distinct customary cultural, economic, social or political institutions; and indigenous language.

5.5.2 OP 4.12 - Involuntary Resettlement

This policy is triggered in situations involving involuntary acquisition of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimize and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects. This policy is applicable to the proposed project as additional land will be required for the extension of Malindi Airport runway.

CHAPTER 6

6. POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 Introduction

This chapter presents the assessment of social, economic and environmental issues likely to arise as a result of implementation of the proposed project. For each issue, the analysis is based on its nature, the predicted impact, extent, duration, intensity and probability, and the stakeholders and/or values affected. Mitigation options are discussed for each potential and significant negative impact identified.

6.2 Impact identification

6.2.1 Sources of impacts

The impacts associated with the proposed project will emanate from project inputs, activities and outputs. They are as discussed below:

i. Project inputs

The project inputs that shall be potential sources of impacts include:

- Aggregate materials taken from the local sources including crushed rocks, stones gravel, steel and cement.
- Skilled and unskilled workforce exerting indirect demand for energy, water supply, sanitation, health services etc.
- Heavy machinery including excavators, earth moving equipment etc used in the project construction process.

ii. Project activities

a) Construction

- Relocation activities/Site clearance
- Removal of vegetation cover
- Establishment of associated work and support infrastructure including construction camps, accessories etc.
- Obtaining raw materials e.g. water abstraction, quarrying etc
- Transportation of raw materials, machinery and labour to the site

- Excavation and backfilling
- Spillage (oil and fuel)

c) Operation activities

- Runway and access roads maintenance
- Transportation of goods and people
- General airport operations

iii. Project outputs

The project outputs expected to lead to negative impacts include the following:

a) Construction wastes

- Eroded soil
- Surface runoff
- Refuse and sewerage wastes from construction camps
- Oil spills

b) Waste from airport use

- Aircraft and vehicle emissions
  - ✓ NOx
  - ✓ Hydrocarbons
  - ✓ Carbon dioxide
  - ✓ Carbon monoxide
  - ✓ Particulate (Diesel and dust)
- Aircraft Noise
- Hazardous wastes

6.2.2 Receptors of impacts

The anticipated negative impacts will be received by both the physical and human environments as below:

i) Human environment

- Settlements within the project site and its vicinity
- Sensitivity of the local population particularly traditional livelihoods with regard to:

- Public health consequences (during construction)
- Increased noise levels (during operation)
- Increased air pollution (during operation)

ii) Natural environment

- Sites supporting terrestrial and aquatic flora
- Soil structure, stability and susceptibility to erosion

6.3 Impact Assessment criteria

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. The significances of the impacts were determined through a synthesis of the criteria below:

Probability: This describes the likelihood of the impact actually occurring.

Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable:	It is most likely that the impact will occur at some stage of the development.
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.

Duration: The lifetime of the impact

Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
Medium term:	The impact will last up to the end of the phases, where after it will be negated.
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.

Permanent: Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale: The physical and spatial size of the impact

Local: The impacted area extends only as far as the activity, e.g. footprint

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/Severity: Does the impact destroy the environment, or alter its function.

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may

materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights were assigned to each attribute:

Table 6.1: Assessment of significance of environmental impacts

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/ Severity	Low	2
	Medium	6
	High	8
Significance	Sum (Duration, Scale, magnitude) x Probability	
	Negligible	<20
	Low	<40
	Moderate	<60
	High	>60

The significance of each activity was rated without mitigation measures and with mitigation measures for both construction, operational and decommissioning phases of the proposed.

6.4 Environmental Impacts and mitigation measures

Determination of key impacts was based on the views of interested and affected parties; legislation requirements and knowledge and understanding of the project team and environmental assessment practitioners. The impacts are classified in terms of the phase of the development in which they are likely to occur, namely the construction phase, the operational phase and the decommissioning phase (where applicable). Impact significance before and after mitigation measures was considered. Even though some impacts are perceived to be of high severity, with appropriate mitigation measures, the probability of these impacts occurring might be low and therefore the significance of the impact is reduced.

6.4.1 Surface and ground water quality

(i) Impact Description:

Surface and ground water quality may be impacted by project activities through spillages from refuelling of construction vehicles, soil erosion and siltation, storm water contamination and poor sanitary facilities from construction camps. The water quality impacts due to leakage or seepage may affect wells or boreholes in the vicinity of the project site, local aquifers, surface water drainages and the downstream environment.

(ii) Significance Rating

Fuel spillage from storage and refuelling of construction vehicles, water pollution from inadequate sanitation facilities and siltation may compromise surface and ground water quality at the project site. The magnitude and duration of the impact will be medium term. The impact has a high probability of occurrence in the absence of any mitigation measures. The mitigation efficiency will however be effective in reducing the impact significance to low.

Project phase	**Impact: Surface and groundwater quality**						
	Activity	**Probability**	**Duration**	**Scale**	**Magnitude/ Severity**	**Significance**	
						WOM	**WM**
Construction	Fuel spillage from storage and refuelling of construction vehicles	Highly Probable (WOM) Probable (WM)	Medium term	Local	Medium	Moderate	Low
	Water pollution from poor	Probable (WOM)	Medium term	Regional	Medium	Moderate	Low

	sanitation facilities	Improbable (WM)					
	Sedimentation of drainage systems	Highly Probable (WOM) Probable (WM)	Medium term	Regional	Medium	Moderate	Low
Operational	Surface and ground water contamination from flood water from the project site	Highly Probable (WOM) Probable (WM	Long term	Regional	Medium	Moderate	Low

WOM = Without mitigation measures.
WM = With mitigation measures.

6.4.1.1 Mitigation measures

(1) Construction Phase

Specific mitigation measures include:

(i) Adequate fuel containment facilities to be used during construction phase.
(ii) All such materials, fuels and chemicals must be stored in a specific and secured area to prevent pollution from spillages and leakages. The basic NEMA regulations of hazardous waste management must be applied fully.
(iii) Construction vehicles and machines must be maintained properly (including preventive maintenance) to ensure that oil spillages are kept at a minimum.
(iv) Spill trays must be provided if refuelling of construction vehicles are done on site.

(v) Provide bins for construction workers at appropriate positions for disposal of litter. These bins can be colour coded to ensure minimal waste of recyclable resources. An ISWM shall be implemented.
(vi) Sensitise and create awareness for all workers in regard to sound waste management practices.
(vii) Replant excavated and open areas with appropriate vegetation to prevent sedimentation of storm water channels – construction should preferably take place during the drier months.
(viii) The location of stockpiled or excavated soil material must be done in such a way as to prevent siltation of drainage systems. The excavated and stockpiled soil material

must be stored and bermed on higher lying areas of the site and not in any storm water channel or steep gradients.

(ix) Stabilize storm water discharge points through robust designs to avoid soil erosion.

(2) Operational Phase

(i) Proper siting of waste disposal or fuel storage areas away from storm water impacts.

(ii) Monitoring and testing of quality of local water sources.

6.4.2 Storm water impacts

(i) Impact Description:

Both the construction phase and operational phase will have an impact on how storm water is managed. The main activities that impact upon storm water are clearance of vegetation, stockpiling of excavated soil, contamination of storm water during construction and operation, and the activities (re-fuelling, handling of chemicals etc) in the construction camp/construction area.

(ii) Significance Rating

This impact has a regional extent as well as medium intensity. In the absence of the proposed mitigation measures there might be a moderate impact, with the appropriate mitigation measures the impact is reduced to low.

Project phase	Impact: Storm water Management						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Sedimentation due to vegetation clearance	Highly Probable (WOM) Probable (WM)	Medium term	Site	Medium	Moderate	Low
	Contamination of storm water run off	Probable (WOM) Probable (WM)	Medium term	Site	Medium	Moderate	Low
Operation	Contamination of storm water run off	Highly Probable (WOM)	Long term	Regional	Medium	Moderate	Low-Negligible

6.4.2.1 Mitigation measures

(1) Construction Phase

(i) Construction activities should preferably take place during the drier season to prevent soil erosion and siltation to surface water features. This, however, also comes with dust.
(ii) The excavated and stockpiled soil material must be stored and bermed on higher lying areas of the site and not in any storm water channel or steep gradients.
(iii) Discharge points of all storm water channels, where flow of water is concentrated should be well and firmly stabilized.
(iv) Spillages from any potential contaminants such as lubricants and hydro-carbon based fuels must be safely and immediately removed and disposed of at an appropriate site. Surface water drainage of contaminated areas containing oil and petrol should be channelled towards a sump which will separate these chemicals and oils.

(2) Operational Phase

(i) Storm water should be diverted away from the steep gradients as well as temporary stockpiled soil and/ or waste.
(ii) Exposed soil should be re-vegetated or covered to prevent soil erosion. In general, landscaping areas not occupied by buildings will enhance site's aesthetic quality as well as other environmental and health impacts.
(iii) Efficient and effective storm water management structures to be applied near all storage facilities of chemicals and hazardous material.

6.4.3 Biodiversity Impact

(i) Impact Description

The proposed project area is a settled area with planted trees/shrubs and vegetation that mainly comprises of crops. There are no wild animals in the area save for the small insects and birds that traverse the area. The process of site clearance is expected to remove all trees from the site during the construction phase of the project. Trees are not desirable within the airport and its take-off/landing corridors.

(ii) Significance Rating

The construction phase has a definite probability on a site extent, leading to a moderate impact. The probability of occurrence has been rated as definite and the severity is high due to the fact that all trees will be cleared and ground levelled. Mitigation measures

would lower the significance of the activity to such an extent that it can be classified as "Low significance".

Project phase	Biodiversity Impact						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Clearance and excavation of site.	Definite (WOM) Definite (WM)	Permanent	Site	high	Moderate	Low

6.4.3.1 Mitigation measures

(1) Construction Phase

(i) Construction teams and machinery should not be allowed outside the project alignment areas. Access to the site should be clearly demarcated.
(ii) Replant cleared areas with appropriate vegetation such grass to arrest soil erosion.
(iii) Adequate storm-water management must be incorporated into the design of the proposed development to prevent erosion and siltation that may impact biodiversity negatively.

6.4.4 Atmospheric Pollution

(i) Impact Description

The expected air pollutants from the proposed Project will include dust, particulate matter and gaseous emissions. Dust and particulate matter will be generated from the excavations, earth moving and materials delivery, sand, cement, gravel, murram, etc. Smoke, hydrocarbons and nitrogenous gases will be emitted from machinery exhausts. These will be expected to increase slightly and will be localized hence expected to be experienced within 100m radius of the project. Air pollution is also expected to increase during the operation phase due to increased aircraft operations and vehicular emissions at the airport.

(ii) Significance Rating

Dust from construction operations and emissions from operating machinery are unlikely to affect residents/institutions in any significant way. Exhaust emissions from aircrafts during the operation phase may impact negatively on atmospheric air quality. The emissions could be mitigated to a low significance with appropriate mitigation measures.

Project phase	Impact: Atmospheric pollution						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Dust pollution from earthworks and increased traffic	Highly Probable (WOM) Probable (WM)	Medium term (Short term)	Regional (Local)	Medium	Moderate	Low
	Exhaust emissions from vehicles & machinery	Highly Probable (WOM) Probable (WM)	Short term	Local	Low (Negligible)	Low	Low
Operational	Aircraft & vehicle emissions	Highly Probable (WOM) Probable (WM)	Long term	Regional *(Global)*	Low	Moderate	Low

6.4.4.1 Mitigation measures

(1) Construction Phase

(i) Impose speed limits (10 km/h in all areas within the site boundaries).
(ii) Regular water sprays on access roads, stockpiles and cleared to minimize dust pollution.
(iii) No open air burning of refuse wastes on the premises or surroundings. Refuse wastes should be removed by an official contractor and dumped at an approved site in compliance with local laws regulations.
(iv) Proper rehabilitation of disturbed areas is required in order to minimize bare patches.
(v) Vehicles to be used during the construction phase well serviced and maintained to prevent or minimize release of excessive fumes.
(vi) Covering of trucks and vehicles transporting materials to prevent dust or particles from flying off the vehicles.
(vii) For the workers who must be at the dusty locations, they should be provided with personal protective equipment.

(2) Mitigation measures: Operational phase

(i) An effective air quality management programme should be compiled for the operations.
(ii) Wet suppression will be required to reduce emissions from materials handling operations. The application of liquid sprays to off-loading points and storage areas should be considered.
(iii) Refuse wastes should not be burned on the premises or surroundings.
(iv) Regular monitoring and testing of air quality at the airport as basis for further mitigation measures

6.4.5 Noise Impact

(i) Impact Description

Noise generation will be due to construction activities, excavation equipment, concrete mixers and the transportation of equipment, materials and people. The use of construction material is not likely to be a major potential source of environmental pollution. It is expected that with the extension of the Malindi Airport Runway, more aircrafts will operate from the facility. This will lead to increased noise levels in an environment which is closely surrounded with human settlements.

(ii) Significance Rating

The impact of increased noise is rated high since the airport is immediately neighboured by residential houses. Mitigation measures are proposed to lower the significance of the impacts identified to moderate or low. Mitigation measures must be taken in the design stage to ensure that the project is designed to have a low to very low impact on the nearest dwellings within the project area.

Project phase	**Impact: Noise**						
	Activity	**Probability**	**Duration**	**Scale**	**Magnitude/ Severity**	**Significance**	
						WOM	**WM**
Construction	Noise Impact associated with construction of the project	Highly Probable (WOM) Probable (WM)	Medium term	Regional	Medium (WOM) Low (WM)	Moderate	Low
Operational	Noise impact from aircraft operations	Probable	Long term	Regional	Moderate	Moderate	Low

6.4.5.1 Mitigation measures

(1) Construction Phase

(i) Fit silencers on equipment and machinery that are expected to generate a lot of noise.
(ii) Provide workers expected to work in noisy areas with ear muffs and enforce their use by worker through stringent supervision.
(iii) Construction activities to be undertaken between 08H00 –17H00. However one can apply to NEMA for permit to construct beyond this period
(iv) All equipment and vehicles on the site should be properly serviced and maintained to reduce noise.

(2) Operational Phase

(i) Proper maintenance and servicing of equipment and machinery used during the operation phase**.**
(ii) Establish program and protocols that only allows low level noise aircrafts at the airport
(iii) **Noise level measurements should be** carried out on individual equipment to detect increases which could lead to increase in the noise impact over time and increased complaints.
(iv) **Environmental noise monitoring at the airport:** This should be carried out regularly at specific positions to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.
(v) All activities on the site must abide by the National and International Noise Laws.

6.4.6 Impact of Solid and liquid wastes

i. Impact description

Construction will result in the creation of various solid wastes, principally surplus earth and rock, metal scraps, plastics (wrappings and containers), cardboard, paper, wood, office wastes including e.g. used toner cartridges, kitchen (canteen) wastes, workshop wastes including e.g. used oil filters, and waste concrete; various liquid wastes including used oils and solvents, runoff from camp and workshop areas, and various liquid waste streams from construction processes. During operation waste is likely to be generated from machine and airplane refueling and maintenance activities, solid wastes from offices and organic waste from kitchen and slashed vegetation along the runway.

ii. Significance rating

Solid wastes from excavation and trenching works, construction camp and oil spills from construction vehicles and machinery will lead to short term impacts whose significance can be reduced to low with implementation of appropriate mitigation measures. Duration the operation stage generation of solid wastes from offices and passenger crews will always be anticipated. In addition, the possibility for oil leakages or spills during refueling or storage will ever be present. But with proper management and mitigation measures the impact, severity and significance will be reduced from high to low.

Project phase	**Impact: Waste management and pollution**						
	Activity	**Probability**	**Duration**	**Scale**	**Magnitude/ Severity**	**Significance**	
						WOM	**WM**
Construction	Solid waste from site offices	Probable	Short term	Local	low	Low	Low
	Soil from excavation and trenching works	Probable	Short term	Local	Local	Local	Local
	Oil spills from construction vehicles	Probable (WOM)	Short term	Regional	Low	Low	Low
Operation phase	Solid waste from office	Probable	Long term	Local	Low	Medium	Low
	Organic waste from vegetation and office	Probable	Long term	Local	Low	Medium	Low
	Oil spills from refuelling or leakages	Probable	Long term	Regional	Medium	Medium	Low

ii. Mitigation options

I) Construction phase

- Materials from excavation of the ground and foundation works should be reused for earthworks and landscaping.

- Solid wastes generated should be handled and disposed offsite by licensed waste handlers and according to national laws governing waste management
- Employ standard best practices in fuel refueling, storage and handling to prevent the risk of spillages.
- Oil spill containment and cleanup equipment should be kept at the contractor's main yard and at major construction locations, with a small kit in every project vehicle.
- Instituting procurement measures that recognize opportunities to return usable materials such as containers
- Train staff on control of emergency oil spill containment and communication procedures.

II) Operation Phase

- Effective waste management practices that involves 3Rs (reduce, re-use, recycle) should be put in place during the construction and operation phase.
- Colour coded bins should be placed at strategic locations within the site for solid waste collection to facilitate separation and sorting
- Solid wastes generated should be handled and disposed offsite by licensed waste handlers and according to national laws governing waste management
- Employ standard best practices in fuel refueling, storage and handling to prevent the risk of spillages.
- Oil spill containment and cleanup equipment should be acquired and be part of emergence equipment at the airport.
- Train staff on control of emergency oil spill containment and communication procedures.
- Minimizing hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed

6.4.7 Impacts of obtaining construction materials

i. Impact description

The project will require materials for construction of project related infrastructure. Specific sources for these materials have not been identified. The project will require both borrow pits (for soil) and quarries (for rock). These need to be sited, accessed, operated and closed so as to minimize impacts on land users and avoid the creation of safety or health hazards (e.g. steep slopes, malarial ponds). The project will also require sand. Sand mining from rivers is associated with habitat destruction due to changes in channel morphology.

ii. Significance rating

Opening up of quarries to obtain aggregates and soil, deliveries of materials to the site have various impacts which are long term in nature. With mitigation measures, the significance of the impacts will be reduced to low.

Project phase	Impact: Impacts of obtaining construction materials						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Opening up of quarries to obtain aggregates and soil	Probable	Short term	Local	Moderate	Moderate	Low
	Health and safety issues from the quarries (Mosquitoes and drowning)	Probable	Short term	Local	Moderate	Moderate	Low

ii. Mitigation options

(a) Borrow pits and quarries

- Maximize the re-use of excavated materials in the works, as fill.
- Selection of quarries and borrow pits sites should be done carefully so as to minimize impacts on existing land uses.
- Strip all available topsoil from borrow pits and quarries and store it safely for use in site restoration.
- Close all borrow pits and quarries in accordance with an approved plan to maximize their long-term biological productivity and minimize health and safety hazards.
- Carry out EIA for quarry site if new quarries are to be opened for purposes of this project

(b) Socially responsible procurement

- Include a provision in the tender documents that where goods and services are of equal quality, those sourced from an organization implementing a certified EMS and/or CSR approach will be preferred.

6.4.8 Traffic Impact

(i) Impact Description

Vehicles shall be used to transport construction material and equipment to site. This will have an impact on the traffic situation and may cause traffic jams in the area. There will be a slight increase in noise and in emission of exhaust fumes from construction vehicles. During the operation phase, it's anticipated that the number of vehicles to and from the airport will increase due to increased activities at the airport. Potential impacts include shortage of parking space at the airport, increased air pollution and delays in catching flights due to increased traffic at the airport.

(ii) Significance Rating

Construction activities will result in a slight increase in traffic by heavy vehicles in the area that can result in disruptions to traffic flow, even though only for a short period. This can lead to a moderate negative impact during the construction phase with or without mitigation. The impact on traffic during the operational phases are permanent and on a regional level, but it will have a low impact with appropriate mitigation measures.

Project phase	Impact: Traffic associated with the project						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Traffic impact caused by construction activities	Highly Probable	Short term	Local	Medium	Moderate	Low
Operational	Increased traffic due to increased activities at the airport	Probable	Long term	Regional	Medium	Moderate	Low

6.4.8.1 Mitigation measures

(1) Construction Phase

i) Adequate and appropriate road signs should be erected to warn road users of the construction activities.
ii) Sensitize drivers on safe driving and working practices
iii) Avoid transporting materials during periods of peak traffic activity

iv) Traffic should be controlled especially during material delivery mostly when large trucks are turning into the site

(II) Operational Phase

i) Vehicles should be controlled at point of entry and departure from the airport by traffic police to avoid traffic jams at the adjacent Mombasa – Malindi Road
ii) Deploy enough personnel and install equipment for use in vehicle security screening and control
iii) Increase parking slots at airport parking section to accommodate increased traffic

6.4.9 Health and Safety impacts

(i) Impact Description

- Activities associated with construction such as excavating of trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site increase the risk of injury. Construction activities will also result in access of the area by vehicles delivering materials to the site that may result in accidents/incidents. Work at the proposed site may involve **hazards such as accidental falls into open trenches, slippery walkways, working at heights, exposure to energized circuits, and heavy equipment.** Work at the project site may also involve entry into confined spaces, including manholes and storage tanks among others.
- There may also be unhealthy interactions between male project workers and local women. These may lead to unsafe sex and exposure to sexually transmitted infections including HIV/AIDS.
- Increased number of workforce during construction provides opportunity for **criminals** to infiltrate the airport hence causing potential **security risks**.
- **Bird strikes**; the safety of aircrafts may also be compromised due to the presence of certain birds at the airport. The risk of bird strikes to aircrafts is likely as evidenced by the mushrooming of informal settlements and poor waste management around the airport grounds. Birds are attracted by among other aspects waste dumps, unplanned human settlements, trees, slaughter houses, sewage flows and ponds, open water masses and some agricultural activities among others.
- **Fire hazards** – this may result from poor handling and storage of inflammable substances at the airport during construction and operation phase. Aircraft accidents arising during takeoff or landing may also be a source of fire explosions.

- **Settlement patterns and public safety** - Residential, institutional and commercial activities located within the immediate neighbourhoods of the airport and along the flight paths are at a high safety risks from potential air crash.

(ii) Significance Rating

Most health and safety impacts during construction phase will be onsite and will be short term in nature. However, a few others may affect the larger community. These may include accidents from vehicles delivering material to site and other construction site activities with potential of causing injuries to residents. The impact will be short term in nature with moderate significance which can be turned into low with implementation of appropriate mitigation measures. Impacts such as fire out breaks, bird strikes and site security will be long term in nature, have a high magnitude but with mitigation measures the impacts will be low.

Project phase	Impact: Safety, health and fire hazards						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Increased risk of accidents from construction activities	Highly Probable (WOM)	Medium term	Site	High (WOM) Medium (WM)	Moderate	Low
Operational	Risk of accidents during operations	Highly Probable	Long term	Site	High (WOM) Medium (WM)	Moderate	Low
Construction and operation	Fire hazards	Highly Probable	Long Term	Regional	High	Moderate	Low
	Infiltration of criminals into the airport	Probable	Long Term	local	High	Moderate	Low
Operation	Impact of bird strikes	Probable	Long Term	local	High	Moderate	Low

6.4.9.1 Mitigation measures

(1) Construction and operational Phases

(i) The Contractor shall conform to all the stipulations of the Occupational Health and Safety Act, 2007. The Act requires the designation of a Health and Safety representative when more than 20 employees are deployed.

(ii) The contractor shall provide ample warning signs, guard rails, warning tape, etc., around open excavations, stacks of material, debris, etc. and shall be held liable for all claims as a result of neglect of such precautions and provisions.
(iii) Proper access control should be enforced to ensure that no unauthorised persons enter the site.
(iv) Construction vehicles should be under the control of competent personnel. Ensure that persons handling equipment and materials are suitably trained, supervised and adequately instructed. Establish and enforce a strict code of conduct for all project drivers including outside suppliers delivering materials
(v) Establish and implement an HIV/AIDS prevention programme specifically related to the project's construction phase. The programme should include those at high risk of engaging in unsafe sex conduct such as truck drivers and bar workers
(vi) The construction sites should be properly fenced and guarded with controlled exit and entry points
(vii) Employees should be properly vetted and supervised to weed out any criminal agents within the work force

(II) Operational phase

(i) Consider creating security buffer zones around airports to enhance aviation and public security
(ii) Control and zoning of land uses adjacent airport areas
(iii) Ensure that the contact details of the police or Security Company, fire brigade and ambulance services are available on site
(iv) Use of detection and alarm systems including communication and public address systems to detect a fire and alert the building staff, emergency response teams, occupants and other fire response units.
(v) Use of automatic and manual fire suppression and control equipment, such as automatic sprinkler systems, manual portable extinguishers, and fire hose reels.
(vi) Formulate an Emergency Response Plan for the airport to assist staff and emergency response teams during fire emergency.
(vii) Regular servicing and testing of fire-fighting equipment and facilities to ensure they function properly at all times and as required by law
(viii) Constitute appropriate Birds Strike committees with adequate funding and equipment
(ix) Avoid or eliminate the presence of bird attraction features around the airport.

6.4.10 Visual Impact

(i) Impact Description

Major and minor earthworks will take place to ensure site preparation; which will entail the removal of the existing buildings, trees, soil cover and the subsequent exposure of the soil. Material stockpiles, construction camps and construction equipment will be present on site, which could give the site a disordered feel. Upon the completion of the construction work the site will be cleaned and disturbed areas landscaped.

(i) Significance Rating

The visual receptors that will be mostly affected are the surrounding residents living adjacent to the site. The visual intrusion is considered to be moderated and can be reduced to moderate or low assuming that mitigation measures as described in this report are adequately implemented.

Project phase	Landscape Impacts						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Removal of trees, vegetation & buildings within the project area	Definite	Permanent	Site	Medium	Medium	Low
	Impact of presence of unsightly views of construction activities.	Highly probable	Short Term	site	Low	Low	Low
Operational	Altering the visual character of the site due to introduction of new land uses on the site.	Probable	Permanent	Local	Low	Low	Low

6.7.6.1 Mitigation measures

(I) Construction Phase

- All project facilities, fences and sign boards should be painted with a muted earth toned colour that will blend with the background colour of the vegetation. Avoid pure lights and darks.

- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance.
- Rehabilitate or vegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long stages of exposed soil and possible erosion that will result in indirect landscape and visual impacts.

(2) Operational Phase

- Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers.

6.4.11 Displacement of people and loss of livelihoods

(i) Impact Description

The proposed project involves displacement of people and loss of livelihoods so as to create room for the expansion of the airport. The proposed sites for the runway expansion are densely populated. The displacement will also impact negatively on the social and cultural patterns of the people. In additional to demolition of residential buildings, a number of schools, health facilities, churches, mosques and small scale businesses will be affected.

(ii) Significance Rating

Displacement of people from the proposed project site will have negative impacts on the various cultural, social and economic aspects of their lives. A socio-economic survey will be undertaken to understand the social economic fabric of the community as basis to make informed decisions before displacement. A Resettlement Action Plan will then be prepared to guide the resettlement process. Impact significance can be classified as high and permanent as the PAPs will be removed from their homes and property. Displacement will affect settlement patterns, infrastructure and business networks both locally and regionally. Adoption of appropriate mitigation measures will lower the significance of the impact from high to low.

Project phase	Impact: Displacement of people and Loss of livelihoods						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Pre-construction phase	Displacement of people	Definite	Permanent	Local	High	High	Low
Pre - Construction	Loss of economic	Definite	Long Term	Regional	Medium	Medium	Low

phase	livelihoods						

6.4.11.1 Mitigation measures

(1) Pre-Construction Phase

The following mitigation measures should be taken in advance:

- The expectations of the community must be managed carefully. A communication structure should be established to ensure that all the project affected persons are informed about the process that will be followed.
- The consultant shall map and undertake a detailed valuation of property that is likely to be lost or damaged to serve as basis for compensation.
- Prepare a detailed report on compensation which shall be made public to avoid corruption and unfairness. Such a report shall contain the list of the PAP, property affected, terms and rates of compensation among other details.
- Constitute a grievance redress mechanism comprising of the client (KAA), community representatives, officials from the ministry of lands, local administration and PAPs among others
- Compensation for loss of land or property should be done promptly and should be based on market rates.
- Resettlement and compensation should be implemented in accordance to National and International guidelines
- The PAPs should be given adequate notice to remove property or harvest crops that have matured before commencement of construction so as to minimize losses

(II) Construction and operation phase

- The consultants should prepare livelihood restoration strategies and measures necessary to assist people affected by the project improve or restore their living standards.
- A monitoring and evaluation protocol should be developed to support regular monitoring of the resettlement performance of the whole RAP exercise

6.4.12 Impacts on Physical infrastructure

(i) Impact Description

The acquisition of additional land for the expansion of the airport will cut off infrastructure and disrupt essential services. These include existing electrical power lines,

water supply systems and access passages that connect communities. Major and minor roads that cut right across the proposed site such as Ganda Road will be affected. This will adversely affect businesses and transportation services in the neighbourhood and has the likelihood to cause heavy traffic jams within the town.

(ii) Significance Rating

This impact will definitely occur and can be described as moderate and short term. Disruption of physical infrastructure is likely to negatively impact on businesses and sensitive institutions locally as well as regionally. However with advance planning and implementation of mitigation measures the impact will be turned to low.

Project phase	Impact: Impact on physical infrastructure						
	Activity	Probability	Duration	Scale	Magnitude/ Severity	Significance	
						WOM	WM
Construction	Impact on electrical power lines, water supply systems and sewage systems	Definite	Short term	Local/Regional	Medium	High	Low
	Impact on existing roads	Definite	Short term	Local/Regional	Medium	High	Low

WOM = Without mitigation measures. WM = With mitigation measures

6.4.12.1 Mitigation measures

(1) Pre - Construction

(i) The proponent (KAA) should contact and mobilize the service providers (for electricity, water, sewage and roads) in the area to brainstorm and plan for the re-routing and reconnection of the services before project commencement.
(ii) KAA should constitute a committee to coordinate and monitor re-routing and reconnection of the physical infrastructure within agreed timelines.
(iii) The service providers should ensure that the planned new physical infrastructure shall be put in place before disconnection of any existing services. This will ensure a smooth reconnection of the services without unnecessary loss of time and revenues.
(iv) Any land to be acquired as way-leeve for re-routing infrastructure or damage to property shall be adequately compensated in compliance to the existing national laws.

(v) Adequate and appropriate road signs should be erected to warn road users of closure of roads and direct them to alternative roads.

CHAPTER 7

7. PROJECT ALTERNATIVES

7.1 The proposed alternatives.

This section deals with various project development alternatives. The criteria for assessing these alternatives is based on project location, design, construction materials, socio-economic considerations and proposed best technologies available. At the time of preparing this Environmental and Social Impact Assessment report, the design of the facility was not complete. The recommendations are based on the project brief prepared by the proponent.

7.2 No Development Alternative

The 'No development" alternative describes a situation in which KAA does not undertake the proposed development. This option would mean that all airport operations will continue to be handled at the existing and largely constrained Malindi Airport. Direct international flights and large aircrafts would not be permitted to land at the airport and this means that the region will lose on the economic growth anticipated in the area. In case the regulatory authority (NEMA) settle for no development option, the government would lose in terms of financial commitments already made in design and planning of the project. This includes among others moneys already committed to the project consultants among others. The option would similarly make the jobs that the project envisioned to create to be forgone. However, the no development option will shield the local community from issues of relocation/resettlement and compensation.

7.3 Relocation Option

The other option available for the proponent is to relocate the project to an alternative site. The county spatial plan advocates for an alternative site located at Lango Mbaya which is sparsely populated for the development of a new airport. However, a feasibility study has not been undertaken to generate information on the viability of the alternative site as well as comparative cost estimates of expansion at current site and relocation. At the moment, the government should consider buying the land identified and reserve it for relocation and expansion in the future use.

7.4 Alternative to technology

7.4.1 Energy use

Energy will be required at the runway for lighting landing markings and security lights especially during the night. The energy will mainly be obtained from the national grid. Reliance on the national grid is not sustainable in the long term because of power rationing and outages in the country. Alternative energy sources should be considered such as automatic diesel powered generator as back up to generate power during electrical power outages. This will offer hopes of uninterrupted operation especially during power outage from the national grid. Solar power should also be considered as an alternative source of energy for providing energy to power security lights during the night. Since solar power is not reliable, the proponent should consider installing a hybrid system that uses electricity, generator and solar power.

7.4.2 Solid waste management options

KAA should plan to implement its own integrated solid waste management system in which an elaborate solid waste management chain, from generation, storage, collection, recovery and disposal are all properly coordinated. This will prevent various health and environmental challenges and attraction of scavenging birds which may cause safety risks for aircrafts at the airport. KAA should also conduct environmental education to the neighboring community on good practices of solid waste management as part of their corporate social responsibility. This will also help it strengthen the collection and management of waste around the airport.

7.4.3 Water source options

The main source of water at the airport is the piped water from the Malindi Water and Sewerage Company (MAWASCO) water distribution network. To avoid water shortages during construction period, KAA and the contractor should have alternative water sources to ensure seamless flow of construction work. The water source options available include sinking a borehole or buying water from vendors within Malindi environments. Buying water from water vendors is the best alternative to MAWASCO supply in-case of water shortages in comparison to sinking a borehole.

7.5 Preferred Development Option

All the alternative options analyzed have implications but the extension of Malindi Airport Runway is considered as the more viable option due to the following reasons:

- The current location of the airport provides easy and quick access to the airport from Malindi Town and its environments.
- Cheaper compared to the cost of setting up a new airport

CHAPTER 8

8. PUBLIC CONSULTATION

8.1 Introduction

Public participation is basically concerned with involving, informing and consulting the public in planning, management and other decision-making activities. Public participation tries to ensure that due consideration is given to public values, concerns and preferences when decisions are made. It encompasses the public actively sharing in the decisions that government and other agencies make in their search for solutions to issues of public interest. Effective public participation requires the availability of adequate information in public inputs. The latter involves various values, critiques, questions, information, suggestions and other inputs, which are expressed by individuals, groups or organizations among the general public in an attempt to influence decision-making.

8.2 Objectives of Public Participation

Public consultations with interested and affected parties (IAPs) in this project were done with the following aims:

(i) To inform the local people, leaders and the beneficiary/project affected communities about the proposed project and its objectives

(ii) To seek views, concerns and opinions of people in the project area concerning the proposed project

(iii)To establish if the local people foresee any positive or negative environmental impact which may arise as a result of implementation of the proposed project and if so, how they would wish these perceived impacts to be addressed.

8.3 Methodology

Public participation was mainly achieved through direct interviews, public meetings and questionnaire administration. The ESIA consultants began the public consultation process by holding preparatory meetings to strategize on how to engage the stakeholders in the ESIA and RAP processes. The following is a detailed discussion of public consultation methodology used by the ESIA team

8.3.1 Planning and Mobilization meetings

In order to actualize the objectives of the ESIA and RAP process, a number of preliminary meetings were held. The main aim of the meetings was to inform key opinion and administrative leaders and plan how to mobilize interested and affected stakeholders. These meetings were held between the consultants and KAA staff, Kilifi County Commissioner, Assistant County Commissioner, Chiefs and sub-chiefs, Village elders among others. (Minutes of the meetings have been attached in Annex 3)

Plate 2: Planning and consultative meeting with Kilifi County Administration, KAA and Consultants

8.3.2 Public Consultative meetings

In order to enhance project acceptability and sustainability, the ESIA/RAP team together with the local administration planned and organized a public consultative meeting. The local chiefs, their assistants and village elders informed the locals on the date and venue of the meeting a week earlier. The meeting took place on the 26th of February 2020 at Furunzi area within the proposed project site. The participants mainly comprised of the local community (PAPs), assistant commissioner, area member of county assembly (MCA), Kenya Airport Authority officials at Malindi and the consultants (Participant attendance details are attached herewith in Annex 4). These provided an opportunity for the consultants to introduce themselves to the community and allow the community and project affected person to ask the most critical questions concerning the project. Insights, comments and opinions expressed during this public meeting were very crucial and set

the stage for further engagement with the community. Subsequently, the project team then embarked on interviews, questionnaire administration, socio-economic survey, land surveying and land property valuation. (Proceedings of the public meetings have been attached in Annex 3)

Plate 3: Public consultative meeting at the project site

8.3.3 Questionnaire administration

A total of 90 questionnaires were administered to the PAPs and the general public to solicit their views and opinions about the project. A group of well-trained field assistants guided by the EIA lead expert took the participants through the questionnaire. This was conducted by visiting project beneficiaries in their localities and guiding them on questionnaire filling process. Sample questionnaires used during the survey have been attached in Annex 9 of this report. A summary of the responses from the questionnaires is presented below;

8.3.3.1. Benefits of the proposed project

The respondents were asked if they thought the proposed project would benefit them. Among the benefits they mentioned includes:

- Creation of job opportunities
- Increased tourist activities and investment in the region
- Expansion of business activities

- Development of Malindi town
- It will improve infrastructure and reduce the cost of transportation
- Direct entry into the country from abroad
- It will bring pride for coast people to have an international airport
- Lifestyle improvement (health, cleanliness)
- Improve the economy of the region and the country at large

8.3.3.2. Problems likely to result from the implementation of the proposed project

The main problems mentioned by the respondents as likely to result from the proposed project are:

- Erosion due to cutting down of trees
- Noise and vibration pollution
- Air pollution
- Displacement of people from their homes
- Disruption of social life of families and the community
- Loss of economic livelihoods
- Conflict between the residents and the project
- Safety concern (plane crash)
- Impact on infrastructure especially roads, electricity and water supply lines
- Poor drainage

8.3.3.3. Suggested solutions to the problems raised in sub-section 8.3.3.2 above.

Asked to suggest the possible solutions to the problems identified with the implementation of the project, they gave the following solutions:

- KAA Management should give the locals alternative lands to relocate and have a proper and detailed resettlement plan
- Effective noise and vibration pollution control strategies such low noise engine aircrafts
- Relocation of the project to alternative site at Chakama/Lango Mbaya
- The airport management should have a proper plan for solid waste disposal
- Planting of trees where they have been cut
- Transparency in the resettlement and compensation process
- Air control quality such as suppression of dust through spraying of water during construction
- They contractor should construct good drainage system
- KAA should have good cooperate social responsibility

The general response from the questionnaire is that the residents welcome the project and have no problem with it. However they want the process of resettlement and relocation to be conducted transparently and fairly to benefit all the people. They hoped that compensation should be fully completed before they are relocated. A few of them wished that the project should have been relocated to an alternative site.

8.3.4 Direct Interviews

Direct interviews were used to get responses from key County Government officials and representatives of various local institutions that were thought to be directly involved in the project. Their comments were sought through engaging them in discussions about the proposed project and probing them on their opinions about the benefits that are likely to be realized as a result of implementation of the proposed project and associated infrastructure. This kind of engagement gave the respondents the opportunity to give insights on their opinion about the project. The ESIA team was thus able to establish through this method the impacts that are likely to occur as a result of implementation of the proposed project.

Plate 4: Meeting with CEC Member in charge of Roads, Transport and Public Works Kilifi County

8.5 Issues/comments from direct interviews

The consultants received various comments and opinions during the interviews. Addressing of the issues raised is significant for the successful implementation of the proposed project and its acceptability by the local community. These interviews were conducted from the 24th to the 28th of February 2020. The following is a summary of comments from stakeholders contacted during this assessment.

Table 8.1: Summary of comments from direct interviews

Stakeholder	Designation	Contact	Comment/Views
Mr. Wilfred Nyiro	**Chief – Malindi Town Location**	**0722106333**	The chief began by informing the ESIA team that the proposed area for expansion was identified since 1967 as airport expansion area. The expansion process has been on and off and the residents are fully aware of the project. There is no public facility within the area except for a few private schools. The current location of the airport falls in Barani sub-location but with the planned extension it will spread to Malindi Central sub-location. A total of six villages will be affected by the planned expansion and relocation of residents. They include Furunzi Barani, Furunzi Central, Bondeni, Ziwani, Majivuni and Mtangani JCC. The chief reiterated his commitment and support to the ESIA and RAP teams to ensure that the project becomes successful.
Ms Gladys Sua	**Safety Officer**	**Malindi Airport**	The ESIA team asked the Safety officer on the safety measures that will be undertaken during project implementation. She briefed us that the contractor will be required to share his safety work plan with her office before commencement. All workers will then undergo a safety awareness and sensitization program. The office also will ensure that workers are provided with appropriate personal

			protection gears. As regards to aviation safety, there is a bird and wildlife control unit that works in partnership with KWS to scare birds or wildlife. At the completion of the project, direct international flights will be permitted to the airport therefore the need for more strict disease control and management. She informed us that there is already a Port Clinic that offers Yellow Fever Vaccination, first aid and it's currently doing screening for Corona Virus disease to ensure everyone's safety. Security at the airport is the responsibility of Kenya Airport Police Unit in collaboration with KAA security personnel. The airport has one ambulance and one fire track and will need to add more as the number of passengers and flights increase.
Mrs. Priscillah Oluoch	**Deputy Technical Manager**	**Malindi Water & Sewerage Company**	There is no sewerage infrastructure in the proposed project site. Residents and institutions in the area use septic tank systems and pit latrines. As regards to water supply, the site has several water supply pipelines (service lines) connected to households and schools. There is no mainline for water distribution in the site. The officer recommended that the proponent factor in the cost of re-routing the underground service lines in their budget. She further said that there is need for early consultation between KAA and MAWASCO to plan how to reroute the service lines before project commencement.
Harrison Macharia	**Branch Manager**	**KPLC Malindi**	The project site is covered by an ample network of KPLC power lines. Consultation with the branch manager revealed that the proponent (KAA) will be required to make an application for the re-routing of the KPLC power lines. Re-routing will be done at the proponent's expense upon submission of a demolition order and survey maps to KPLC office.

Mr. Lennox Mwangolo	**Environment, Forestry and Solid Waste Management Officer**	**Malindi Sub County**	According to the Mr. Mwangolo, the area around the airport is not well zoned thus presenting a challenge to the municipal council of Malindi in solid waste collection. The Kilifi Solid Waste Management Bill 2017 is in the process of being gazetted. It is hoped that once it's gazetted it will streamline solid waste management in the county. In the meantime, there is need to sensitize people living along the airport fence to stop illegal dumping.
Mr. Said Charo	**Senior Supervisor in charge of waste management**	**Malindi Sub-county**	Mr. Said Charo said that Malindi subcounty does not have a waste collection vehicle but plans are in progress to acquire one. All solid waste collection and disposal is contracted to private companies. The officer informed the ESIA team that the contractor should ask for dumping permission before transporting any waste to Mayungu dumping station during runway construction.
Inspector Peter Mjambili	**Deputy Officer Commanding Station (OCS)**	**Malindi Airport**	The contractor and all workers that will be involved in the construction of the runway will undergo security vetting before being allowed to work at the site. All entry points will be properly manned and security officers will carry out random patrols. The inspector also said that they work in partnership with the adjacent community on security issues and are encouraged to report any suspicious activities to the police. The station also has enough police officers who work in liaison with KAA security officers.
Hon. Nahida Mohamed Athman	**County Executive Committee member for Trade, Tourism**	**PO Box 519-80108,** **Kilifi, Kenya.**	The Executive Committee Member is aware of the proposed project and fully supports its implementation which she says should be fast tracked. According to her, there has been a lot of pressure from interested airlines to directly link the airport to other destinations

	and Cooperative Development		abroad. Among them are the Ethiopian and Qatar airlines. Traders who will be displaced from the proposed project site should be well compensated. She also advised that KAA should ensure that airport transport activities should not be affected during the construction of the runway.
Hon. Kiringi Mwachitu	**County Executive Committee (CEC) member – Water, Forestry, Environment, Natural Resources and Solid Waste Management**	**PO Box 519-80108,** **Kilifi, Kenya.**	Hon. Mwachitu expressed satisfaction with the current location of the airport. He said it is near and ideal for Malindi and Kilifi residents compared to the previously proposed site at Lango Mbaya. He further noted that there are no critical ecosystems in the proposed site that will be affected. There is a solid waste management act (Kilifi County Solid Waste Management Act) that is in the process of gazettement.
Hon. Eng. Prof. Josphat Mwatela	**County Executive Committee (CEC) member for Roads, Transport and Public Works**	**jmwatela@kilifi.go.ke**	The CEC fully supports the proposed project and advised that all stakeholders be brought on board. He said that there has been a lot of pressure from investors to expand the airport. The CEC member identified Malindi as low lying town vulnerable to flooding and advised that the municipal council and the contractor design sound drainage systems. According to him, Nganda Road should not be re-routed but rather constructed as an under pass. He noted that the alternative site at Lango Mbaya would have been a better alternative but the cost of constructing a whole new airport could be prohibitive.
Dr. Anisa Omar	**County Executive Committee (CEC) member for Health Services**	**PO Box 519-80108,** **Kilifi, Kenya.**	The issue of drainage should be handled and managed well. The airport is surrounded by settlements whose runoff might end up at the airport grounds. She further advised that KAA built an isolation ward/unit to handle infectious diseases and employ enough

			personnel at the Port Health Clinic.
Mr. Dado	**County Executive Committee (CEC) member for Lands and Physical Planning**	**PO Box 519-80108,** **Kilifi, Kenya.**	The plan to extend the Malindi airport runway has been in the pipeline for a long time. This has delayed development and growth in the area since residents have been fearing that they will be displaced at any time. He noted that there has been pressure from investors to upgrade the airport. From the planning perspective, he said the current location of Malindi airport is not suitable in the longterm due to high population growth and expansion of the town. The county spatial plan advocates for an alternative site located at Lango Mbaya which is sparsely populated. On solid waste management, there should be regular clean ups organized by KAA and Malindi municipal council. He advised that land issues be handled carefully since Malindi has the highest cases of land conflicts and squatter problems

CHAPTER 9

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT

9.1 Introduction

9.1.1 General

The key outcome of the Environmental and Social Impact Assessment (ESIA) process for the proposed extension of Malindi Airport Runway project is the Environmental and Social Management Plan (ESMP). In real meaning, the ESMP is a mechanism to meet the recommended environmental and social mitigation measures. This ESMP is an instrument that will allow KAA, airport users and other key stakeholders to integrate environmental and social components into the project during implementation, operation and decommissioning phases.

The ESIA is a complex document containing a series of recommendations related to mitigation measures, monitoring and management. A key role of the ESMP is to put them all in a single framework showing mitigation measures, responsibilities, and timelines for implementation. It also highlights the various commitments that must be made at various levels, from the senior management level of KAA to the levels of all parties involved in the implementation of the project.

9.1.2 Scope and Objectives of the ESMP

This Environmental and Social Management Plan focuses on mitigating the impacts identified during the environmental and social assessment. It is an instrument that will allow KAA, Airport users and other key stakeholders to integrate environmental and social concerns into the project during the various phases. This plan is meant to establish measures and procedures to control the analyzed impacts and monitor their progress. It will achieve the following in the long run:

(i) Provide the National Environment Management Authority (NEMA) with a tool to make ease the evaluation of the objectives at different phases of the project, taking into account the Kenyan environmental legislation;

(ii) Provide clear and mandatory instructions to the proponent, airport users and other key stakeholders with regard to their environmental and social responsibilities in all phases of project.

(iii) Ensure continuous compliance of KAA, airport users and other key stakeholders with Kenyan legislation and policies regarding the environment;

(iv) Assure the regulators and interested and affected parties the satisfaction of their demands in relation to environmental and social performance.

9.1.3 Applicable Legislation

The pieces of legislation applicable to the ESMP are described in Chapter five of this project report. International normative instruments concerning the environment, as well as international best practices have also been considered.

9.2 Environmental Awareness

The proponent will be sensitive to the needs of the environment so as not to degrade the existing environmental conditions. It is the proponent's primary responsibility to ensure that all parties are directly involved in the construction and operation phases of the project, including making managers and employees aware about the need to prevent or minimize environmental and social impacts. The awareness activities should be guided by the following issues:

(i) Prevention of pollution of surface water and groundwater;
(ii) Prevention of air quality degradation;
(iii) Minimization of increased noise levels;
(iv) Relocation and compensation of project affected persons
(v) Prevention/reduction of social and economic disruptions;
(vi) Prevention of risks to health and safety of workers and the general public.

9.3 Mitigation

All activities related to the lifecycle of the project will be subjected to appropriate mitigation measures to ensure that negative impacts are properly mitigated and managed. Mitigation involves identifying the best options to be adopted to minimize or eliminate negative impacts, highlighting the benefits associated with the proposed project and the protection of public and individual rights. Practical measures are therefore sought to reduce adverse impacts or enhance beneficial impacts of the project.

9.4 Responsibilities in Environmental and Social Management

9.4.1 General

Kenya Airports Authority and Airport users are the main entities responsible for implementing this ESMP. In the interest of environmental protection, health and safety of

workers and the public, and in their own interest, the proponent should include in their contractual arrangements with contractors, clauses relating to environmental protection - and, specifically, compliance with the ESMP - that will safeguard the right to require the contractor's compliance with environmental requirements and social action in case of breach.

9.4.2 Responsibility of KAA

The proponent (KAA) will ensure that all project operations are conducted in accordance with their internal environmental policies and in accordance with the ESMP. KAA in partnership with the contractor and other key stakeholders will ensure that the ESMP and other requirements related to health, safety and environment are implemented in full. KAA should strive to manage operations in a manner to protect the environment and health and safety of employees, contractors, consumers and the general public. To achieve this objective, KAA will:

(i) Obtain Authorizations/Approvals/Licenses required for project implementation;
(ii) Request the contractor to operate on the basis of valid Authorizations/approvals/ licenses for the activities to be implemented;
(iii) Ensure that the EMP is an integral part of the contract document with the Contractor and that the contractor will be responsible for its implementation;
(iv) Establish institutional linkages with relevant parties in the project implementation as needed, or designate a representative for that purpose;
(v) Ensure that the various project activities comply with the mitigation measures proposed in the Environmental Management and Monitoring Program (ESMP);
(vi) Ensure that there are contingency plans and resources for employees health and contingency plans to respond to accidents at work (Emergency Response Plan);
(vii) Make regular inspections to all the different activities with regard to social aspects, health, safety and environment and check for any non-conformity with the EMP attributable to the Contractor and identify the steps taken for its correction;
(viii) Produce reports that allow to monitor and evaluate the performance of operations following the measures and objectives of the ESIA and ESMP in relation to health, safety and environmental protection;
(ix) Conduct an initial induction for construction activities with contractors before the commencement of operations;
(x) Monitor the performance of their own teams, or designate a representative to that effect;
(xi) Approve work procedures established for each phase of the project and ensure that the various proposed activities are implemented in accordance with them;
(xii) Establish and implement a complaints management procedure that allows treatment/appropriate response to them;

(xiii) Create awareness among workers about environment, health and safety issues; and

(xiv) Ensure that any corrective activities recommended by the audits or inspections (performed internally or externally) are implemented within the time pre-set.

If the activities of this project are awarded to contractors or subcontractors to act on behalf of the proponent, the responsibilities indicated here as of the proponent's move to these companies. From an environmental point of view, the primary responsibility over the continued operations, belong to the proponent. It is recommended therefore that where there are jobs awarded to contractors, be appointed a Clerk of Work/Supervisor, which will verify its performance.

9.4.3 Responsibility of Airport users

Airport users will ensure that all their operations are conducted in accordance with the EMP and will ensure that the EMP and other requirements related to protection, Environment and Health are implemented in full in order to protect the environment and health and safety of workers, contractors, consumers and the general public. To achieve this, airport users shall:

(i) Establish an Environmental Management System that allows to reach a determined level of environmental performance and promote its continuous improvement over time;

(ii) Ensure that there are contingency plans and resources for employee health and contingency plans for responding to accidents at work associated with handling chemicals used in the project (Emergency Response Plan);

(iii) Plan their activities, aiming to eliminate or minimize impacts in the environment, through preventive activities or mitigation measures; and

(iv) Develop strategies for environmental management and ensure they comply with environmental laws, implement a pollution prevention program, manage instruments to correct environmental damage, tailoring products to the ecological specifications, and monitor their environmental program.

9.4.4 Responsibility of the Contractor

All Contractors should identify individuals responsible for overall management of the environment, social management, safety and health management during all operations. The Contractor shall be responsible for relevant training of its staff, which must be able

to complete the project activities in an efficient and appropriate manner in accordance with the contractual requirements of KAA to the agreed work. Among many tasks, the contractor shall:

(i) Prepare its own EMP as well as a health and safety plan within 30 days of signing of the contract. The EMP implementation plan must be approved by KAA prior to the initiation of construction works;

(ii) Submit to the proponent the work procedures/methods or equivalent documents for approval;

(iii) Operate on the basis of valid Licenses/Approvals/Authorizations for the activities to be implemented;

(iv) Employ techniques, practices and construction methods to ensure compliance with the ESMP;

(v) Prevent or minimize the occurrence of accidents which might cause damage to the environment and be able to respond positively to an accident if it occurs;

(vi) Meet the working procedures and environmental requirements and health and safety established by contract with the Proponent; ensure compliance with them by sub-contractors who might be hired by him;

(vii) Minimize environmental damage, waste control, avoid pollution, prevent loss or damage on natural resources and minimize the effects on the users and occupants of surrounding lands and the public;

(viii) Provide Personal Protective Equipment (PPE) to workers which is appropriate to the tasks to be performed and ensure that it is used;

(ix) Implement all corrective activities agreed in audit (internal or performed by other agencies) or inspections, within the pre- established deadline;

(x) Manage the complaints process on the elements that fall within its jurisdiction, or refer complaints to the Proponent, so that they can receive treatment/appropriate response;

(xi) Prepare a Rehabilitation Plan which shall include preliminary designs on the temporary and permanent landscaping plan during both the construction and post-construction and maintenance period (where applicable).

9.4.5 Responsibilities of Regulatory Agencies

Regulatory Agencies directly involved in this project include the National Environment Management Authority (NEMA) through the County and Sub County Environment Officers, County Labour Officer, KPLC, Malindi Water and Sewerage Company (MAWASCO), Kenya Rural Roads Authority (KERRA) among others. NEMA is the institution that plays a greater role in the process since it is responsible for taking decision on the ESIA process and responsible for regulating the environmental performance of projects in Kenya. They are also responsible for verification, inspection and audit, before, during and after the implementation of projects (in accordance with EMCA 1999). NEMA is also a governmental agency with expertise in waste management with regard to: the issuance and dissemination of the mandatory rules on the procedures to be followed for waste management ; carry out the environmental licensing of facilities or storage sites and/or disposal of hazardous waste; accredit operators of hazardous waste transportation and vehicles used to transport ; register the public or private entities that handle hazardous waste, and adopt, in coordination with the sectors in charge, the necessary measures to suspend the storage, disposal or transportation of hazardous waste illegally made and/or in conditions that are a danger to public health or the environment.

The other institutions listed above play a subsidiary role in specific issues of the ESIA process and its implementation. For instance KPLC and MAWASCO shall be responsible for the removal and re-routing of electric power and water supply lines respectively in the project site, while KERRA and KAA will work together on the relocation of Nganda Road that cuts across the project site.

9.4.6 Responsibility of the Environment, Health and Safety Supervisor (EHSS)

The Resident Engineer at the commencement of the project shall appoint an Environmental, Health and Safety Supervisor who shall be working on the construction site to oversee the contractor's compliance of the ESMP. The EHSS will be responsible for monitoring of all activities related to the execution of work (development and operation of construction sites, service fronts, borrow pit areas) and all construction activities, participating in the receipt of approval of services, checking compliance with project specifications and standards of service, in addition to any requirements that may be made by the environmental licensing authority. The EHSS shall report directly to the Resident Engineer. Activities to be undertaken by the supervisor include:

(i) Evaluation of the implementation strategy of the proposed works, and of the final execution planning proposed by the contractor in the Work Implementation Plan;

(ii) Permanent monitoring of construction activities, integrated with the technical supervision of works, checking compliance with the mitigation measures of impact and/or environmental and social control, contributing to the proper routing of unforeseen situations and for the rapid solution of non- compliances;

(iii) Permanent and rigorous verification of the occurrence of impacts to the surrounding communities and users of space covered by construction activities;

(iv) Preparation of regular monitoring reports indicating non-compliances and environmental disputes to be resolved by the contractor;

(v) Participation in the verification and approval of the services measurement in what concerns the conservation of the environment and health and safety of workers and communities surrounding the project;

(vi) Monitor the environmental and safety impacts of current activities, continuous review of the update of the proposed measures for mitigation activities and related impacts of the proposed work. This will be formulated in terms of, and considering the standards and specifications for the KAA for activities to mitigate environmental impact;

(vii) Develop procedures and technical tools for monitoring and supervising environmental and social works;

(viii) Develop procedures and technical tools for the management and monitoring social and environmental programs;

(ix) Installation of the database that will collect information and records of supervisory activities and environmental management of the project;

(x) Comply with and enforce existing laws and the requirements of environmental agencies and other relevant bodies involved;

(xi) Ensure that the Environmental Management Plan is fulfilled according to the stipulated standards;

(xii) Identify and evaluate periodically the effects and results on the basis of established environmental standards and propose, where necessary, changes, additions or new

actions and activities, considering also the progress of services and their capacity to contractual deadlines and resources allocated.

9.5 Construction Phase Environmental Management Plan

The EMP for the construction phase mainly focuses on impacts that are likely to affect the environment, the health and safety of the public as well as the workers during the planning and construction process. Mitigation measures are then proposed to minimize the anticipated impacts. Issues covered by the construction EMP include; Occupational safety and health, air pollution, surface and ground water contamination, noise pollution, displacement and damage to property and traffic impact among others. This are presented in Table 9.1

Table 9.1: Environmental Management Plan for the construction phase

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Impacts of obtaining construction materials	• Strip and stockpile topsoil from borrow pits and quarries for use in site restoration. • Close all borrow pits and quarries in accordance with an approved plan to maximize future use and minimize health and safety hazards • Re-use excavated materials from the works as fill.	KAA, contractor	1,000,000	Construction period
Traffic Management	• Sensitize drivers on safe driving and working practices • Avoid transporting materials during periods of peak traffic activity • Provide alternative routes for traffic where total closure of roads is expected • Erect appropriate road signs to warn road users of the construction activities.	Contractor	500,000	Construction period

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Solid waste management	1. The contractor should comply with National Environmental (solid waste management) Regulations 2006. 2. The contractor should develop a solid waste management plan for the site 3. Sort, recycle or re-use solid wastes where applicable in line with sound environmental management practices 4. Construction wastes that cannot be re-used or recycled should be disposed at designated dumping sites by the Malindi Municipal Council 5. Track all waste generated and disposed	KAA Contractor and KAA	1,500,000	Weekly during construction
Vegetation Removal and Soil erosion	1. Vegetation cover should be removed only where necessary. Re-plant exposed project sites with appropriate vegetation covers 2. Earthworks should be carried out during the dry season to prevent soil from being washed away by rain 3. Excavated materials and stockpiled soils should be covered or kept at appropriate sites to prevent wind erosion 4. Undertake appropriate soil erosion control measures to manage siltation and clogging of drains during construction phase	Contractor	Part of construction costs	At the end of construction period

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Surface and underground water pollution	1. Construct oil-water interceptors or sumps to capture discharge of oils, fuels and other pollutant liquids 2. Provide pit latrines/portable toilets at the camp and construction sites for use by workers 3. Sensitize workers not to dump waste generated from camps and construction sites into water sources 4. Materials, fuels and chemicals must be stored in a specific and secured area to prevent pollution from spillages and leakages. The EMCA Regulations on hazardous waste management must be applied fully. 5. Train drivers and workers on oil and fuel management	Contractor, KAA Environment Officer, OHS Officer	Part of construction costs	During construction
Occupational Health and Safety risks	1. Develop a safety and health plan for guiding all workers on safety and health issues at the construction site	Contractor and KAA OHS Officer, Fire safety officer	Use KAA staff, contractor	During construction period
	2. Constitute a health and safety committee to manage health and safety issues	Contractor		
	3. Train and sensitize all workers on accident prevention and safe work procedures	Contractor		
	4. Provide and display emergency telephone numbers within the site	Contractor	1,000,000	During operation period
	5. Restrict and control unauthorized access into construction sites to prevent accidents and injuries			
	6. All machines and other moving parts of equipment must be enclosed to protect all workers from injuries			
	7. Provide personal safety gears and enforce adherence to their use at all times			

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
	8. Train some workers on first aid and fire control and management techniques			
	9. Avail a well stocked first aid kit at the site and ensure its easily accessible in case of an emergency			
	10. Provide suitable and adequate sanitary facilities for both male and female workers			
Air pollution	1. Sprinkle water on dusty work areas to minimize dust generation.	KAA, Contractor	Part of construction costs	During construction period
	2. Ensure all workers are provided with personal protective gears	KAA, Contractor		
	3. Control speed for construction vehicles and spray water on dusty roads	Contractor	N/A	During construction period
	4. Cover sand and loose aggregate materials during transportation to site	Contractor	Part of construction costs	
	5. Regular servicing and maintenance of machines and vehicles to reduce emission of harmful fumes to the atmosphere	Contractor		
Noise pollution	1. Device appropriate noise mitigation measures e.g. muffling of exhaust pipes, use of acoustic barriers	Contractor	Part of construction costs	During construction period
	2. Provide personal protective equipment to workers during construction			
	3. Track drivers to avoid hooting and revving of engines where unnecessary			
Site Security	1. Develop security rules and procedures to be followed by the contractor and suppliers during construction	KAA security team, contractor	KAA to use their own	Construction period

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
	2. Conduct thorough vetting for all workers to avoid criminal elements infiltrating the airport grounds 3. Proper screening and manning of entry points 4. Conduct random and regular security patrols around the construction site		security team at the airport	
	5. Establish a working partnership with the adjacent communities on security issues			
Drainage	1. Integrate airport drainage system with the Malindi municipal drainage system to ensure smooth flow of runoff 2. Employ the use of partially covered drains to avoid bird activity at airport grounds 3. Discharge drains should be fitted with grit chambers and oil/grease interceptors 4. Drainage outfalls should be well designed and constructed to avoid soil erosion	Contractor, Malindi Municipal civil engineers	Part of construction costs	During construction period
Impact of the project on existing water and electric power infrastructures	• Re-route power lines from project site in liaison with KPLC • Remove and re-route water supply lines from proposed project site in liaison with MAWASCO • KAA should factor the cost of removal or re-routing the power and water infrastructures in the project budget	KAA, MAWASCO, KPLC, Contractor,	To be determined	Pre-construction stage

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Impact of displacement of people and damage to property	• Undertake a detailed survey and valuation of land and property likely to be affected and prepare report on compensation before project commencement. • Compensation for loss of land or property should be done promptly and should be based on market rates • Constitute a grievance redress mechanism comprising of representatives of all stakeholders • Resettlement and compensation should be implemented in accordance to National and International guidelines	KAA, consultant, Representatives of the affected people, National Land Commission	To be determined	Pre-construction
Socio – economic impacts	• Give priority to locals when hiring workers for the project during construction • Ensure gender balance in employment as far as possible. • Provide business opportunities for local suppliers and service providers • Implement HIV/AIDS and STD awareness and prevention programme for workers and local residents targeting risk groups • Constitute a committee to handle social conflicts related to the project	KAA, Contractor	Not applicable	During construction
Total			**4,000,000/=**	

9.6 Operation phase Environmental Management Plan

Operation phase EMP proposes measures that should be undertaken to minimize adverse impacts that are likely to result from operation activities of the project. The following issues have been identified and mitigation measures proposed as shown in Table 9.2.

Table 9.2: Operational phase Environmental Management plan

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Noise and vibrations pollution control	1. Ground personnel at the airport should be provided with personal protective equipment 2. Auxiliary machines and equipment used at the airport should be fitted with noise mufflers and regularly serviced 3. Initiate noise mapping for the airport in relation to adjacent land use patterns 4. Sensitize the community and discourage them from building closely to the airport boundaries 5. Promote building designs that reduce impact of noise 6. Formulate policy that favors low noise aircrafts	Contractor, KAA	To be determined by KAA	Operational phase
Air pollution	1. Formulate an emission control plan for the airport 2. Install air quality equipment and systems that shall enable continuous monitoring 3. Regular servicing and maintenance of ground equipment and machines to control excessive exhaust fumes	KAA	To be determined by KAA	Operation phase
Solid Waste Management	1. Develop a waste management plan for the airport and adhere to EMCA solid waste management regulations 2006 2. Waste should be sorted and segregated at source for easy of management	KAA management	KAA Environment staff	Operation phase

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
	3. Provide adequate infrastructure for waste collection and transfer points before disposal (bins, holding containers etc.)		100,000	Operation phase
	4. Contract a NEMA licensed solid waste handler to collect, transport and dispose waste from the airport 5. Track all waste generated from the airport for disposal		1,000,000	Yearly-during operation phase
Storm water management	1. Conduct regular checks and unclog or de-silt blocked drainage channels within the airport 2. Regular repair and maintenance of drainage out falls to prevent soil erosion	KAA management	To be determined as need arises	Operation phase
Water and soil pollution	1. Ensure proper handling and management of oils and fuel at service and maintenance yards at the airport 2. Regular checks and maintenance of oil interceptors and grit traps 3. Hazardous materials should be kept on a raised platform to avoid contamination with storm water runoff	KAA Management	To be determined	Regularly

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Bird Strike menace	1. Conduct a bird species and habitat preference study at the airfield and surrounding habitat 2. Ensure that the existing bird control committee is well equipped and funded 3. Identify and minimize all bird attraction sites within the proposed project area 4. Grass at the airfield should be cut regularly to a height that will discourage habitation of birds and small animals	KAA	To be determined	Regularly-during operation period
Occupational Health and Safety	• Constitute a health and safety committee to manage health and safety issues at the airport taking into consideration the growth and expansion of the airport • Provide adequate firefighting equipment and first aid kits to match with the growth and expansion of the airport • Review emergency and contingency plans periodically • Enhance measures to screen and control infectious diseases as the airport opens up to direct international flights	KAA	To be determined	During operation period

Environmental issues	Action required	Responsible party	Estimated Cost (Kshs)	Time frame
Aviation safety and security	• All entry points should be properly secured and passengers and vehicles thoroughly screened • Thorough vetting for all airport staff and workers to avoid criminal elements that can easily compromise safety • Assess safety risks that can result from new upcoming tall buildings along the flight corridor • Carry out regular security patrols around the airport • Establish an information sharing system where the community can easily report suspicious activities • Secure the runway by erecting a fence around the new runway extension section	KAA Management	To be determined by KAA	Throughout the Operation phase
Total			**1,100,000.00**	

9.7 Environmental Monitoring

9.7.1 General

Environmental monitoring and audits are essential in Project's life span as they are conducted to establish if project implementation has complied with set environmental management standards for Kenya as spelt out in EMCA 1999 and the Environmental (Impact Assessment) and Audit Regulations 2003. In this Project, environmental monitoring and audit will be conducted to ensure that identified potential negative impacts are mitigated during the project's implementation, operation and decommissioning periods. The key objectives of monitoring are:

(i) To ensure that the ESMP is implemented;
(ii) To evaluate the effectiveness of the mitigation measures;
(iii)To verify predicted impacts;
(iv)To provide feedback to licensing authorities.

Environmental concerns, that will be monitored and audited during the project's construction and operation period include: water quality, air Pollution, occupational health and safety issues (including worker accidents and hazards), soil erosion, Socio-cultural changes; and socio-economic benefits.

9.7.2 Project parameters to be monitored

The EMCA 1999 require the project proponent to prepare and undertake a monitoring plan and regular auditing. Monitoring is needed to check if and to what extent the impacts are mitigated, benefits enhanced and new problems addressed. Table 9.3 present the various project parameters to be monitored.

Table 9.3: Monitoring plan

Monitoring Parameters	Responsibility	Monitoring Location(s)	Time/Frequency	Indicators
Condition of machinery and equipment	Contractor, KAA	At work stations	Weekly	Service, maintenance, repair or replacement records of faulty machines
Training on safety and health	Contractor, KAA	At work stations	At onset of construction and operation	Records of first aid, fire management training
Accidents, incidents, injuries etc.	Contractor, KAA	At work stations	Daily	Mitigation/prevention measures in place, PPEs, Records of incidents or accidents, Medical records,

Monitoring Parameters	Responsibility	Monitoring Location(s)	Time/Frequency	Indicators
				Training , First Aid kits; Fire extinguishers
Dust emissions	Contractor, KAA	At work stations	Daily - construction	Health safety measures in place
Noise emissions	Contractor, KAA	At work stations	During construction and operation	Noise level measurement and monitoring records, Noise reduction strategies in place
Sanitation and welfare facilities	Contractor,	Workers camps, construction sites and site offices	Weekly	Presence of sanitation & welfare facilities
Oil spills and leakages	Contractor	Workers camps and construction sites	Daily	Records of daily inspections
Solid Wastes	Contractor, KAA	Workers camps, construction sites and airport terminal offices	Daily/weekly	Inspection and waste disposal records
Traffic management	Contractor	At construction sites	Daily	Records of driver and vehicle activities
Ambient air quality	KAA	During operation	Sampling every 3 months	Sampling and measurement records

CHAPTER 10

10. DECOMMISSIONING

10.1 Introduction

Decommissioning normally takes place both at the end of construction period and during the final phase of a project life-cycle. Environmental planning is therefore necessary before any decommissioning activities should be allowed to commence. The reason for this is because a project earmarked for decommissioning has in all likelihood been operational for some time, and as such, the environment within which it lies has stabilised in response to the presence of the associated infrastructure, activities and facilities. At the end of construction phase, decommissioning mainly targets temporary facilities associated with construction camps and site restorations. The decommissioning of one or all components of the proposed project will therefore have some effect on the environmental status quo of the project site, either in a positive or in a negative way.

10.2 Purpose and objectives of decommissioning

The generally accepted purpose of decommissioning is the release of valuable assets such as machinery and sites for alternative use, recycling and reuse of materials and the restoration of environmental amenity. In all cases, the basic objective is to achieve an end-point that is sensible in technical, social and financial terms, that properly protects workers, the public and the environment and, in summary, complies with the basic principles of sustainable development. Stringent regulatory controls protect the public, the environment and workers from the hazards associated with decommissioning activities.

10.3 Decommissioning at the end of construction phase

10.3.1 General

The construction process at the proposed project site will involve a number of activities which may contribute to some changes in the local environmental conditions. Activities associated with site construction process and which may have some impact on local environment include acquisition and transportation of construction materials, equipment, vehicles and personnel to the site. Construction process will involve excavation and piling of soil which may negatively affect the local environmental conditions.

10.3.2 Decommissioning and site restoration activities

The decommissioning exercise will involve dismantling of site facilities; backfilling all disturbed areas and transportation of materials out of site for disposal or re- use in similar future projects.

10.3.3 Disposal of materials from the construction site

Materials from the site will be basically remains from construction activities and include metal scraps and metal pipes among others. These materials can be reused, exchanged, recycled and donated to other organizations. Scrap materials, can often be reused or refurbished. Some items could be used by Kenya Airports Authority for their next job, and many items can be sold to for recycling. Various items should be accumulated separately to facilitate recycling. The table below gives a summary of mitigation measures proposed for decommissioning during construction stage

Table 10.1: Decommissioning at the end of construction phase

Activity/ Issues	Recommended mitigation measures
Impacts related to procurement of construction materials	1. Maximise the re-use of excavated materials in the works, as fill.
	2. Strip and stockpile topsoil from borrow pits and quarries for use in site restoration.
	3. Close all borrow pits in accordance with an approved plan to maximise future use and minimise health and safety hazards.
Spoil disposal	1. Maximise the re-use of all excavated materials in the works
	2. Dispose of spoil only at designated sites and by approved methods; methods must consider topsoil conservation and quality, long-term soil stability against shrinking and swelling, erosion and floodwaters.
Waste Management and Pollution	1. Design and implement formal site waste management plan.
	2. Apply best practice and standard operating procedures (SOPs) to minimise risk of spills (including secondary containment of fuel dispensing areas and vehicle maintenance on concrete pads with oil and grease traps).
	3. Collect, sort and store all pieces of metals scattered within the site in a special area

	pending disposal to scrap metal
Dust nuisance	1. Identify dust-sensitive locations on all unpaved roads and access tracks leading to the site and establish and enforce maximum vehicle speeds of 10km/h through these roads.
Hazards to workers	1. Implement full H&S programme (Health and Safety Plan) and labour welfare provisions.
	2. Establish and operate an emergency evacuation procedure for casualties.

10.4 Decommissioning at the end of project life cycle

Decommissioning of airports is not usually possible due to lack of alternative sites with expansive space and the costs associated with setting up new infrastructure. However, should decommissioning be required, the airport management will be required to draw a detailed decommissioning master plan. Such plan should address all environmental and socio-economic impacts associated with decommissioning. An EIA report for decommissioning would then be prepared and submitted to NEMA. A license shall then be issued stipulating the terms and conditions to be followed during decommissioning.

CHAPTER 11

11. CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

The proposed extension of Malindi Airport runway will improve the operational status of the airport and open up the region for more business opportunities. Tourism related businesses are expected to flourish as a result of the planned introduction of direct international flights to the airport upon completion of the project. Apart from the anticipated economic benefits, the project will create more employment opportunities both during construction and operation phases.

In order to safeguard the health of both the public and the environment, the proponent and contractor should ensure that the environmental and social management and monitoring plan contained in this study report should be strictly followed. Most of the potential negative impacts associated with the proposed project indicated in chapter six of this report are moderate in significance and can be easily mitigated through implementation of the proposed mitigation measures.

The project team has already prepared a Resettlement Action Plan to facilitate the relocation and resettlement of people who will be affected by the project. It is important that compensation be done before the project commences. The process should be done in a transparent and accountable manner and in accordance to applicable national and international laws.

11.2 Recommendations

- The proponent and contractor shall ensure that worker's occupational health and safety standards are maintained through capacity building, proper training and provision of protective clothing. If a residential camp for workers is set up, it should be management in accordance to the required health and environmental standards and regulations
- The design and construction of the proposed runway should strictly comply to ICAO runway design standards and operation regulations.
- KAA should initiate noise and air pollution monitoring programs to track any expected changes in noise and air pollution levels at the airport for effective management. Such monitoring programs must adhere to statutory regulatory

requirements as spelt out in the EMCA's Noise and Vibrations Regulations 2009 and Air Quality Regulations 2014.

- KAA in liaison with Malindi Municipal Council shall ensure that Land Use Zoning and Building codes are strictly followed to prevent incompatible activities around the airport.
- KAA in collaboration with the Kilifi County engineers shall ensure that drainage designs both within the airfield and the surrounding areas are integrated and streamlined to avoid flooding at the airport grounds.
- Construction work should be planned and implemented in such way that it will not cause much interference to flight schedules at the airport.

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ANNEXES

Annex 1: RAP Report
Annex 2: Site Layout Plan
Annex 3: Minutes and proceedings of meetings
Annex 4: Attendance Lists
Annex 5: Geospatial and survey works Report
Annex 6: Compensation Rates Guidelines
Annex 7: Compensation Matrix
Annex 8: Practicing Licenses (Firms & Individuals)
Annex 9: Questionnaires

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