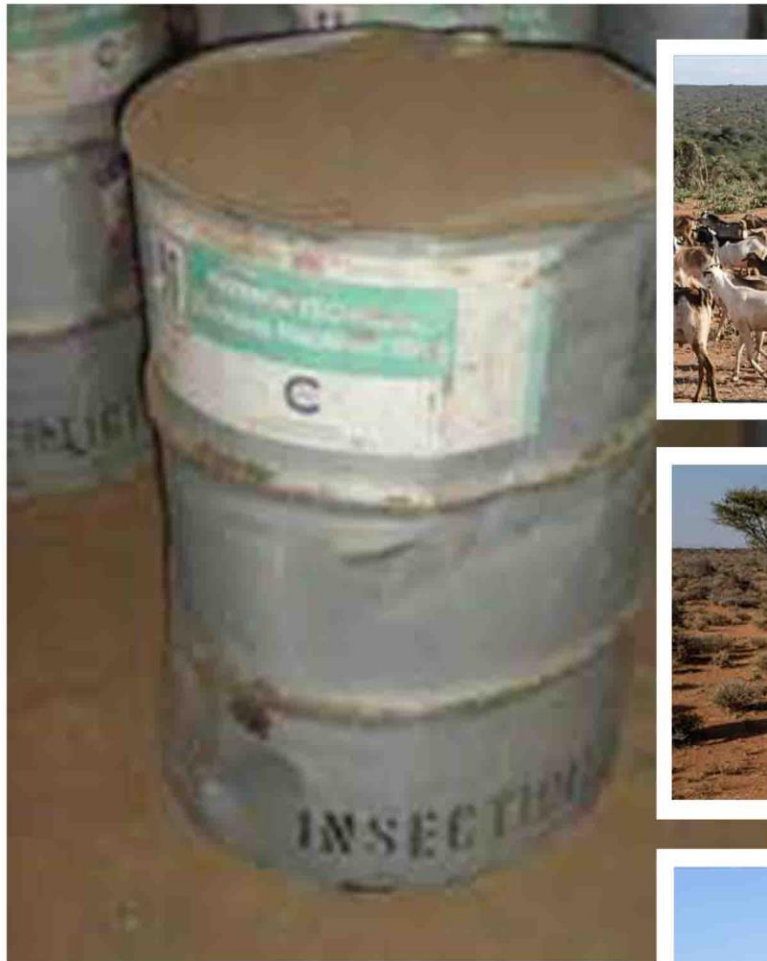




**MINISTRY OF AGRICULTURE, LIVESTOCK
FISHERIES AND COOPERATIVES**

**EMERGENCY LOCUST RESPONSE PROGRAM
(P173702)**

INTEGRATED PEST MANAGEMENT PLAN (IPMP) NOVEMBER 2020

Prepared By:



EMC Consultants
ENVIRONMENTAL KNOWLEDGE IN PRACTISE

Tito Kodiaga
Environmental and Social Safeguards Consultant
Nairobi, Kenya. Cell: +254-722-579272
Email: tito@emconsultants.org
Website: <http://www.emconsultants.org>

TABLE OF CONTENTS

EXECUTIVE SUMMARY	6
1 INTRODUCTION.....	20
1.1 Emergency Locust Response Program.....	20
1.2 Project Development Objective	20
1.3 ELRP Project Components	20
1.4 Selected Pesticides	21
1.5 Project Activities.....	22
1.6 Project Beneficiaries	23
1.7 Aims and Objectives of IPMP.....	23
1.8 Component 1 Implementation Arrangements	24
2 STAKEHOLDER ENGAGEMENT	25
2.1 Stakeholder Identification	25
2.2 Stakeholder Engagement.....	25
2.3 IPMP Disclosure	26
3 ENVIRONMENTAL AND SOCIAL BASELINE DATA.....	27
3.1 Location and Size	27
3.2 Topography and Drainage.....	27
3.2.1 Hydrology	27
3.3 Perennial and Seasonal Rivers	30
3.3.1 River Perkerra	30
3.3.2 Tana River.....	30
3.3.3 Daa River	30
3.3.4 Kerio River.....	31
3.3.5 Athi-Galana-Sabaki River.....	31
3.3.6 Turkwell River	31
3.3.7 Kathita River	31
3.3.8 Kalabata River	32
3.3.9 Ol Arabel River.....	32
3.3.10 Suguta River.....	32
3.3.11 Kinna Springs.....	32
3.3.12 Lake Logipi.....	32
3.4 Land Use	33
3.5 Protected Areas	35
3.6 Birdlife	37
3.7 Socio-Economic Background.....	40
3.7.1 Livelihood Systems.....	40
3.7.2 Poverty, Health and Gender.....	41
4 POLICY AND REGULATORY FRAMEWORK FOR PEST AND PESTICIDE MANAGEMENT	43
4.1 The Legal, Regulatory and Policy Framework	43
4.1.1 Constitutional Provisions.....	43
4.1.2 Pest Control Products Act Chapter346, 2012	44
4.1.3 Pest Control Products (Registration) Regulations, 1984	45
4.1.4 The Pest Control Products (Licensing of Premises) Regulations, 1984	45

4.1.5	The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984	46
4.1.6	Pest Control Products (Importation and Exportation) Regulations, 1984 ..	46
4.1.7	Pharmacy and Poisons Act Chapter 244, 2012	46
4.1.8	Pest Control Products (Licensing of Premises) Regulations, 1984	46
4.1.9	Pest Control Products (Disposal) Regulations, 2006.....	47
4.1.10	Plant Protection Act Chapter 324, 2012	47
4.1.11	Environment Management and Coordination Act (No. 8 of 1999), EMCA (Amendment) Act 2015, Cap 387.....	47
4.1.12	Occupational Health and Safety Act, 2007	49
4.1.13	Public Health Act, Chapter 242, 2012	51
4.2	Relevant Sector Policies.....	51
4.2.1	The Kenya Vision 2030	51
4.2.2	Agricultural Sector Development Strategy	51
4.2.3	National Climatic Change Strategy	52
4.2.4	The National Agricultural Research Systems Policy.....	52
4.2.5	The National Agricultural Sector Extension Policy.....	52
4.2.6	The National Productivity Policy.....	52
4.2.7	The National Food and Nutritional Security Policy	53
4.3	Relevant Institutions-Environmental.....	53
4.4	World Bank Group EHS Guidelines	54
4.5	International Environmental and Social Management Requirements.....	54
4.5.1	Convention on Biological Diversity, 1992	54
4.5.2	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1998.....	54
4.5.3	Bamako Convention, 1992.....	55
4.5.4	International Plant Protection Convention (IPPC) of FAO, 1952	55
4.5.5	World Food Security and the Plan of Action of November 1996.....	55
4.5.6	United Nations Framework Convention on Climate Change, 1992	55
4.5.7	FAO Guidelines on Good Practice for Aerial Application of Pesticides, 2001	55
4.5.8	FAO Guidelines on Good Practice for Ground Application of Pesticides, 2001	56
4.5.9	FAO Guidelines on Management Options for Empty Pesticide Containers, 2001	56
4.5.10	FAO Guidelines on Desert Campaign Organization and Execution, FAO Rome, 2001	56
4.5.11	FAO Guidelines on Desert Locust Control, 2003.....	56
4.5.12	FAO Desert Locust Guidelines on Safety and Environmental Precautions, 2003	57
4.6	Applicable World Bank's Environmental and Social Standards	57
5	INTEGRATED PEST MANAGEMENT PLAN	59
5.1	Control Strategies and Management Approach	59
5.2	Choosing Pesticides for Locust Campaign.....	59
5.3	Alternative Less Toxic Pesticides	61
5.4	Summary of Toxicity of Selected Pesticides.....	62

5.5	Proposed Pesticides For Use in ELRP	63
5.6	Risks Associated with Pesticide Use.....	64
5.6.1	Pesticide Inefficacy	64
5.6.2	Impacts Occupational Health and Safety.....	64
5.6.3	Impacts on Ecologically Sensitive Environments.....	68
5.6.4	Impacts to Birds, Fishes, and Other Organisms.....	69
5.6.5	Storage and Store Siting Impacts.....	70
5.6.6	Solid Waste Impacts	71
5.6.7	Effluent Waste Impacts.....	73
5.6.8	Community Health and Safety.....	73
5.6.9	Accidental Release of Pesticides	75
5.6.10	Livelihood and Food Security Impacts	76
5.6.11	Pilferage of Pesticides.....	77
5.7	Integrated Pest Management Plan.....	79
5.7.1	Pre-Spray Phase	79
5.7.2	Spray Phase.....	80
5.7.3	Post Spray Phase	89
5.8	Monitoring Indicators.....	91
5.8.1	Pre-Spray Phase	91
5.8.2	Spray Phase	92
5.8.3	Post Spray Phase	100
6	IPMP IMPLEMENTATION ARRANGEMENT.....	103
6.1	Environmental and Social Risk Management Instruments	104
6.1.1	Preparation and Review of Sub Project IPMPs	104
6.1.2	Sub Project Screening.....	105
6.2	Capacity Building.....	105
6.3	Monitoring.....	106
6.4	Monitoring Roles and Responsibilities	106
6.4.1	NPCU Environmental and Social Specialists	106
6.4.2	CPCU Environmental and Social Specialists	106
6.4.3	National Environment Management Authority	106
6.4.4	Monitoring Approaches	107
6.5	Estimated Budget	110
7	REFERENCE.....	111
7.1	Annex A. Stakeholders Consulted	112
7.2	Annex B. Pesticide Waste Management Plan.....	113
7.3	Annex C. Emergency Preparedness and Response Plan.....	127

List of Tables

Table 0-1.	Summary of Mitigation Measures.....	12
Table 0-2.	Capacity Building	17
Table 0-3.	Summary of Stakeholder Consultation Concerns	18
Table 2-1.	Summary of Stakeholder Consultation Concerns	25
Table 3-1.	Classification of Dryland Ecological Zones.	33
Table 3-2.	Protected Areas in Affected Counties.....	35
Table 4-1.	Other Institutions.....	53
Table 5-1.	Pesticide Toxicity.....	63

Table 5-2. Pesticides to be purchased by MoALFC	63
Table 5-3. Target campaign personnel and topical training areas	67
Table 5-4. Ecologically and Agronomically Sensitive Areas and their Management Measures ..	69
Table 5-5. Estimated Mitigation Budget	101
Table 6-1: Institutional arrangement for Desert Control and Implementing the PMP	103
Table 6-2. Capacity Building	105
Table 6-3. Overall Estimated Costs Budget For implementation of IPMP	110
Table 6-4. Operational Cost Budget	110

List of Figures

Figure 3-1. Affected Counties in Kenya.....	28
Figure 3-2. Hydrological Basins in ASAL Counties in Kenya	29
Figure 3-3. Land Use and Land Cover	34
Figure 3-4. Protected Areas in ASAL Counties in Kenya.....	38
Figure 3-5. IBA in ASAL Counties in Kenya	39
Figure 5-1. Conceptual Model for Possible Exposure Pathways from Preparation of Pesticide...	65
Figure 5-2. Conceptual Model for Possible Exposure Pathways from Disposal of Pesticide Formulations.....	65

EXECUTIVE SUMMARY

This Integrated Pest Management Plan (IPMP) has been prepared for the Kenya part of the Emergency Locust Response Program (ELRP), Component 1, which is a World Bank financed project to Government of Kenya's (GoK) Ministry of Agriculture, Livestock Fisheries and Cooperatives (MoALFC).

This document serves as the guide to locust control pesticide use related actions and activities under the Program. As per the World Bank's Environmental and Social Framework (ESF) requirements and Environmental and Social Standard 3 (ESS3), Resource Efficiency and Pollution Prevention and Management a project involves a significant pest management issues, then an IPMP is a required environmental and social risk and impact mitigation instrument. This IPMP is prepared due to the fact that:

- (i) The project will finance procurement of potentially hazardous pest control products;
- (ii) There are potential concerns on the impacts of the pesticides on the environment and human health.

According to the Bank's ESS 3, for any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). Where projects involve recourse to pest management measures, the Borrower will give preference to integrated pest management (IPM)¹ or integrated vector management (IVM) approaches using combined or multiple tactics.

Emergency Locust Response Program

The ELRP is financing activities that will have positive impacts and benefits to the areas currently infested with the desert locust. The proposed locust control activities will eliminate swarms of locust that have destroyed vegetation, crops and restore livelihoods that have been destroyed in the Country. Through the project's livelihood restoration and recovery component, the project could positively and negatively affect pastoralist and farmers communities that have seen their livelihood destroyed by large swarms of locust. Particularly disadvantaged and vulnerable groups could include internally displaced people (IDP), refugees, pastoralists and women and girls across these groups.

Project Development Objective

The Project Development Objective (PDO) is to prevent and respond to the threat to livelihoods posed by the desert locust outbreak and to strengthen Kenya's system for preparedness. Citizen engagement will be monitored by tracking awareness raising communication campaigns conducted and grievances registered and resolved by the program.

¹ IPM refers to a mix of farmer-driven, ecologically based pest control practices that seeks to reduce reliance on synthetic chemical pesticides. It involves: (a) managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them; (b) integrating multiple methods (relying, to the extent possible, on nonchemical measures) to keep pest populations low; and (c) selecting and applying pesticides, when they have to be used in a way that minimizes adverse effects on beneficial organisms, humans, and the environment

ELRP Project Components

Component 1: Surveillance and Control Measures

The objective of activities under this component is to limit the growth of existing climate-change-induced desert locust populations and curb their spread, while mitigating the risks associated with control measures and their impacts on human health and the environment. Activities to be supported would be continuous surveillance and monitoring, spraying of hopper bands and adult swarms, and delivery of training and capacity building to field teams to ensure that operations are carried out in a safe and effective manner.

Sub-component 1.1: Continuous Surveillance

This sub-component will finance the surveillance activities including both aerial and ground surveillance. The surveillance activities will be anchored at the national level and will be undertaken through already established ground control stations. Continuous surveillance will be designed to enable informed and climate-responsive locust management decision-making. The surveillance activities will cover the following broad areas: (i) monitoring the presence of and movements of adult swarms, breeding and egg-laying areas and the movement of developing nymphs and hopper bands, all to support improved forecasting of breeding and migration and decision making on areas to be treated and appropriate and optimal control methods to break the cycle of the next generation; (ii) evaluating the effectiveness of locust control operations; (iii) aerial and ground assessments of damage caused by the locust upsurge to crop and pasturelands to guide targeting of livelihood protection and restoration activities to be supported under Component 2; and (iv) continuous monitoring and assessment of environmental and human health risks associated with locust control. Innovative approaches to surveillance such as the use of satellite maps, drones, eLocust3, Geographical Positioning Systems (GPS) enabled cameras and meta-data analysis and climate information for locust risk mapping will be used, building on work already going on related to big data and disruptive agricultural technologies under the KCSAP.

Sub-component 1.2: Control measures will reduce locust populations and prevent their spread to new areas. This would be achieved via a range of targeted ground and aerial control operations and would emphasize, whenever possible, neutralizing hopper bands before they develop into adult swarms, which leads to another cycle of infestation and expansion and requires more costly and logistically challenging aerial spraying. Depending on the size of hopper bands and of the related infested areas, their control can be handled either by ground control teams or aircraft spraying either with insect growth regulators, bio-pesticides or conventional chemical pesticides. The primary strategy to be employed in the control of the desert locust will be to target the breeding sites and control the hoppers, i.e. while locusts are still at the nymph stage before they can fly. The adult locust swarms shall be controlled mainly through aerial sprays. This sub-component would finance the spraying equipment, protective gear, approved pesticides, and safety and awareness training for spraying teams and other locust control personnel. Public awareness campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations. The project will also implement health, environmental and safety measures to reduce risks to an acceptable minimum.

Selected Pesticides

ESS3 requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the Environmental Health and Safety Guidelines (EHSGs). In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on nontarget species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.

The Project will finance the use of two pesticides (already approved by the Bank) for the desert locust control activities, a **chemical pesticide** Fenitrothion 96% which is a WHO **class II**, formulated as Ultra Low Volume (ULV) and a **biopesticide** Metarhizium. The selected pesticides do not have any formulation that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. The pesticides are not restricted for distribution or use in Kenya and are not likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

Project Activities

Major activities that would be undertaken on ground are the following among others:

- Procurement/rental of equipment (sprayers, vehicles, drones, aircrafts), support to field operations (aerial and ground operations)
- Procurement of pesticides (Fenitrothion and Metahirzium)
- Procurement of PPEs (gloves, visors, masks, boots, coveralls, googles, crushing equipment)
- Renovation of pesticide stores.

- Application of pesticides (spray operations)
- Environmental and health monitoring of the spraying activities

Component 2: Livelihoods Protection and Rehabilitation

Beyond the immediate control measures deployed to curtail the proliferation and spread of the locusts, the next priority and the objective of Component 2 would be to help protect the poor and vulnerable in locust- affected areas from human capital and asset loss, enhance their access to food, and restore livelihoods that have been damaged or destroyed by swarms. The objective of this component is to support affected farmers and livestock holding households restore their productive assets for enhanced adaptation and resilience. A separate ESMF has been prepared for Component 2.

Component 3: Coordination and Early Warning Preparedness

Interventions under this component would include establishing and strengthening a Locust Control Unit (LCU) within the Plant Protection Services Division (PPSD) of MoALFC at the national level to prevent future outbreaks from spiraling out of control. Early warning systems will be developed and implemented to support prevention and rapid response to new and existing climate change-induced locust infestation, thereby limiting in-country and cross-border spread and intensification. Due to the emergency nature of this project, the environmental and social instruments required may be deferred, the production and implementation of these instruments will be presented as disbursement conditions for the relevant components in the Environmental and Social Commitment Plan (ESCP) developed.

Component 4: Project Management

This would finance the associated costs such as financial management, procurement, environmental and social management, and communications. The communications component, in particular, apart from external and internal communication activities can promote increased community awareness about locust response and what they need to do when their area has been treated with pesticides (e.g., do not eat the locusts or feed them to livestock, do not dump in water bodies, etc.), as well as coordination among responsible entities (international, regional, national, and subnational) to better respond to outbreaks.

Project Beneficiaries

The Project is expected to benefit all the farmers in the impacted counties in Kenya. The component 1, 3 and 4 will be implemented in all the counties that have experienced locust infestations. However, component 2 will be implemented in specific wards that are most impacted in the 15 of the most severely impacted counties in the country. The primary project beneficiaries will be affected farmers, pastoralists and households that have been affected by the locust upsurge and are food insecure. Vulnerable and marginalized households and female headed households will be prioritized in the targeting process.

Justification and Objective of IPMP

ESS 3 requires that for any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). This Integrated Pest Management Plan is prepared to address use of chemicals to control desert locust invasion under the Kenya-ELRP. The project is funded by the World Bank and in compliance with the environmental and social standards, an IPMP is required because of the planned use of large quantities of pesticides.

Pesticide Policy, Legal, International Requirements and Guidelines

The following legal instruments provide guidance and regulations when implementing projects that use pesticide in Kenya. Also included are international conventions and guidelines that Kenya is a signatory to with regards to pesticide use.

- *Public Health Act*
- *The Agricultural Sector Development Strategy (ASDS)*
- *The National Agricultural Sector Extension Policy (NASEP)*
- *The National Productivity Policy (NPP)*
- *The Kenya Constitution, 2010 (Constitution of Kenya 2010)*
- *Chapter 324 – Plant Protection Act*
- *Chapter 346: Pest Control Products*
- *Chapter 326 – Seeds and Plants Variety Act*
- *The Pest Control Products (Licensing of Premises) Regulations, 1984*
- *The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984*
- *The Pest Control Products (Importation and Exportation) Regulations, 1984*
- *The Pharmacy and Poisons Act*
- *Environmental Management and Coordination Act*
- *Occupational Health and Safety Act*
- *Pest Control Products (Licensing of Premises) Regulations, 1984*
- *Pest Control Products (Disposal) Regulations, 2006*
- *Convention on Biological Diversity (1992)*
- *International Plant Protection Convention of FAO (1952)*
- *United Nations Framework Convention on Climate Change (1992)*
- *World Food Security and the Plan of Action of November 1996*
- *FAO directive on safety and environmental precautions (2003)*
- *FAO directive on locust campaign*
- *FAO desert locust guidelines*
- *FAO guidelines on management of empty containers*
- *FAO Desert Locust Guidelines, Section 6, Safety and Environmental Precautions (2003)*
- *Guidelines for personal protection when handling and applying pesticide (2020)*
- *Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides, 2009*
- *Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011*
- *International Code of Conduct on Pesticide Management*
- *Guidelines on Good Practice for Ground Application of Pesticides, 2001;*
- *Guidelines on Good Practice for Aerial Application of Pesticides, 2001;*
- *Guidelines for personal protection when handling and applying pesticides, 2020;*
- *Guidelines on Organization and Operation of Training Schemes and Certification Procedures for Operators of Pesticide Application Equipment, 2001;*

- *Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides, 2009;*
- *Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011 and*
- *The International Code of Conduct on Pesticide Management of the World Health Organization Food and Agriculture Organization of the United Nations Rome, 2014*

Environmental and Social Risk Management Instruments

Prior to appraisal of the ELRP, GoK prepared and disclosed an Environmental and Social Commitment Plan (ESCP), and Stakeholder Engagement Plan (SEP), which includes guidance on outreach activities and the establishment of grievance redress mechanisms (GRM) prior to undertaking desert locust control activities. There are other environmental and social risk instrument that will complement this IPMP and these are Environmental and Social Management Framework (ESMF), Social Assessment/IPP, Gender Based Violence (GBV) Action Plan, Security Management Plan (SMP) and Labor Management Procedures (LMP).

Environmental and Social Requirements

In order to reduce, minimise and mitigate adverse environmental and social risks and impacts and undue harm of its development projects to the environment, all bank-financed projects are guided by applicable environmental and social standards under the Environmental and Social Framework (ESF). A number of Banks' ESSs are applicable as a result of this project and highlighted below.

- Assessment and Management of Environmental and Social Risks and Impacts. **(ESS1)**
- Labor and Working Conditions **(ESS2)**
- Resource Efficiency and Pollution Prevention and Management **(ESS3)**
- Community Health and Safety **(ESS4)**
- Biodiversity Conservation and Sustainable Management of Living Natural Resources **(ESS 6)**
- Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities **(ESS7)**
- Stakeholder Engagement and Information Disclosure **(ESS 10)**

Environmental and Social Risks Classification

The overall Environmental and Social Risk Classification of the ELRP is **High**. On Component 1, the main potential environmental and social risks and impacts associated with these activities related to the desert locust control operations include: (i) transport, handling, storage of the pesticides, dosage (i.e., proper calibration of the spraying equipment to get the right dose of active ingredient per hectare) during treatment and disposal of used pesticide containers; (ii) risk of polluting ecologically sensitive habitats such as wetlands, national parks and water bodies; (iii) risks that pasture, local water sources and cropping areas may be contaminated; (iv) potential contamination and poisoning of the pesticides control teams; (v) risk of diversion of pesticides for other uses; (vi) inappropriate use of pesticides; (vii) potential high risk of accumulation of obsolete stocks.

The Project will finance the use of two pesticides for the desert locust control activities, this include a chemical pesticide Fenitrothion 96% ULV) which is a WHO class II, formulated as Ultra-Low Volume (ULV), the biopesticide Metarhizium and equipments. The biopesticide risks to the environment and applicators are minimal as it contains a fungus that is highly specific to this species of locust and safe to other species of insects, animals and humans. The application of the pesticides will cover large swathes of the Country, approximately 15 Counties impacted by the desert locust infestations, the use of the pesticides will potentially impact local populations dependent on natural resources for their livelihoods such as pasture, vegetation and crop fields. However, given that proven proposed mitigation measures that will be put in place, SOP, training of field control teams and operators, and the technical support to be provided by FAO, the Environmental Risk is considered **Substantial**.

The principle social risks associated with the project fall broadly into one main category (i) risks to the community and workers from the locust control measures under Component 1, sub-component 1.2 (control measures). Under Component 1, labour influx associated with these control measures is a primary risk, as it may impact upon the community through sexual exploitation and abuse of vulnerable women and girls or spreading disease (including COVID-19) to otherwise isolated rural communities with limited access to health services. In addition, community and workers health through proximity to locust control measures as well as potential livelihood impacts through control measures impacting livestock and crops. Out of these risks, the most concerning is the risk of sexual exploitation and abuse, and other forms of violence, perpetrated by project workers and volunteers in ground operations under Component 1. Members of the National Youth Service (NYS), commonly referred to as a paramilitary organization, are being used for ground spraying under component 1. The NYS has, on several occasions, been cited in the press as perpetrating human rights violations whilst on official deployments. The NYS have been undertaking locust related activities with MoALFC and FAO staff across the project area, including under the recent CERC. The living arrangements for deployed NYS volunteers are understood to be essentially unregulated, spending several days in the field and often camping in school grounds. It is for this reason that the social risk classification for the project is **High**.

Adverse Impacts and Mitigation Measures

Below is a summary of the potential negative environmental and social risks and impacts that Component 1 may have with respect to pesticide use and proposed mitigation measures that will be considered during preparation of site-specific (sub project) spray operation IPMPs.

Table 0-1. Summary of Mitigation Measures

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
Procurement			

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
Procurement from uncertified sources	L	Good registration process requiring submission of specification, source of supply etc.	MoALFC
		Designation and licensing local importer, linked to a known international supplier	MoALFC/NPCU
		Establishment of a transparent tendering process	MoALFC
Importing wrong pesticide specification	L	Above listed mitigations plus Robust inspection at port of entry and manufacture specification	MoALFC
Pilferage at port-of-entry and enroute to central storage	M	Linking transportation from port-of-entry to central warehouse as part of importer responsibility	MoALFC/NPCU National Police Service National Youth Service
		Use of certified/licensed drivers and dedicated transportation.	
		Use security guard during transportation	
Pilferage at central stores	L	Pesticide stock protected by same high-level security for drugs and other essentials	
Inland Transportation			
Inadequate transportation	M	Use of certified/licensed drivers and dedicated vehicles.	MoALFC/NPCU CPCU
Pilferage	L	Use security guard during transportation	National Police Service
Transport relation incidents	L	Transporters trained on first response to incidents (e.g. secure site, call emergency response)	National Youth Service
Storage and Pesticide Management in Spray Areas			
Pilferage	H	Secure, dedicated storage facilities and, as necessary, use of security guard	MoALFC/NPCU CPCU
		Strict auditing scheme (e.g. daily spray cards, team leader daily summary cards, supervisor daily summary cards)	National Police Service National Youth Service
		Regular inventories	MoALFC/NPCU CPCU
Inappropriate storage practices	M	Trained storekeepers in pesticide management	MoALFC/NPCU CPCU
		Regular inspections	
		Good storage maintenance	

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
		Effective inspection regimes	MoALFC/NPCU CPCU
End-use of Pesticide: Human Safety			
Exposure of spray operators and other handlers	H	▪ Training on best practices for all categories of workers and other volunteers	MoALFC/NPCU CPCU
		▪ Use of full PPEs by all spray operators	MoALFC/NPCU CPCU
		▪ Availability and effective use of ablution facilities	MoALFC/NPCU CPCU
		▪ Clear criteria for reprimand for non-compliance	MoALFC/NPCU CPCU
		▪ Provision of first aid facilities and training of administration of first aid during exposure to pesticides.	MoALFC/NPCU CPCU
Exposure of communities	H	▪ Safe disposal of used PPE and other waste associated with spraying activities	MoALFC/NPCU CPCU
		▪ Field supervision to assure best operator practices	MoALFC/NPCU CPCU
		▪ Avenue for receipt of complaints	MoALFC/NPCU CPCU
		▪ Enforce any exclusion period after application-time during which humans, livestock, etc., must be kept away from the treated area.	MoALFC/NPCU CPCU
		▪ Develop awareness protocol for handling dead locusts (do not eat or feed livestock) including requirement to sweep and bury the locusts in pits to avoid possible poisoning of poultry/birdlife by feeding on them.	MoALFC/NPCU CPCU
		▪ Training and awareness creation targeting local communities on the effects of exposure to the pesticides and related safety precautions including accidental exposure etc	MoALFC/NPCU CPCU
Poisoning incidents	L	▪ Effective inspection regimes	MoALFC/NPCU CPCU
		▪ Staff training and IEC with components aimed at preventing poisoning.	MoALFC/NPCU CPCU
		▪ Enhance capacity for poison management by: ○ Training of all category of workers to identify danger signs and required response ○ Training health workers, designate and equip district reference points for	MoALFC/NPCU CPCU

RISKS RELATING TO PESTICIDE LIFE CYCLE	RISK LEVEL	MITIGATION MEASURES	RESPONSIBLE
		treatment of incidents of pesticide poisoning ○ Conduct pre-post medical test for the control teams and regular blood test to check exposure/toxicity levels through the acetylcholinesterase blood test	
End-Use of Pesticides: Environmental Safety			
Environmental release from handling/spray activities affecting sensitive ecosystems, protected areas, national parks, wetlands, areas where organic farming is practised etc.	H	- Application of best practices (triple wash/rinse water re-use) - Construct of pits (with charcoal) to dispose rinsate. - Prohibition of decanting into streams and open drains - Prohibit worker washing in streams - Clear criteria for reprimand for non-compliance by spray workers - Effective inspection regimes	MoALFC/NPCU CPCU MoALFC/NPCU CPCU NEMA KWS KFS KALRO
Non-recommended use of pesticides	M	- Secure storage, management and inventory system - Effective enforcement - Significant punitive measures against pilferage - Effective IEC on dangers and consequences of non-recommended use of pesticides	MoALFC/NPCU CPCU MoALFC/NPCU CPCU MoALFC/NPCU CPCU National Police Service MoALFC/NPCU CPCU
Disposal			
Release of empty packaging materials in general environment or reused for non-recommended purposes.	H	- Strict auditing (see above) and accounting for empty sachet and packaging materials for sound disposal - Crushing the used/empty containers and possible return to manufacturer arrangements - Safe disposal of used PPEs	MoALFC/NPCU CPCU

Risk Level

High	
Medium	
Low	

Procedure for Preparation of Sub Project IPMPs

In compliance with the Bank's ESS 3, in order to minimise and control the release and use of hazardous materials, there would be need to prepare sub project specific Environmental and Social Impact Assessment (ESIAs) for each area specific locust surveillance and control activities once the scope and location among others are known in order to ensure compliance with the NEMA EIA/EA regulations and World Bank's ESS. National Environment Management Authority (NEMA) has classified aerial spraying as a **High-Risk** activity (Agriculture) requiring the preparation of ESIA study report. For this reason, ELRP would be required to prepare ESIA for the spray operation areas in the 15 Counties. All the ESIA/ESMPs would have to be prepared by a NEMA registered EIA/EA expert, reviewed and approved by NPCU and submitted to NEMA and the World Bank for further review and approval prior to commencement of spray operations.

However, due to the emergency nature of the project, a waiver will be sought by the MoALFC from NEMA to instead use sub project Integrated Pest Management Plans (IPMPs) rather than conducting ESIA studies for each spray operation and subject the same to the approval process as per the EIA/EA regulations which is lengthy and would negate the emergency nature of and context of the project.

This framework level IPMP will also guide preparation of sub project level (spray area) IPMPs which will be prepared by the environmental and social specialists who will be based at each of the Counties and part of the CPCU and reviewed and cleared by the environmental and social experts at the NPCU.

The preparation of sub project IPMPs will be informed by the surveillance activities. Surveillance will be undertaken to monitor the presence of and movements of adult swarms, breeding and egg-laying areas and the movement of developing nymphs and hopper bands. Surveillance will support improved forecasting of breeding and migration and decision making on areas to be treated.

During the surveillance, if an area within the 15 Counties affected is determined to be infested or likely to be infested by the desert locust, mapping as a standard operating procedure (SOP) of the geographical area (sub project area) specifically the bio-physical characteristics will be undertaken using innovative approaches to surveillance such as the use of satellite maps, drones, eLocust3, Geographical Positioning Systems (GPS) enabled cameras. A screening form will be filled out describing the bio-physical characteristics and map attached which will inform whether to use the biopesticide (Metathiazin) or organophosphate (Fenitrothion) in the control operation. The biopesticide selected will be used in locations that have been screened and mapped and determined to have ecologically and agronomically sensitive ecosystems including surface water bodies, wetlands, forests and parks etc.

Reporting and Capacity Building

Capacity development and strengthening remains a crucial component in this IPMP and will be integrated all through the project implementation phase. The Project will be implemented by the MoALFC which has a long experience of implementing World Bank

financed projects under the safeguards policies, these include Kenya Climate Smart Agriculture Project (KCSAP), the National Agriculture and Rural Inclusive Growth Project (NARIGP) and the Regional Pastoral Livelihood Resilience Project (RPLRP). Currently the MoALFC is executing a similar desert locust control operation financed under the Contingency Emergency Response Component (CERC) under Kenya Climate Smart Agriculture Project. The Project is working with FAO on the desert locust operations who are providing technical support to MoALFC through the Multi-Institutional Technical Team (MITT) on the pesticide selection, applications and management. MoALFC has adopted several FAO Desert Locust Guidelines, which are aligned to Good International Industry Practice (GIIP) in managing the environment, health and safety risks for this operation. They include:

- FAO Desert Locust Guidelines (2003)
- FAO Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides, 2009
- FAO Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011
- FAO Guidelines on Good Practice for Aerial Application of Pesticides (2001)
- FAO Guidelines on Management Options for Empty Pesticide Containers
- FAO Guidelines on Desert Campaign organization and execution, FAO Rome 2001
- FAO Desert Locust Guidelines on Safety and Environmental Precautions (2003)
- WHO Guidelines for personal protection when handling and applying pesticides- International Code of Conduct on Pesticide Management

In order to strengthen the capacity of the NPCU, CPCU and other implementing agencies, the following capacity building efforts are recommended. The World Bank and FAO will train the NPCU on topics highlighted in the table below. The NPCU will thereafter provide training to the CPCU and sub county technical teams on the topics outlined below supported by FAO. To ensure that the message and quality of training is assured, NPCU will besides using FAO, will engage consultants familiar with Bank's ESF, ESS and the other relevant instruments to support the county-based trainings.

Table 0-2. Capacity Building

Training Topic	Target	Trainers
World Bank ESF, ESS	NPCU, MITT	World Bank
Monitoring of impacts of pesticides on soil, water, health, biodiversity, livestock etc.	NPCU, CPCU, NEMA, KWS, KFS, DVS, KALRO, KEPHIS	FAO
County Project Coordinating Unit		
World Bank ESF, ESS	CPCU	NPCU
IPMP	CPCU	NPCU
Monitoring of impacts of pesticides on soil, water, biodiversity, livestock etc	CPCU	NPCU
Sub County Technical Teams		
World Bank ESF, ESS	Sub County Technical Teams	NPCU and CPCU
Monitoring of impacts of pesticides on soil, water, biodiversity, livestock etc	Sub County Technical Teams	NPCU and CPCU
IPMP	Sub County Technical Teams	NPCU and CPCU

IPMP Public Consultations and Disclosure

This IPMP has been subjected to public consultation (virtually on 7th July 2020) as per the national laws and World Bank ESS requirements with respect to stakeholder engagement and specifically to ESS 10, the project SEP and recommendations arising from the consultation have been incorporated in this IPMP. The IPMP will be at disclosed on the website of MoALFC and also forwarded to the Bank for disclosure at WB external website. Participants in the stakeholder consultations who raised the concerns in table below included representatives from among others: -

- County Governments
- Non-Governmental Organisations (including self-help groups and CBOs)
- Community leaders
- KALRO
- FAO
- ELRP/NPCU
- KCSAP
- World Bank

This IPMP will be disclosed on MoALFC's website of and World Bank's external website upon its review and approval by the MoALFC and the World Bank.

Table 0-3. Summary of Stakeholder Consultation Concerns

Concerns	Response
Concern over impacts of spray operations on apiculture and need for adequate mitigation measures.	■ The project will use biopesticides in areas where apiculture is practised.
Concern over impacts of spray operations on avifauna and need for adequate mitigation measures	■ The project will use biopesticides in areas where birdlife especially those that are considered important are known to exist. There will be mapping of such areas prior to commencing spray operations.
Concern over impacts of spray operations on non-target organisms (poultry) feeding on contaminated dead locust and need for adequate mitigation measures	■ Awareness creation targeting community members will be undertaken to inform on how to handle dead locusts including sweeping and disposing the locusts in pits/burning prior to releasing poultry to feed/locking poultry and other livestock during spraying and observing re-entry timelines.
Concern over impacts of spray operations on livestock feeding on contaminated pasture of locust and need for adequate mitigation measures	■ Awareness creation targeting community members will be undertaken to inform on how to handle dead locusts including sweeping and disposing the locusts in pits/burning prior to releasing poultry

	livestock during spraying and observing re-entry timelines.
Concern on the quality of staff to be hired to undertake environmental monitoring	■ MoALFC to conduct recruitment of competent staff including provision of training and capacity building to the staff upon recruitment.
Request to establish Sub County Technical Teams as part of the organisational structure and implementation set up	■ MoALFC to address this issue in follow on deliberations and report recommendations to the Counties.
Reservations on use of National Youth Service in the implementation and request to employ local youth instead.	■ MoALFC to address this concern in follow on deliberations and report recommendations to the Counties.

Component 1 Implementation Arrangements

The Component 1 of the project will be implemented by the MoALFC through a two-tiered institutional arrangement: National, and County levels. At the National level, the MoALFC will be the main implementing agency while at the County level, County Governments will be the implementing agency. For smooth integration of project operations with other ongoing efforts on desert locust control, the component 1 will operate within the structures established by the MoALFC specifically to deal with the desert locust crisis in the country. These include the Multi-Institutional Technical Team (MITT) and the Locust Command Centre (LCC) under the Plant Protection Services (PPS) Division. The MITT will be expanded to include other agencies such as National Environment Management Authority (NEMA), Kenya Wildlife Service (KWS), Kenya Forest Service (KFS), Kenya Agricultural Livestock Research Organisation (KALRO), Department of Veterinary Services (DVS) and Pests Control Products Board (PCPB) among others for monitoring effects of the chemicals being used in locust control on human health, water, soils, livestock and wildlife.

- **National Project Coordination Unit:** -A National Project Coordination Unit (NPCU) has been established comprising of officers responsible for day-to-day implementation of activities under the leadership of the National Project Coordinator (NPC). These include for component 1, the National Project Coordinator, Component 1 Leader, Environmental Specialist, Social Standards Specialists, GBV Expert, Grievance Redress Expert, Monitoring and Evaluation Specialist, Financial and Procurement Specialists.
- **County Project Coordination Unit:** - The Project will use the existing County Project Coordinating Units (CPCUs) for KCSAP and NARIG that are established headed by the County Project Coordinator (CPC) who also double as either the Crops or Livestock Specialist. The CPCU members include, the CPC, Livestock/Crops Specialists, Environment and Social Standards Specialist, Monitoring and Evaluation Specialist, Finance and Procurement Officers. The CPCU will engage services of technical experts on need basis.

I INTRODUCTION

The Government of Kenya (GOK) through the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALFC) has received financing from the World Bank for the Emergency Locust Response Program (ELRP). The ELRP is a Multiphase Programmatic Approach (MPA) which is a programmatic framework approach for a regional response to Desert Locust crisis with “first mover” countries for which Kenya is included as phase 1 of the ELRP MPA. The desert locust invasion in Kenya that has been recorded as the worst in 70 years has posed a severe food security threat to about 3 million people. The invasion started in 28 December 2019 from Ethiopia and Somalia and has since spread to twenty-eight counties. The invasion has posed a risk to food and nutrition security and livelihoods thus undermining the economic growth. The second generation started forming swarms in April 2020, coinciding with the main planting season in Kenya and many other parts in East Africa.

1.1 Emergency Locust Response Program

The project is financing activities that will have positive impacts and benefits to the areas currently infested with the desert locust. The proposed locust control activities will eliminate swarms of locust that have destroyed vegetation, crops and restore livelihoods that have been destroyed in the Country. Through the project livelihood restoration and recovery component, the project could positively and negatively affect pastoralist and farmers communities that have seen their livelihood destroyed by large swarms of locust. Particularly disadvantaged and vulnerable groups could include internally displaced people (IDP), refugees, pastoralists and women and girls across these groups.

1.2 Project Development Objective

The Project Development Objective (PDO) is to prevent and respond to the threat to livelihoods posed by the desert locust outbreak and to strengthen Kenya’s system for preparedness. Citizen engagement will be monitored by tracking awareness raising communication campaigns conducted and grievances registered and resolved by the program.

1.3 ELRP Project Components

Component 1: Surveillance and Control Measures

The objective of activities under this component is to limit the growth of existing climate-change-induced desert locust populations and curb their spread, while mitigating the risks associated with control measures and their impacts on human health and the environment. Activities to be supported would be continuous surveillance and monitoring, spraying of hopper bands and adult swarms, and delivery of training and capacity building to field teams to ensure that operations are carried out in a safe and effective manner.

Sub-component 1.1: Continuous Surveillance

This sub-component will finance the surveillance activities including both aerial and ground surveillance. The surveillance activities will be anchored at the national level and will be undertaken through already established ground control stations. Continuous surveillance will be designed to enable informed and climate-responsive locust

management decision-making. The surveillance activities will cover the following broad areas: (i) monitoring the presence of and movements of adult swarms, breeding and egg-laying areas and the movement of developing nymphs and hopper bands, all to support improved forecasting of breeding and migration and decision making on areas to be treated and appropriate and optimal control methods to break the cycle of the next generation; (ii) evaluating the effectiveness of locust control operations; (iii) aerial and ground assessments of damage caused by the locust upsurge to crop and pasturelands to guide targeting of livelihood protection and restoration activities to be supported under Component 2; and (iv) continuous monitoring and assessment of environmental and human health risks associated with locust control. Innovative approaches to surveillance such as the use of satellite maps, drones, eLocust3, Geographical Positioning Systems (GPS) enabled cameras and meta-data analysis and climate information for locust risk mapping will be used, building on work already going on related to big data and disruptive agricultural technologies under the KCSAP.

Sub-component 1.2: Control measures will reduce locust populations and prevent their spread to new areas. This would be achieved via a range of targeted ground and aerial control operations and would emphasize, whenever possible, neutralizing hopper bands before they develop into adult swarms, which leads to another cycle of infestation and expansion and requires more costly and logistically challenging aerial spraying. Depending on the size of hopper bands and of the related infested areas, their control can be handled either by ground control teams or aircraft spraying either with insect growth regulators, bio-pesticides or conventional chemical pesticides. The primary strategy to be employed in the control of the desert locust will be to target the breeding sites and control the hoppers, i.e. while locusts are still at the nymph stage before they can fly. The adult locust swarms shall be controlled mainly through aerial sprays. This sub-component would finance the spraying equipment, protective gear, approved pesticides, and safety and awareness training for spraying teams and other locust control personnel. Public awareness campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations. The project will also implement health, environmental and safety measures to reduce risks to an acceptable minimum.

1.4 Selected Pesticides

Resource Efficiency and Pollution Prevention and Management (**ESS3**) requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the World Bank's Group Environmental Health and Safety Guidelines (EHSGs). In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies. For any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). A pest management plan will also be prepared when proposed financing of pest control products represents a large component of the project.

The Project will finance the use of two pesticides (already approved by the Bank) for the desert locust control activities, a **chemical pesticide** Fenitrothion 96% which is a WHO **class II**, formulated as ULV and a **biopesticide** Metarhizium. The selected pesticides do not have any formulations that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. The pesticides are not restricted for distribution or use in Kenya and are not likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

1.5 Project Activities

Major activities that would be undertaken on ground are the following among others:

- Procurement/rental of equipment (sprayers, vehicles, drones, aircrafts), support to field operations (aerial and ground operations)
- Procurement of pesticides (Fenitrothion and Metahirzium)
- Procurement of PPEs (gloves, visors, masks, boots, coveralls, googles, crushing equipment)
- Renovation of pesticide stores.
- Spray operations
- Environmental and health monitoring

Component 2: Livelihoods Protection and Rehabilitation

Beyond the immediate control measures deployed to curtail the proliferation and spread of the locusts, the next priority and the objective of Component 2 would be to help protect the poor and vulnerable in locust- affected areas from human capital and asset loss, enhance their access to food, and restore livelihoods that have been damaged or destroyed by

swarms. The objective of this component is to support affected farmers and livestock holding households restore their productive assets for enhanced adaptation and resilience. A separate IPMP has been prepared for component 2.

Component 3: Coordination and Early Warning Preparedness

Interventions under this component would include establishing and strengthening a Locust Control Unit (LCU) within the Plant Protection Services Division (PPSD) of MoALFC at the national level to prevent future outbreaks from spiraling out of control. Early warning systems will be developed and implemented to support prevention and rapid response to new and existing climate change-induced locust infestation, thereby limiting in-country and cross-border spread and intensification. Due to the emergency nature of this project, the environmental and social instruments required may be deferred, the production and implementation of these instruments will be presented as disbursement conditions for the relevant components in the Environmental and Social Commitment Plan (ESCP) developed.

Component 4: Project Management

This would finance the associated costs such as financial management, procurement, environmental and social management, and communications. The communications component, in particular, apart from external and internal communication activities can promote increased community awareness about locust response and what they need to do when their area has been treated with pesticides (e.g., do not eat the locusts or feed them to livestock, do not dump in water bodies, etc.), as well as coordination among responsible entities (international, regional, national, and subnational) to better respond to outbreaks.

1.6 Project Beneficiaries

The Project is expected to benefit all the farmers in the impacted counties in Kenya. The component 1, 3 and 4 will be implemented in all the counties that have experienced locust infestations. However, component 2 will be implemented in specific wards that are most impacted in the 15 of the most severely impacted counties in the country. The primary project beneficiaries will be affected farmers, pastoralists and households that have been affected by the locust upsurge and are food insecure. Vulnerable and marginalized households and female headed households will be prioritized in the targeting process.

1.7 Aims and Objectives of IPMP

ESS 3 requires that for any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). This Integrated Pest Management Plan is prepared to address use of chemicals to control locust invasion under the Kenya-ELRP. The project is funded by the World Bank and in compliance with the environmental and social standards, an IPMP is required because of the planned use of large quantities of pesticides. Under ELRP, an Environmental and Social Management Framework has prepared and the Bank ESS 3 require that IPMP be prepared alongside ESMF because Component 1 will finance desert locust control activities that will employ significant quantities of pesticides selected by MoALFC and approved by the World Bank. The specific objectives of the IPMP are: -

- 1) Establish clear procedures and methodologies on the procurement, transport, distribution and storage of the pesticides to be financed under the project
- 2) Develop a monitoring and evaluation systems for pesticide use on the desert locust management practices
- 3) Assess the potential economic, environmental and social impacts of the pest management practices
- 4) Mitigate against negative impacts of pesticides on the crops, vegetation and livestock
- 5) Identify capacity of the country's regulatory framework and institutions to promote and support safe, effective, environmentally and socially sound pest management practices and provide appropriate technical assistance for successful implementation of the IPMP
- 6) Ensure compliance with national laws, regulations, World Bank ESS and FAO directives on desert locust control
- 7) Propose a budget required to implement the IPMP

1.8 Component 1 Implementation Arrangements

The Component 1 of the project will be implemented by the MoALFC through a two-tiered institutional arrangement: National, and County levels as described below, and these institutions will take lead in the IPMP implementation.

- **National Project Coordination Unit:** -A National Project Coordination Unit (NPCU) has been established comprising of officers responsible for day-to-day implementation of activities under the leadership of the National Project Coordinator (NPC). These include for component 1, the National Project Coordinator, Component 1 Leader, Environmental Specialist, Social Standards Specialists, GBV Expert, Grievance Redress Expert, Monitoring and Evaluation Specialist, Financial and Procurement Specialists.
- **County Project Coordination Unit:** - The Project will use the existing County Project Coordinating Units (CPCUs) for P154784-KCSAP and P153349 NARIG that are established headed by the County Project Coordinator (CPC) who also double as either the Crops or Livestock Specialist. The CPCU members include, the CPC, Livestock/Crops Specialists, Environment and Social Standards Specialist, Monitoring and Evaluation Specialist, Finance and Procurement Officers. The CPCU will engage services of technical experts on need basis.

2 STAKEHOLDER ENGAGEMENT

This chapter describes the consultations conducted during the preparation of the IPMP, the disclosure arrangements and the grievance redress mechanism in place for use during the project implementation.

2.1 Stakeholder Identification

MoALFC undertook identification of stakeholders who were provided with the draft IPMP for comments. Participants who were identified and engaged included representatives from among others: -

- County Governments
- Non-Governmental Organisations (including self-help groups and CBOs)
- Community leaders
- KALRO
- FAO
- ELRP/NPCU
- KCSAP
- World Bank

2.2 Stakeholder Engagement

MoALFC presented this IPMP as a draft to identified stakeholders as part of public consultation and more specifically to seek input from the stakeholders on potential impacts and mitigation measures of the ELRP. The consultations were consulted virtually on the 7th July 2020 due to the COVID-19 pandemic that restricted physical interactions (social distancing). MoALFC provided adequate notice to the stakeholders with respect to the date and time for the consultations, presented the draft IPMP and presentation materials in advance and facilitated the stakeholders by ensuring adequate internet connectivity. The issues raised by the stakeholders and responses including list of participants are included in **Annex A** and were used in the finalisation of the IPMP.

Table 2-1. Summary of Stakeholder Consultation Concerns

Concerns	Response
Concern over impacts of spray operations on apiculture and need for adequate mitigation measures.	The project will use biopesticides in areas where apiculture is practised.
Concern over impacts of spray operations on avifauna and need for adequate mitigation measures	The project will use biopesticides in areas where birdlife especially those that are considered important are known to exist. There will be mapping of such areas prior to commencing spray operations.
Concern over impacts of spray operations on non-target organisms (poultry) feeding on contaminated dead locust and need for adequate mitigation measures	Awareness creation targeting community members will be undertaken to inform on how to handle dead locusts including sweeping and disposing the locusts in pits/burning prior to releasing poultry to feed/locking poultry and other livestock

	during spraying and observing re-entry timelines.
Concern over impacts of spray operations on livestock feeding on contaminated pasture of locust and need for adequate mitigation measures	Awareness creation targeting community members will be undertaken to inform on how to handle dead locusts including sweeping and disposing the locusts in pits/burning prior to releasing poultry livestock during spraying and observing re-entry timelines.
Concern on the quality of staff to be hired to undertake environmental monitoring	MoALFC to conduct recruitment of competent staff including provision of training and capacity building to the staff upon recruitment.
Request to establish Sub County Technical Teams as part of the organisational structure and implementation set up	MoALFC to address this issue in follow on deliberations and report recommendations to the Counties.
Reservations on use of National Youth Service in the implementation and request to employ local youth instead	MoALFC to address this concern in follow on deliberations and report recommendations to the Counties.

2.3 IPMP Disclosure

This IPMP will be disclosed in accordance with the ESS 10 disclosure standards on the website of MoALFC and forwarded to the Bank for disclosure at its Public Information Center (PIC) of the country and at the Bank's external website. This IPMP will also be disclosed in the project areas and made accessible to the beneficiaries.

3 ENVIRONMENTAL AND SOCIAL BASELINE DATA

This section describes the ecologically and agronomically sensitive areas in the 15 Counties that are targeted for spraying under the ELRP. These sensitive ecosystems are the most at risk areas if exposed to pesticides and include water bodies, protected areas, avi-fauna habitats as well as agronomic zones.

3.1 Location and Size

Kenya has 23 ASAL counties, 9 of them classified as arid and 14 as semi-arid, as shown in **Figure 3-1**. The ELRP will be implemented in 15 Counties namely Mandera, Wajir, Marsabit, Garissa, Samburu, Isiolo, Meru, Baringo, Kitui, Tharaka Nithi, Embu, Machakos, Turkana, Elgeyo Marakwet and West Pokot.

3.2 Topography and Drainage

3.2.1 Hydrology

The ASAL region in Kenya mainly fall within Rift Valley, Athi River, Tana River and Ewaso Ng'iro catchment or drainage basins see **Figure 3-2**.

Figure 3-1. Affected Counties in Kenya

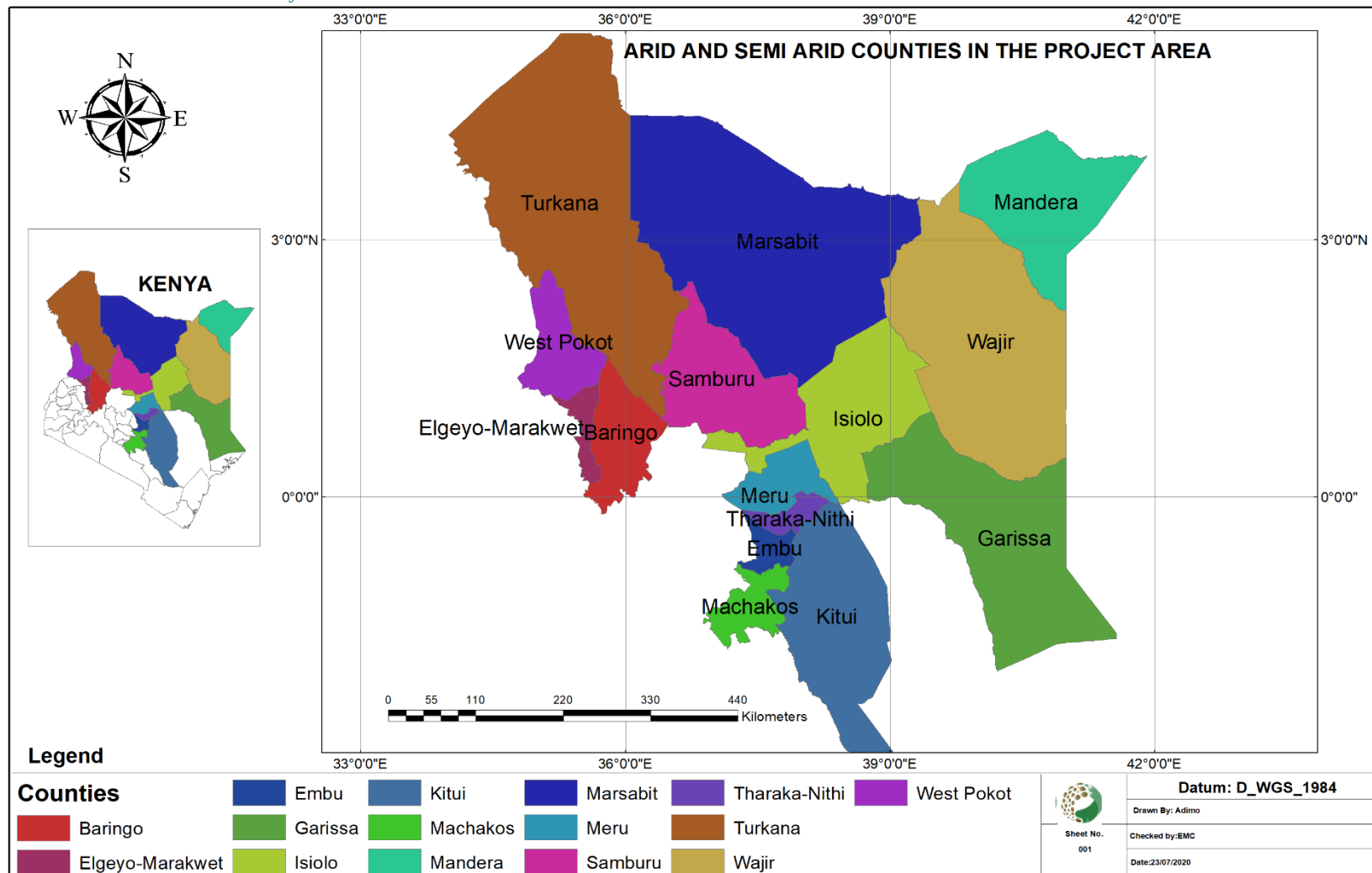
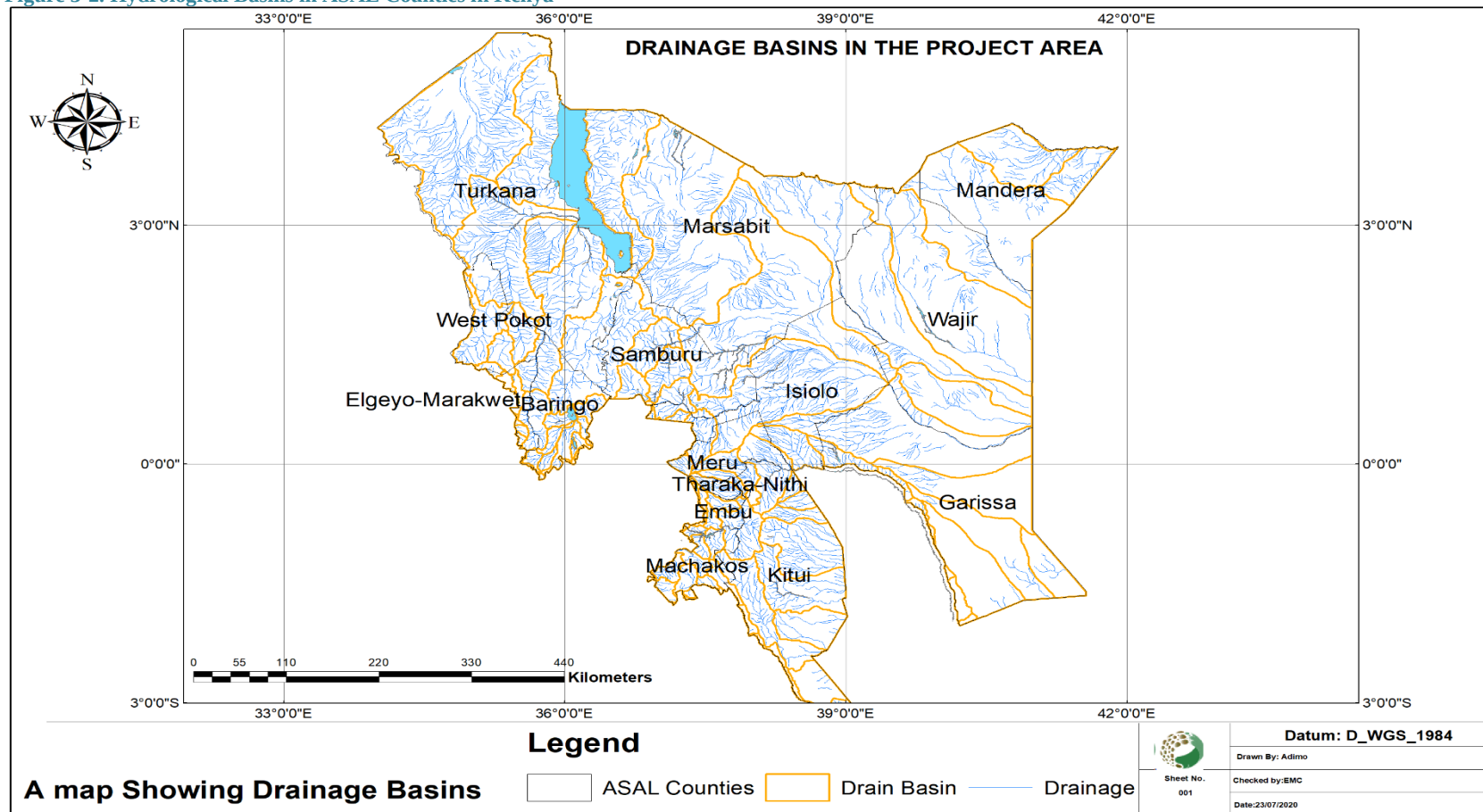


Figure 3-2. Hydrological Basins in ASAL Counties in Kenya



3.3 Perennial and Seasonal Rivers

In the 15 Counties where the emergency locust control operations are targeted, there are a number of perennial and seasonal rivers which are a source of livelihood to communities who rely on the water resources for agricultural production (crop cultivation), domestic use (livestock and human consumption) as well as source of food (fisheries). The rivers are also an important habitat for flora and fauna (aquatic resources). Socio-economic activities including settlements are located within close proximity to these water resources. The application of pesticides within the proximity of these water resources are likely to contribute to contamination of the water resources and trigger bio-physical and socio-economic impacts. The riverine ecosystems in the 15 Counties are described below.

3.3.1 River Perkerra

The Perkerra River is a river in the Great Rift Valley in Kenya that feeds the freshwater Lake Baringo. It is the only perennial river in the arid and semi-arid lands of the Baringo County. The Perkerra river supplies water to the Perkerra Irrigation Scheme in the Jemps flats near Marigat Township, just south of Lake Baringo. The river has a catchment area of 1,207 square kilometres (466 sq. mi). It rises in the Mau Forest on the western wall of the Rift valley at 8,000 feet (2,400 m), dropping down to 3,200 feet (980 m) at its mouth on the lake. The catchment area has steep slopes on the hillsides, flattening out lower down. Most of the water comes from the hill slopes, where annual rainfall is from 1,100 millimetres (43 in) to 2,700 millimetres (110 in). The region around the lake is semi-arid, with annual rainfall of 450 millimetres (18 in) and annual evaporation rates of 1,650 millimetres (65 in) to 2,300 millimetres (91 in). With the advent of Europeans in the area, both human and livestock populations increased. The high grass of the catchment was grazed down, erosion increased, and run-off rates also increased, causing periodic floods. The brushwood barrier system could not deal with the floods and the Njemps turned to pastoralism.

3.3.2 Tana River

Tana river flows at approximately 440 miles (708 km) from its headwaters in the Aberdare Range and Mount Kenya to the Indian Ocean. The river takes a north easterly course at first and plunges over the Kitaru (Seven Forks) fall (440 feet [134 m]) into a semi desert landscape that constitutes its middle course. The river then veers south and opens into a wide valley, where it meanders through a floodplain subject to inundations. Kenya's longest river, it reaches the Indian Ocean at Formosa Bay, Kipini, but a former outlet lies 20 miles (32 km) southwest.

3.3.3 Daa River

The Daa River is found in Northern section of Kenya Mandera County. It flows through three major countries: Kenya, Ethiopia, and Somalia, with 81% falling into Ethiopian territory. It is known for its complex geological environment, evident through its diverse lithology and structural framework, coming from the river's closeness to multiple volcanic-tectonic events. The wide river has gentle slopes either side of its exposed bedrock. The Daa river flows south east to form part of the Ethiopia-Somalia border and part of Ethiopia-Kenya border. Awata, Digati, and Mormora are the only significant off-flowing rivers to Daa.

3.3.4 Kerio River

The Kerio River is one of the longest rivers in Kenya, originating near the equator. The River rises on the north slopes of the Amasya Hills to the west of Lake Bogoria. It flows northward through the Kerio Valley between Tugen Hills and Elgeyo Escarpment. The Elgeyo Escarpment rises to over 1,830 metres (6,000 ft) above the Kerio valley in places. The Kerio continues northward, often through deep and narrow valleys, to enter Lake Turkana in a delta just south of the delta formed by the Turkwel and Lokichar rivers.

3.3.5 Athi-Galana-Sabaki River

The Athi-Galana-Sabaki River is the second longest river in Kenya (after the Tana River). It has a total length of 390 kilometres (240 mi) and drains an area of 70 square kilometres (27 sq mi). The river rises in the Gatamaiyo Forest as the Athi River and enters the Indian Ocean as the Galana River (also known as the Sabaki River). The Athi River flows across the Kapiti and Athi plains, through Athi River town, and then takes a northeast direction where it is met by the Nairobi River. Near Thika the river forms the Fourteen Falls and turns south-south-east under the wooded slopes of the Yatta ridge, which shuts in its basin on the east. Apart from the numerous small feeders of the upper river, almost the only tributary is the Tsavo River, from the east side of Kilimanjaro, which enters at about 3° S. It then turns east, and in its lower course is known as the Sabaki (or Galana) River, which traverses the sterile quartz-land of the outer plateau. The valley is low and flat, covered with forest and scrub, containing small lakes and backwaters connected to the river during the rainy season. During the rainy season, the stream rises as much as 10 metres (33 ft) in places, now strongly flowing with a turbid yellow colour; navigation is interrupted by the Lugard falls, actually a series of rapids. Flowing east, it enters the Indian Ocean 10 kilometres (6.2 mi) north of Malindi.

3.3.6 Turkwell River

The Turkwel River (sometimes spelled Turkwell River) is a river flowing from Mount Elgon in the border of Kenya and Uganda to Lake Turkana. The river is called the Suam River from its source to the border with the West Pokot County of Kenya. The Turkwel begins from the lush green slopes of Mount Elgon and the Cherangani Hills, traverses the Southern Turkana Plains, crosses Loturerei Desert near Lodwar and empties to the world's largest desert lake, Lake Turkana. The river's flow is seasonally varied, and it is subject to flash floods in the rainy season. The Turkwel River receives input from the Marmalte River and discharges from the tailrace of the Turkwel Dam after power production. Discharges from the tailrace mean that flows in the upper reaches of the River Turkwel are typically perennial.

3.3.7 Kathita River

The Kathita River is the longest river in Meru County. The river flows in a north-easterly direction from a source high on Mount Kenya around Ithangune and Rutundu hills from where it flows easterly through thick equatorial rainforests towards Meru Town, and in a southeasterly direction into River Tana. It is the northernmost of the Mt. Kenya tributaries of the Tana River.

3.3.8 Kalabata River

The Kalabata water course is a sub-catchment of the Kerio basin. The Kalabata River is an ephemeral watercourse that is fed by direct precipitation, run-off and ephemeral flow from luggas that provide a drainage network from the south-west. Flow in the luggas is ephemeral and driven by short duration, intense seasonal rainfall. The Kerio and the Turkwel Rivers both ultimately discharge to Lake Turkana.

3.3.9 Ol Arabel River

Ol Arabel (or Olarabel) is a river in the Great Rift Valley of Kenya that feeds Lake Baringo. It gives its name to a forest covering its headwaters and to a region. The river forms a delta where it enters the southeast of Lake Baringo at 0.531113°N 36.115837°E, and this forms a dense marsh during periods when the lake level is relatively high. In the past the region was used by Il Chamus herders.

3.3.10 Suguta River

The Suguta River is a seasonal river in the Great Rift Valley in Kenya (Africa), directly south of Lake Turkana. It flows northward through the Suguta Valley in the rainy season, forming the temporary Lake Alablal, a dry lake that combines with Lake Logipi at the northern end of the valley. The Suguta River originates in a stream of near-boiling water that emerges from the side of Mount Silali, an extinct volcano. Some geologists speculate that the Kapedo hot spring, which drops through a set of waterfalls to the Sugutu river, is the outlet from Lake Baringo 60 kilometres (37 mi) to the south. At one point the Suguta River passes between two volcanoes and is fed from both sides by hot springs. In places the banks of the Suguta River are lined with palms. The river and its tributaries are home to a cichlid, the Suguta tilapia (*Oreochromis niloticus sugutae*). Although the river dries up after the rainy season, the fish survive in pools. The river is also home to numerous crocodiles. Large flocks of flamingos inhabit the edge of the river.

3.3.11 Kinna Springs

Most of the springs in Isiolo County are situated within game reserves, and as such, are not accessible to local people. Older records show a total of 24 springs scattered along major rivers in Isiolo. However, 12 of these springs with negligible flows (MoWD 1991; Bake 1993) seem to have disappeared in recent years. This can be attributed to environmental degradation that has taken place due to overgrazing and poor land management. However, in a few cases, springs have been rehabilitated to improve water supplies, as was found at Kinna.

3.3.12 Lake Logipi

Lake Logipi is a saline, alkaline lake that lies at the northern end of the arid Suguta Valley in the northern Kenya Rift. It is separated from Lake Turkana by the Barrier volcanic complex, a group of young volcanoes that last erupted during the late 19th century or early 20th century. Saline hot springs discharge on the northern shoreline of Lake Logipi and at Cathedral Rocks near its southern limit and help to maintain water at times of extreme aridity. During the rainy season, the lake is also recharged from the Suguta River which flows northward along the Suguta Valley, periodically forming a temporary lake (Lake Alablal) that unites with Logipi. Lake Logipi has a maximum depth of 3 to 5

m and is about 6 km wide by 3 km long. Its waters are of sodium bicarbonate composition with a pH of 9.5-10.5 and salinity (total dissolved salts) that varies from less than 20 g/l to greater than 50 g/l. Flamingos frequently inhabit the saline waters feeding on cyanobacteria (*Arthrospira* spp. - formerly termed *Spirulina*) and other plankton.

3.4 Land Use

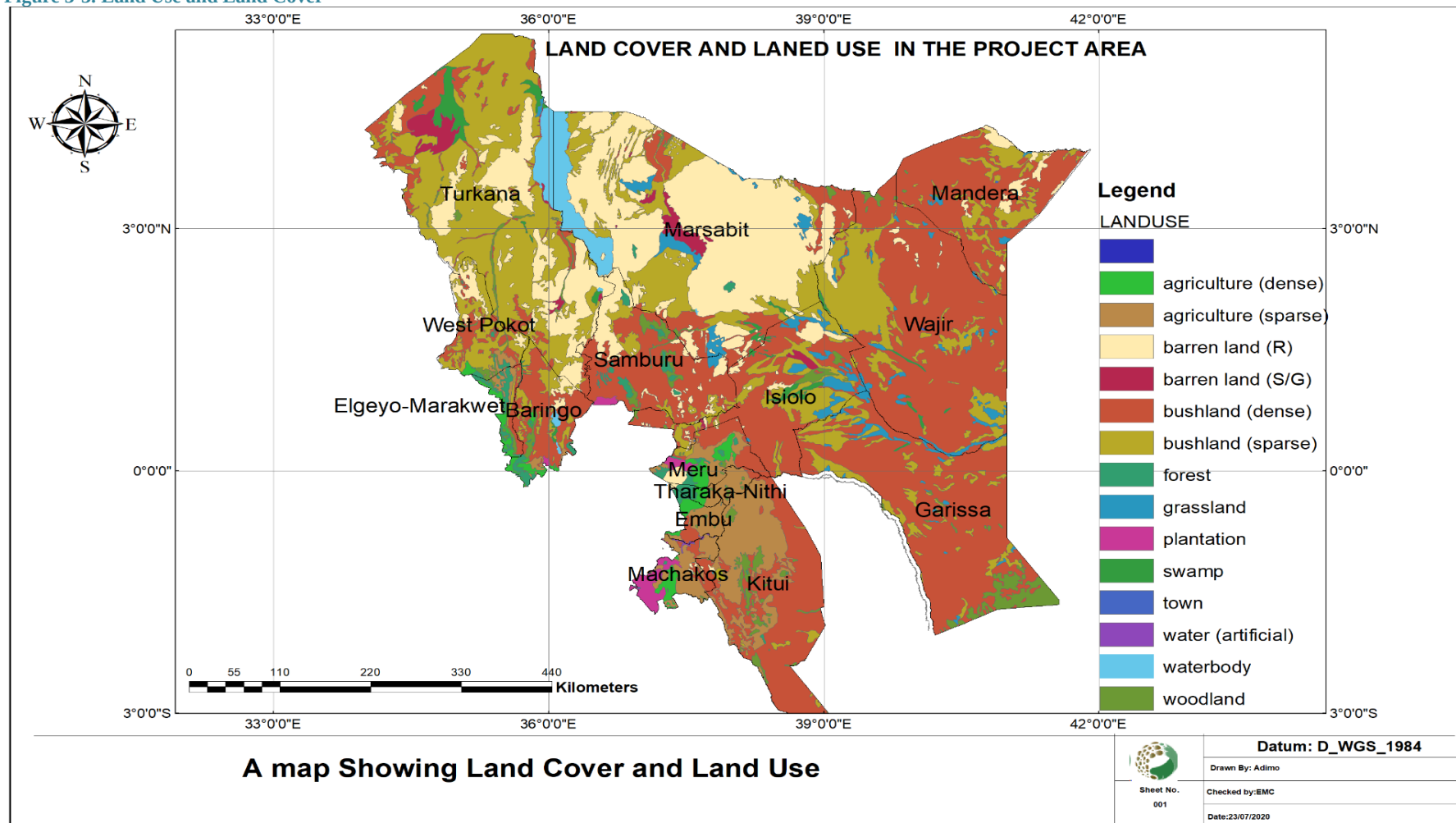
The majority of the population in Kenya's ASALs are pastoralists and agro-pastoralists but increasingly, farmers from the overcrowded higher potential areas have migrated into the drylands causing changes in land use, privatization of communal land and increasing pressure on land resources. Rain-fed agriculture is risky (as crops may fail two or more years in five) yet has become a dominant activity in semi-arid lands. Pastoralism depends totally on the natural ecosystem goods and services (pasture, browse, water). While livestock and cultivation (opportunistic, rain-fed or irrigated) are the mainstay, there are a variety of activities that are undertaken with a more direct market value. These activities include ecotourism and the collection and sale of gums, resins and henna.

In Kenya's dry zone, the climate is generally hot and dry. Temperatures in arid areas are high throughout the year, with high rates of evapotranspiration. In the dry areas the air is dry, humidity low and the vegetation has less cover on the ground, see figure 3-4. Table 3 shows the most important climatic eco-zones and corresponding vegetation. Kenya's land mass is commonly divided into seven agro-ecological zones, namely; humid, sub-humid, semi-humid, semi-humid to semi-arid, semi-arid, arid and very arid. Only about 16% of the land area is high and medium potential, while 84% is classified as ASAL. Arid lands are mainly inhabited by pastoralists and agro pastoralists. The arid and semi-arid lands (ASALs) account for about 80 percent of Kenya's land surface. Much of the land falls under the lowlands, which are mostly interspaced by hills and small mountains.

Table 3-1. Classification of Dryland Ecological Zones.

Classification	Mean annual Temperature Range (°C)	Mean annual rainfall (mm)	Annual potential evapotranspiration (mm)	Typical vegetation	Potential for plant growth
Semi-humid to semi-arid	16-18	600-1000	1550-2200	Dry woodland and bushland	Medium
Semi-arid	18-20	450-900	1650-2300	Bushland	Medium to low
Arid	20-22	300-500	1900-2400	Bushland and scrubland	Low
Very arid	22-25	150-350	2100-2500	Desert scrub	Very low

Figure 3-3. Land Use and Land Cover



The lands are categorized as semi-arid areas with:

- Mixed rain-fed and irrigation agriculture and high economic and political disparities
- Semi-arid areas with encroaching agro-pastoral use by marginalized smallholders
- Semi-arid areas with predominantly pastoralist use in the economic and political periphery
- Semi-arid areas that include game parks and reserves and their surroundings.
- Tana River areas and a small part of central Kenya. These fall into two agro-ecological zones (AEZ); AEZ IV (mixed crop livestock production farming system) and AEZ V-VI (maize/cowpea/pigeon pea farming system).

3.5 Protected Areas

The most suitable land use in ASAL is livestock husbandry and wildlife conservation, and almost 90% of the 40 gazetted national parks and game reserves are located in the ASALs. About 8% of the Kenya's land mass is protected area for wildlife conservation. Protected areas are gazetted landscapes/seascapes that have been surveyed, demarcated and gazetted either as National Parks and/or National Reserves. **Figure 3-4** show the gazetted areas in ASAL.

Table 3-2. Protected Areas in Affected Counties

Protected Areas
Meru National Park is located east of Meru, 350 km (220 mi) from Nairobi. Covering an area of 870 km ² (340 sq mi), it is one best known national parks in Kenya. Rainfall in this area is abundant with 635–762 mm (25.0–30.0 in) in the west of the park and 305–356 mm (12.0–14.0 in) in the east. The park has a wide range of wild animals including the African bush elephant, lion, African leopard, cheetah, eastern black rhinoceros, black rhinoceros, Grevy zebra and hippopotamus.
Tsavo East National Park forms the largest protected area in Kenya and is home to most of the larger mammals, vast herds of dust-red elephant, rhino, buffalo, lion, leopard, pods of hippo, crocodile, waterbucks, lesser Kudu, gerenuk and more than 500 species of birds. Tsavo East National Park occupies 13,747 sq km or 30 percent of Kenya's total park area.
Samburu National Reserve is situated at the southeastern corner of Samburu District in the Rift Valley Province of Kenya. It is bordered to the south by Ewaso Nyiro River, which separates it from the Buffalo Springs National Reserve. The reserve covers an area of 165 Km ² and is located around 345Km from Nairobi. The park has a pleasant aura of vastness and seclusion. It boasts more than 450 bird species, – elephant, lion, leopard, buffalo and rhino and the northern specialist species known as the Samburu 5–the Grevy's zebra, Somali ostrich, reticulated giraffe, gerenuk and the beisa oryx. Birdlife is abundant with over 450 species recorded. Birds of the arid northern bush country are augmented by a number of riverine forest species. Lesser Kestrel and the Taita Falcon are species of global conservation concern and they both utilize the reserve. Five species categorized as vulnerable have recorded in the reserve. These are African Darter, Great Egret, White-headed Vulture, Martial Eagle and the Yellow-billed Ox-pecker. Critically endangered species under CITIES – Pancake tortoise (<i>malacochersus tornieri</i>) is found in the reserve.
Marsabit National Park is far to the north of Kenya, a densely forested mountain and three crater lakes provide a haven for a variety of birdlife, mammals and reptiles. The beautiful Marsabit National Park is a refuge for huge tusked bull elephants, diverse birdlife and reptiles.
Shaba National Reserve lies to the east of the Samburu National Park and covers an area of 130 square kilometers north of the Ewaso Ng'iro River. Together with the Samburu and Buffalo Springs, Shaba is located in Kenya's Northern Frontier Province, a rugged and little visited region. Driving to the park you will often see Samburu herding cattle through the thorn bush or watering camels in the river. The Ewaso Ng'iro River is life giving for the area. The permanent water ensures that an abundance of wildlife exists in the reserve at all times. The main attractions are reticulated giraffe, Grevy's zebra, Beisa oryx, the

Somali ostrich and the gerenuk. Elephant are plentiful and black rhino, lion, leopard, cheetah, buffalo and hyena can all be seen. Dik diks are always dashing across the red roads whilst vervet monkeys scamper about under the trees.

Lake Baringo is, after Lake Turkana, the most northern of the Kenyan Rift Valley lakes, with a surface area of 130 square kilometres (50 sq mi) and an elevation of 970 metres (3,180 ft). The lake is fed by several rivers: the Molo, Perkerra and Ol Arabel. It has no obvious outlet; the waters are assumed to seep through lake sediments into the faulted volcanic bedrock. The lake is in a remote hot and dusty area with over 470 species of birds occasionally including migrating flamingos.

Lake Bogoria National Reserve covers 107km² within a catchment basin that forms the arid and semiarid areas of northern Kenya. Although the area is protected, it is vulnerable to siltation and pollution. The river has only one major river that feeds it. The hot springs on the western edge of the lake attract a large number of visitors creating problems (solid wastes pollution, and destruction of fragile rocks at the hot-springs). The lake supports large numbers of flamingos and in some occasions as many as 2 million can be found feeding in the lake. The lake has no macrophytes but its phytoplanktonic flora is dominated by *Spirulina platensis*, which is dominant in most parts of the lake.

Located on the wild and rugged shores of **Lake Turkana** – the cradle of mankind - Sibiloi is home to important archaeological sites including Koobi Fora where the fossil remains have contributed more to the understanding of human evolution than any other site in the continent. The area is characterized by semi-desert habitat and open plains flanked by volcanic formations including Mount Sibiloi, where the remains of a petrified forest can be seen. Sibiloi serves as a stopover for migrant waterfowl and is a major breeding ground for the Nile crocodile. Terrestrial wildlife includes zebras, Grant gazelles, lions, leopards, striped hyenas, Beisa Oryx, greater kudu, cheetahs and northern topi among others. A total of over 350 species of aquatic and terrestrial bird have been recorded in Lake Turkana. Sibiloi is surrounded by the Turkana, the Gabra and the Dassanach who are communities with very rich and unpolluted traditional cultures.

The Cherangani Hills, an old fault-block formation of non-volcanic origin, form an undulating upland plateau on the western edge of the Rift Valley. To the east, the Elgeyo Escarpment drops abruptly to floor of the Kerio Valley, while westwards the land falls away gently to the plains of Trans-Nzoia District. The hills reach 3,365 m at Cheptoket Peak in the north-central section. The hills are largely covered by a series of Forest Reserves. These are made up of 13 administrative blocks, totalling 95,600 ha in gazetted area. Of this, c.60,500 ha is closed-canopy forest, the remainder being formations of bamboo, scrub, rock, grassland, moorland or heath, with c.4,000 ha of cultivation and plantations. Kapkanyar, Kapolet and Kiptaberr Forest Reserves together form a large western block of forest, totalling c.20,000 ha. The avifauna of the Cheranganis is characteristic of the highland forests of Kenya west of the Rift Valley, comprising both central highland species and western species. Ecological surveys have recorded over 73 forest-dependent species, none of which is presently globally threatened. Regionally threatened species include *Gypaetus barbatus* (one of the last breeding populations in Kenya, nesting on the high peaks), *Stephanoaetus coronatus* (widespread in small numbers), *Glaucidium tephronotum* (recently recorded in Kapkanyar), *Campephaga quiscalina* (uncommon and local; recent records from Kapkanyar) and *Indicator conirostris* (uncommon).

Ol Donyo Sabuk National Park is dominated by a small mountain covered in montane forest, the Ol Donyo Sabuk National Park is home to 45 species of birds including the white-browed sparrow weaver, grey-headed sparrow weaver, African pied wagtail, mourning dove, augur buzzard, African hawk eagle and purple-breasted sunbird. Buffalo are the dominant animals in the ecosystem and other wildlife include bushbucks, leopards, olive baboons, aardvarks, porcupines, mongoose, pythons and monitor lizard. The mountain's summit also offers visitors scenic views of Mount Kenya.

Mwea National Reserve is located within Mbeere District, in Eastern Province, a distance of about 200km from Nairobi. The savannah ecosystem comprises of small hills with bushy vegetation and scattered large trees. Other areas are open grasslands while along the main rivers, large trees with thick undergrowth are found. Trees mainly found within the ecosystem are the different Acacia species and baobab trees. The ecosystem's main features are the meeting point of rivers Tana and Thiba, Kamburu and Masinga hydro-electric dams, which harbour variety of biodiversity. Major wildlife attractions include the elephants, Rothschild giraffes, Common zebras, Lesser kudu, Buffalo, Water Buck, Bush buck, Impala, Vervet Monkeys, Aardvark, Yellow baboons, Grants gazelle, Dik dik, Cape hare, Warthog, Black backed jackal, Duiker, Sykes monkeys, Genet cat, Slender mongoose, Stripped ground

squirrel, Dwarf mongoose, Crested porcupine, Rock Hyrax, Tree Hyrax and tortoise. Hippos and crocodiles are also found in the dams and rivers. Different birds and reptile species have been recorded in the reserve.

3.6 Birdlife

Chemical pesticides including Fenitrothion 96% an organophosphate which will be used in the project is likely to severely affects birdlife in the project area. Worldwide, hundreds of incidents of OP induced bird poisoning are reported. OP inhibit the enzyme, acetylcholinesterase and in acute poisoning 50-70% inhibition occurs. Sub lethal effects of these pesticides are endocrine disruption, alterations in feeding behavior and compromised immune systems which affect avian reproduction. Critical bird habitat is affected by pesticide use. Pesticides cause the local extinction, behavioral changes, loss of safe habitat and population decline in several birds. Pesticides and their residues can affect birds and their young directly or indirectly by contaminating food sources. Exposure to pesticides during reproductive stages affects hatching success and fledging survival, as well as increases the chance of reproductive failure. Alteration of feeding behavior, compromised immune system and increased predation further reduces the ability of these birds to maintain healthy populations. As behaviour is the result of integration of many inputs, it is considered as a potentially sensitive indicator of pesticide toxicity (Warner et al., 1966).

The 15 targeted Counties are home to different species of birdlife and has Important Bird Area (IBA) and Endemic Bird Areas (EBA) which are distributed in a large part of the ASAL as shown in Figure 3.6.

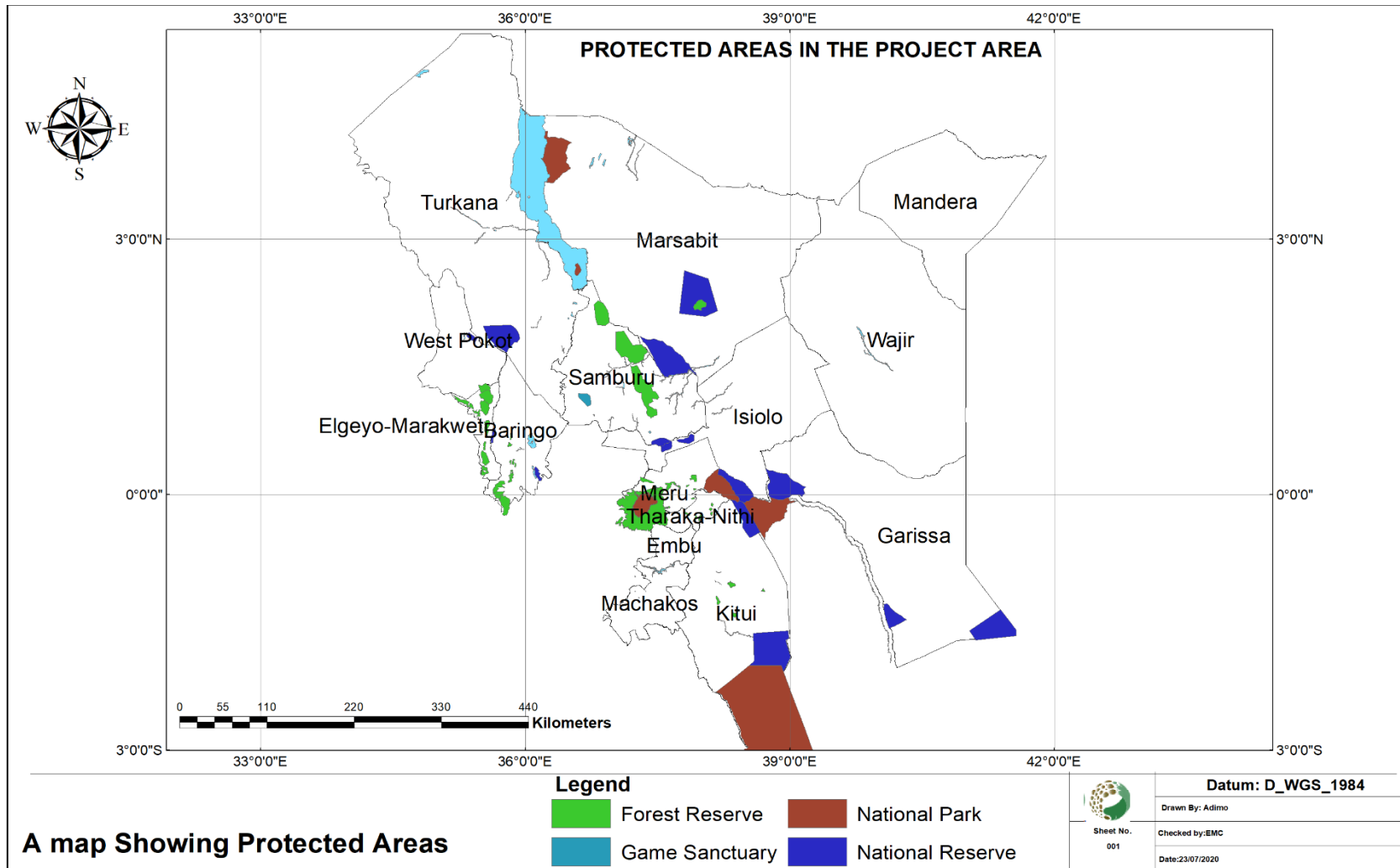
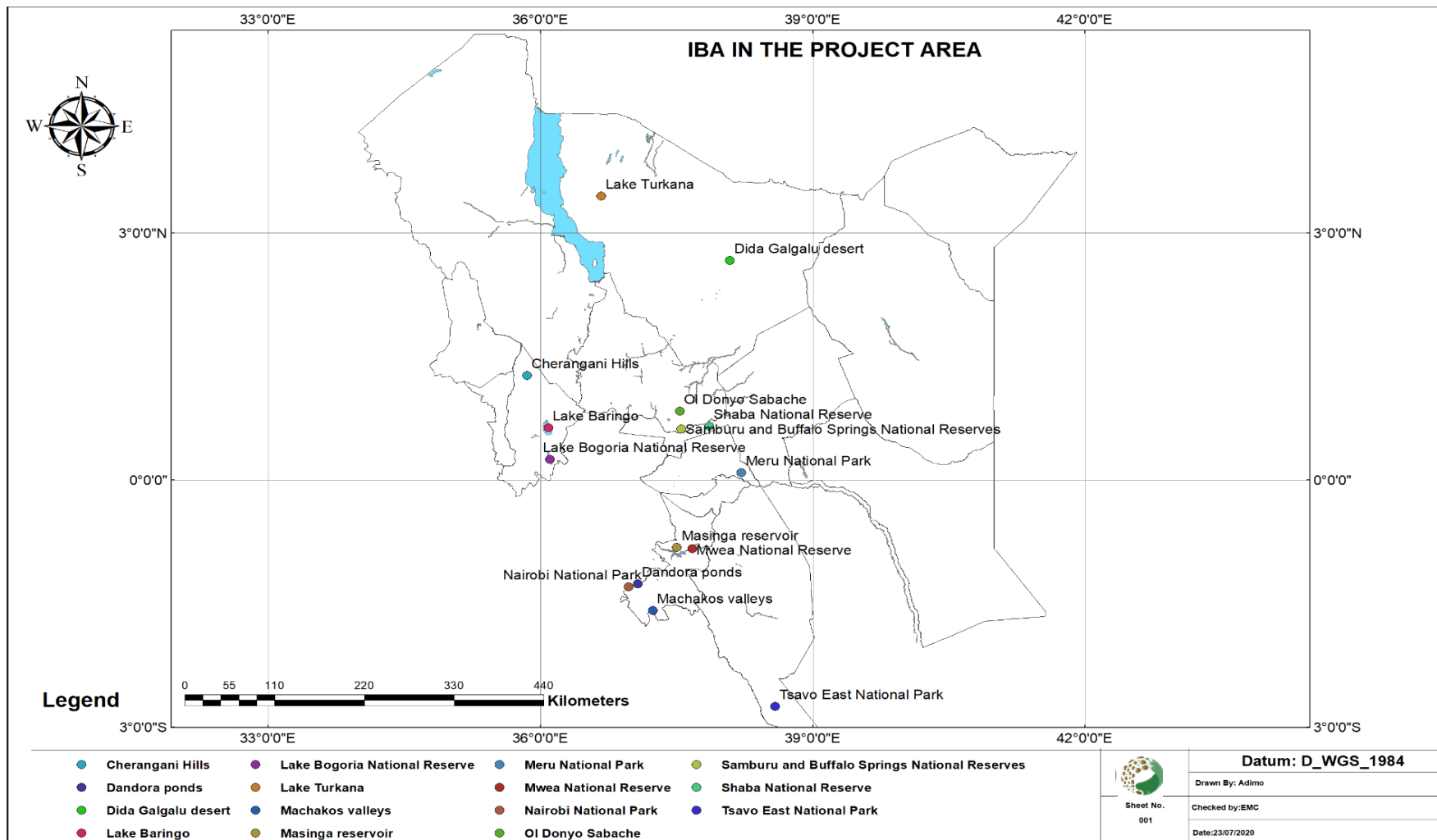


Figure 3-4. Protected Areas in ASAL Counties in Kenya



A map Showing IBA Sites

Figure 3-5. IBA in ASAL Counties in Kenya

3.7 Socio-Economic Background

3.7.1 Livelihood Systems

The economy of arid areas is dominated by mobile pastoralism, while in the better-watered and better-serviced semi-arid areas a more mixed economy prevails, including rain-fed and irrigated agriculture, agro-pastoralism, bio-enterprise, and conservation or tourism-related activities (GoK,2012). Other groups within the ASALs depend on fishing, hunting and gathering for their subsistence. Livelihood assets are the available capital resources people use to make a living. These have been classified into five categories (DFID, 1999): natural, physical, social, financial and human capital. Pastoralist systems contain huge amounts of critical human (language, indigenous technical knowledge, culture) and natural (uniquely adapted breeds of plants and animals) capital.

Pastoralism: Those in which 50% or more of household gross revenue comes from livestock or livestock related activities. Large areas are suitable only for nomadic livestock production.

Agro-pastoralists: These are more settled pastoralists with permanent crop fields close to their homesteads. They also keep livestock, which enable them to survive when crops fail, as it so often happens. More land can be reclaimed for crop cultivation by developing irrigation infrastructure in the ASALs however water is the main limiting factor in ASALS. Ownership of water sources is usually vested in the local community rather than in the household. These pastoralists/agro-pastoralists own about 50% of the national cattle and small ruminant herd and 100% of the camel population. An estimated 70% of cattle (12.2 million heads), 87% of sheep (14.3 million), 91% of goats (25 million) and 100% of camels (2.9 million) of the national livestock population are found in ASALs. The livestock sector provides an important source of livelihoods for 90% of the people who live there (KAPP, 2016). Pastoralism, agro-pastoralism and dryland agriculture are the key livelihood strategies adapted to climate conditions in ASALs. Pastoralism is a livestock-based production system. The contribution of ruminant livestock to national agricultural production has been underestimated in the past (CSDES, 2016).

Pastoralism and artisanal fisheries are among the few land use systems that should be compatible with wildlife conservation, but this is not the case despite the fact that 75% of Kenya's wildlife are found in the drylands (Kenya Republic of 2005) and 92% of Kenya's Protected Area estate (Parks and Reserves), and 50% of Kenya's gazetted forests are found in the drylands. Wildlife impose large costs on livestock-based land use, yet with relatively few benefits in return. As a result, there has been a large reduction of wildlife from all the rangeland districts of Kenya (IUCN, 2007).

Fisher folk: Confined to lakes and rivers such as Lake Turkana, Tana and Athi Rivers. Problems include diminishing fish stock levels in the natural water bodies and high siltation due to soil erosion causing turbidity and low fish productivity e.g. Lakes Baringo and Turkana, and River Tana. Fishing in pastoral areas has been facing some challenges, the major ones being diminishing stocks in natural water bodies as a result of high siltation levels and low productivity

Pastoralists in transition: With the increasing population in arid areas, pastoral families can no longer cope with a purely meat and milk diet. Cultivation, land adjudication and wildlife management have also contributed to a continuous decline of dry season grazing areas, and as a consequence decrease in possibilities to subsist on the pastoral system. Due to the decimation of cattle and other livestock, women play an active role to ensure family survival by participating more aggressively in activities such as beekeeping, camel rearing and trading in livestock, particularly small stock, as well as non-livestock products such as hay, mats, charcoal, clothing, and vegetables. Some of the very poorest people in the region are those who are no longer engaged in the pastoral economy and rely on wage labour or petty trade.

Urban destitute/Urban populations and reliance on trade: An increasing number of ASAL populations living around urban centres are turning to trade in such centres to supplement their income.

Periodic hunters and gatherers: In periods of extreme drought, a few communities turn to wild fruits and leaves in a bid to cushion themselves from starvation.

Emerging Livelihood Options: The ASALs have enormous potential for renewable energy, from both solar and wind. Other natural resources include sand and gravel for construction, soda ash, gums, resins, gemstones, medicinal plants, and potentially oil and gas. Mineral and mining activities provide significant and emerging livelihood options for ASAL communities. The recent discovery of substantial oil, coal and gas deposits is likely to diversify livelihoods among ASAL communities. Other mineral exploitation activities include sand harvesting, gravel-digging, prospecting for gold and precious stones, marble-quarrying and titanium, limestone and soda ash mining.

3.7.2 Poverty, Health and Gender

Poverty

The ASALs have the lowest development indicators and the highest incidence of poverty in the country. On average, 65% of the ASAL population live below the poverty line compared to the national average of 26%. ASALs contain 18 of the 20 poorest constituencies in Kenya; some counties in the north, such as Turkana, Marsabit, Wajir and Mandera, have between 74% and 97% of people living below the absolute poverty line. The economic activities that are found in drylands are not recognized for their true value and do not attract outside investment, therefore further undermining their productivity. Poverty in the drylands is compounded by poor physical infrastructure, limited services compared to the rest of the country, and lack of organized markets including lack of market information. This is heightened by inter-community conflict over water and rich-patch vegetation, something that is likely to become more serious with the negative impacts of climate change.

Health

Health indicators in Northern Kenya are very poor, particularly for women and children, with high maternal, infant and child mortality, high levels of acute malnutrition, and low immunization coverage. The average distance to a health facility in Northern Kenya is

52km, ten times further than the national target of 5km; the percentage of children delivered with trained care in ASAL is less than one-third of the national average; there are also significant differentials between the arid and non-arid parts of Rift Valley and Eastern regions of Kenya. ASALs of Kenya is also characterized by a high prevalence of trachoma and diseases such as kalazar. Levels of HIV/AIDS infection in the north are lower than the national level but thought to be rising. Risk factors include rural-urban migration, mobility, and congested refugee camps (GoK, 2012). Most communities have social protection systems to care for the vulnerable, although these are coming under greater pressure. The disabled and those with HIV/AIDS still face high levels of stigma.

4 POLICY AND REGULATORY FRAMEWORK FOR PEST AND PESTICIDE MANAGEMENT

This chapter outlines and highlights the relevant policy and legal framework in Kenya as relates to pest and pesticide management and with respect to the Emergency Locust Response Program as well as pesticide use for locust control related international conventions and guidelines which Kenya is part to and have a relevance to the ELRP.

4.1 The Legal, Regulatory and Policy Framework

4.1.1 Constitutional Provisions

Kenya now has a new Supreme law in form of the New Constitution which was promulgated on the 27th of August 2010 and which takes supremacy over all aspects of life and activity in the New Republic. With regard to environment, Section 42 of the Constitution states as follows: -

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

- a) *To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and*
- b) *To have obligations relating to the environment fulfilled under Article 70*

In Sections 69 and 70, the Constitution has inter alia identified National Obligations in respect of the environment and Enforcement of Environmental Rights respectively as follows: -

Section 69 (1): The State shall—

- a) *Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;*
- b) *Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;*
- c) *Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;*
- d) *Encourage public participation in the management, protection and conservation of the environment;*
- e) *Protect genetic resources and biological diversity;*
- f) *Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;*
- g) *Eliminate processes and activities that are likely to endanger the environment; and*
- h) *Utilize the environment and natural resources for the benefit of the people of Kenya.*

Section 69 (2) States that; -Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Section 70 provides for enforcement of environmental rights thus:

(1) If a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

(2) On application under clause (1), the court may make any order, or give any directions, it considers appropriate—

- a) To prevent, stop or discontinue any act or omission that is harmful to the environment;*
- b) To compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or*
- c) To provide compensation for any victim of a violation of the right to a clean and healthy environment.*

(3) For the purposes of this Article, an applicant does not have to demonstrate that any person has incurred loss or suffered injury.

Essentially, the new Constitution has embraced and provided further anchorage to the spirit and letter of EMCA 1999 and EMCA (amendment) Act, 2015 whose requirements for environmental protection and management have largely informed Sections 69 through to 71. In Section 72 however, the new constitution allows for enactment of laws towards enforcement of any new provisions of the Supreme Law.

4.1.2 Pest Control Products Act Chapter 346, 2012

This Act covers the use, application, importation and trade in pest products. It includes regulation on:

- Prescribing for the purposes of this Act the nomenclature of pests, classes and kinds of pests and pest control products;
- Prescribing the form in which applications for registration shall be made and the information to be furnished therewith;
- Respecting the registration of pest control products and establishments in which any pest control products are and led by manufacturers or dealers and prescribing the fees therefore, and respecting the procedures to be followed for the review of cases involving the refusal, suspension or cancellation of the registration of any such product or establishment;
- Prescribing the form, composition, and all other standards relating to the safe use of pest control products, including toxic residue effects;
- Respecting the manufacture or treatment of any pest control product to facilitate its recognition by change in colouration or other means;
- Respecting the standards for efficacy and safety of any pest control product;
- Respecting the manufacture, storage, distribution, display and use of any pest control product;
- Respecting the packaging, labelling and advertising of pest control products;
- Respecting the taking of samples and the making of analyses for the purposes and provisions of this Act;
- Prescribing the information to be supplied and the form of such information in respect of any pest control product that is to be imported into Kenya;

- Prescribing the circumstances and conditions under which pest control products that have met the requirements of the Cattle Cleansing Act may be deemed to be registered as prescribed under this Act;

4.1.3 Pest Control Products (Registration) Regulations, 1984

The Pest Control Products (Registration) Regulations, 1984 [L.N. 46/1984, L.N. 109/1984, L.N. 123/2006.] – defines the process of registering pest control products. Key features of the subsidiary legislation include:

- Section 5 - establishes the PCPB, whose functions include assessing and evaluating pest control products, and considering applications for the registration of pest control products. The pesticide to be used is registered for use in Kenya as per this regulation.
- Regulation 2 - provides definitions for various pest control products including biochemical pesticide and micro- and microbial bio pesticides
- Regulation 4 - outlines the procedure for the registration of pest control products including bio pesticide-specific registration pathways
- Regulation 7 - provides for instances when the PCPB can issue or refuse to issue a certificate of registration
- Regulation 8 - stipulates the validity period for certificates of registration
- Regulation 10 - lists instances where the PCPB may refuse to register a pest control product
- Regulation 11 - states instances where the PCPB may suspend or revoke a certificate of registration
- Regulation 14 - provides that a holder of a certificate of registration is to keep a record of all the quantities of pest control products they store, manufacture or sell. This record is to be maintained for five years from the time it is made and must be made available to the PCPB at such times and in such manner as the PCPB may require.

The PCPB publishes the list of pest control products registered in the country on its website. This list is published to stakeholders in the plant health sector in order to easily identify the pesticides that have been evaluated by the PCPB for safety, efficacy, quality and economic value. By accessing the PCPB website, any person can access categorised downloadable list of registered products, including those for use in crop production, animal health and public health. Contained in the list is information on trade names of products, their registration numbers, the name(s) of active ingredient(s) and their concentrations, formulation type, authorized uses including crops and target pests, the name of the registrant and the period of registration.

4.1.4 The Pest Control Products (Licensing of Premises) Regulations, 1984

The Pest Control Products (Licensing of Premises) Regulations, 1984 [Section 15, L.N. 45/1984, L.N. 124/2006.] – Section 2 prohibits any person from using any premises for purposes of manufacturing, formulating, packaging and storing pest control products without a license issued under these regulations.

4.1.5 The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984

The Pest Control Products (Labelling, Advertising and Packaging) Regulations, 1984 [L.N. 89/1984, L.N. 127/2006.] – address the design of pesticide packages (packaging and labelling). Regulation 3 requires all pest control products to bear a label which has been approved by the PCPB. In addition, the regulation specifies the information required on the label. Regulation 9 provides for cases where the physical properties of a pest control product may not be recognized when it is being used. In such circumstances the pest control product must be denatured by means of colour, odour or other methods the PCPB may approve so as to provide a signal or warning of its presence. Regulation 11 specifies the conditions under which a pest control product shall be distributed. Regulation 13 specifies the technical requirements for packaging (e.g. packaging material shall be sufficiently durable and manufactured to contain the pest control product safely under practical conditions of storage, display and distribution). Regulation 14 states the general prohibitions (e.g. words stating, implying or inferring that a pest control product is approved, accepted or recommended by the government shall not appear on a package or label in any advertisement respecting a pest control product).

4.1.6 Pest Control Products (Importation and Exportation) Regulations, 1984

The Pest Control Products (Importation and Exportation) Regulations, 1984 [L.N. 146/1984, L.N. 125/2006.] contain provisions specifically addressing the import and export of pesticides. Regulation 2 prohibits the importation and exportation of pest control products unless licensed. Regulations 4 and 5 establishes the application process for a license in respect of importation or exportation of a pest control product and how the PCPB will deal with applications and issue of licenses respectively. Regulation 8 provides for instances where the PCPB may cancel or suspend a licence (e.g. where the licensee has been convicted of an offence/has committed a breach of any of the terms or conditions of the license).

4.1.7 Pharmacy and Poisons Act Chapter 244, 2012

The Pharmacy and Poisons Act contains provisions addressing the sale of poisons for agriculture and horticulture. Section 28 prescribes the manner in which a person intending to trade in pesticides may apply to the Pharmacy and Poisons Board for a license to deal with pesticides. The section further prescribes instances when the Board may refuse to issue or renew or may revoke a license to trade in pesticides. Section 13 prescribes the safe custody of poisons. The section provides that no person engaged in a trade, business or profession shall knowingly have in their possession or under their control a poison.

4.1.8 Pest Control Products (Licensing of Premises) Regulations, 1984

Pest Control Products (Licensing of Premises) Regulations, 1984 contains further provisions addressing the handling of pesticides - Regulation 7 requires that every person operating premises dealing with pesticides must have an adequate knowledge of the chemistry, toxicology, efficacy and general use of the pest control product. Further, the regulations contain provisions identifying pesticide-related activities permissible only to operators holding a valid license. Regulation 3 prescribes the application process for the

licensing of premises intended to be used for manufacturing, formulating, packaging, selling or storing pest control products. Regulation 7 requires persons intending to handle, use, distribute, transport or deal in a pest control product under restricted class to apply to the PCPB for a permit as per the prescribed Form D in the schedule.

4.1.9 Pest Control Products (Disposal) Regulations, 2006

Pest Control Products (Disposal) Regulations, 2006-Regulation 2 provides that those disposing pesticides for commercial purposes must be in possession of a license, and the use of any pesticide disposal method must be approved by the PCPB. Further, the Guidelines for on-farm Disposal of Pesticide Wastes and Containers, PCPB prescribe best practice when it comes to the disposal of unwanted or unused pesticide concentrates (obsolete stock). Further, guidelines for on-farm disposal of pesticide wastes and containers, PCPB. The guidelines prescribe that pesticide containers and packaging materials should never be used to contain water, food or feed stuffs for human or animal use. Additionally, while cleaning containers, the following guidelines must be noted:

- wear protective clothing
- avoid spillages and leaks
- completely empty containers and packages before disposing
- take care to avoid splashing or creating dust
- place cleaned containers in a dry secure compound prior to disposal
- At the container disposal site:
 - Containers should be punctured after rinsing to make them unusable, and crushed to reduce bulk
 - Combustible packaging materials should be burnt in a licensed incinerator. If not possible, containers should be made unusable, reduced in bulk and buried
 - Integrity of containers to be buried should be destroyed
 - Aerosols should not be punctured

4.1.10 Plant Protection Act Chapter 324, 2012

This Act makes a provision for the prevention of the introduction and spread of pests destructive to plants. The most applicable parts of this Act to Integrated Pest Management are specified in Sec. 3, 4, 5, 6, 7 and 8. The act creates specific rules to support plant protection in various crops. These includes sugarcane (L.N.294/1962. Rule 3, Sch. 2), Maize and Sorghum (L.N.216/1956. Schedule (7 and 8), Sisal (L.N.522/1957, L.N.365/1964, L.N.153/1958, L.N.177/1959, L.N.558/1960) and Banana (Cap.178 (1948), Sub. Leg. L.N.365/1964).

4.1.11 Environment Management and Coordination Act (No. 8 of 1999), EMCA (Amendment) Act 2015, Cap 387.

This is an Act of Parliament providing for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith and incidental thereto. This Act is divided into 13 Parts, covering main areas of environmental concern as follows: Preliminary (I); General principles (II); Administration (III); Environmental planning (IV); Protection and Conservation of the Environment (V), Environmental impact assessments (EIA), audits and monitoring (VI); Environmental audit and monitoring (VII); Environmental quality standards (VIII); Environmental Restoration

orders, Environmental Easements (IX); Inspection, analysis and records (IX); Inspection Analysis and Records (X); International Treaties, Conventions and Agreements (XI) National Environment Tribunal (XII); Environmental Offences (XIII). The Act provides for the setting up of the various ESIA Regulations and Guidelines which are discussed below:

Environmental (Impact Assessment and Audit) Regulations 2003

The Environmental (Impact Assessment and Audit) Regulations 2003 state in Regulation 3 that “the Regulations should apply to all policies, plans, programmes, projects and activities specified in Part III and V of the Regulations” basically lists the guidelines of undertaking, submission and approval of the ESIA Reports a key requirement outlined in this ESMF.

Environmental Management and Co-ordination (Waste Management) Regulations 2006

These are described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006. These Regulations apply to all categories of waste as provided in the Regulations. These include:

- *Industrial wastes;*
- *Hazardous and toxic wastes;*
- *Pesticides and toxic substances;*
- *Biomedical wastes;*
- *Radio-active substances.*

The proposed Project will have to abide by these regulations in dealing with waste management especially the provisions of wastes which may be generated during their construction and operation phases of the sub project investments.

Environmental Management and Coordination, (Water Quality) Regulations 2006

These are described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006. These Regulations apply to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. This includes the following:

- *Protection of sources of water for domestic use;*
- *Water for industrial use and effluent discharge;*
- *Water for agricultural use.*

These Regulations outline:

- a) *Quality standards for sources of domestic water;*
- b) *Quality monitoring for sources of domestic water;*
- c) *Standards for effluent discharge into the environment;*
- d) *Monitoring guide for discharge into the environment;*
- e) *Standards for effluent discharge into public sewers;*
- f) *Monitoring for discharge of treated effluent into the environment.*

In fulfilling the requirements of the regulations, the project proponent will have to undertake monitoring of both domestic water and wastewater and ensure compliance with the acceptable discharge standards.

Environmental Management and Coordination, Conservation of Biological Diversity (BD) Regulations 2006

These regulations are described in Legal Notice No. 160 of the Kenya Gazette Supplement No. 84 of December 2006. These Regulations apply to conservation of biodiversity which includes Conservation of threatened species, Inventory and monitoring of BD and protection of environmentally significant areas, access to genetic resources, benefit sharing and offences and penalties.

Environmental Management and Coordination (Wetlands, Riverbanks, Lake Shores and Sea Shore Management) Regulations 2009

These regulations provide for the protection and management of wetlands, riverbanks, lakeshores and sea-shore management and detail guidelines on the same.

4.1.12 Occupational Health and Safety Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- *Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapours, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.*
- *Prevents employment of children in workplaces where their safety and health is at risk.*
- *Encourages entrepreneurs to set achievable safety targets for their enterprises.*
- *Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.*
- *Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.*

Failure to comply with the OSHA, 2007 attracts penalties of up to KES 300,000- or 3-months jail term or both or penalties of KES 1,000,000-or 12-months jail term or both for cases where death occurs and is in consequence of the employer. The Occupational Safety and Health Act (OSHA) 2007 repealed the Factories and Other Places of Work Act. Anything done under the provisions of the Factories and Other Places of Work Act including subsidiary legislation issued before the commencement of the OSHA 2007 shall be deemed to have been done under the provisions of this Act.

The Factories and Other Places of Work Act had over the years passed several subsidiary rules and regulations for effective implementation of the Act. All shall, as long as it is not inconsistent with OSHA 2007 remain in force until repealed or revoked by subsidiary legislation under the provisions of OSHA 2007 and shall for all purposes be deemed to have been made under this Act.

These regulations include:

- *The Factories (Cellulose Solutions) Rules 1957;*
- *The Factories (Wood Working Machinery) Rules 1959;*
- *The Factories (Dock) Rules 1962;*
- *The Factories (Eye Protection) Rules 1978;*

- *The Factories (Electric Power) (Special) Rules 1978;*
- *The Factories (Building Operations and Works of Engineering Construction) Rules 1984;*
- *The Factories and Other Places of Work (Health & Safety Committees) Rules 2004;*
- *The Factories and Other Places of Work (Medical Examination) Rules 2005;*
- *The Factories and Other Places of Work (Noise Prevention and Control) Rules 2005;*
- *The Factories and Other Places of Work (Fire Risk Reduction) Rules 2007;*
- *The Factories and Other Places of Work (Hazardous Substances) Rules 2007.*

The scope of OSHA 2007 has been expanded to cover all workplaces including offices, schools, academic institutions and plantations. It establishes codes of practices to be approved and issued by the Director, Directorate of Occupational Health and Safety (DOHS) for practical guidance of the various provisions of the Act.

Other parameters within the Act relevant to the project include:

1. *Duties of employers, owners or occupiers of workplace;*
2. *Establishment of safety and health committees;*
3. *Annual safety and health audit of workplaces;*
4. *Safety and Health obligations for persons who may come to premises for work and are not employees of that particular workplace;*
5. *Reporting of any accident, dangerous occurrence or occupational poisoning caused in the workplace to the area Occupational Health and Safety Office. These incidents should be entered in the General Register. In case of fatal accident information to the area Safety and Health Office should be within 24 hrs. and a written notice to the same within 7 days;*
6. *The duties of manufactures, designers, importers and suppliers to ensure that all articles and substances for use at workplace are safe and will not cause injury to health and the environment;*
7. *Duties of self-employed persons;*
8. *Duties of employed persons;*
9. *Prohibition of interference or misuse of any appliance, convenience or any other facility provided to secure Safety, Health and Welfare at work by any person (occupier, self-employed person or employed);*
10. *The administration of the Act is the responsibility of a Director and other appointed and gazetted officials (Occupational Health and Safety Officers);*
11. *The registration of all workplaces by the Director Directorate of Occupational Health and Safety (DOHS) forming the basis of his work statistics;*
12. *Machinery safety to include:*
 - *Safe use of machinery, plant and equipment;*
 - *Prime makers and transmission machines;*
 - *The maintenance, construction of fencing safeguards;*
 - *The statutory requirements of various machines, plants and equipment (hoists and lifts, chains and ropes, cranes, steam receivers and containers, air receivers, cylinders for compressed liquefied and dissolved gases and refrigeration plants).*
13. *Chemical safety including:*
 - (i) *Handling, transportation and disposal of chemicals and other hazardous substances;*
 - (ii) *Importance of Materials Safety Data Sheets (MSDS);*
 - (iii) *Labelling and marking of chemical substances;*

- (iv) *Classification of hazardous chemicals and substances;*
- (v) *Establishment and adoption of exposure limits on hazardous substances in a workplace;*
- (vi) *Control of air pollution, noise and vibrations;*
- (vii) *Redeployment on medical advice.*

4.1.13 Public Health Act, Chapter 242, 2012

The Public Health Act provides for the protection of human health through prevention and guarding against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health. The Public Health Act regulates activities detrimental to human health. The owner(s) of the premises responsible for environmental nuisances such as noise and emissions, at levels that can affect human health, are liable to prosecution under this act. An environmental nuisance is defined in the act as one that causes danger, discomfort or annoyance to the local inhabitants or which is hazardous to human health. This Act controls the activities of the project with regard to human health and ensures that the health of the surrounding community is not jeopardized by the activities of the project such as water development.

4.2 Relevant Sector Policies

4.2.1 The Kenya Vision 2030

The Sessional Paper Number 10 of 2012 on the Kenya Vision 2030 under the economic pillar identifies specific interventions which in the agricultural sector include increasing productivity of crops and livestock, introducing land use policies for better utilization of high and medium potential lands, developing more irrigable areas in arid and semi-arid lands for both crops and livestock, and improving market access for smallholders through better post-harvest and supply chain management. It also prioritizes flagship projects in the sector, specifically: enactment of the consolidated agricultural reform bill, fertilizer cost-reduction investment, disease-free zones, land registry, land-use master plan and arid and semi-arid lands development project. The Policy makes reference to climatic change and directs responses. The Policy under the social pillar, with respect to environmental management proposes to intensify conservation of natural resources, such as establishing voluntary carbon markets, intensify research on impact of and response to climatic change and pilot adaptation programmes.

4.2.2 Agricultural Sector Development Strategy

The Agricultural Sector Development Strategy (ASDS) 2010-2020 sets out to implement the Kenya Vision 2030 in the agricultural sector. It identifies two strategic thrusts for its vision of a food-secure and prosperous nation, i.e. increasing productivity, commercialization and competitiveness of agricultural commodities and enterprises and developing and managing the key factors of production. It commits government to implement “National Climate Change Response Strategy” which would include mainstreaming of tradition early warning and mitigation systems, identification of

priorities for climate adaptation and mitigation with specific measures for vulnerable groups, awareness creation, conducting of periodic climate change threat and risk assessments and their mitigation as well as research and development in the area.

4.2.3 National Climatic Change Strategy

The Strategy sets out to reduce the vulnerability to impacts of climatic change and to catalyse transition to cleaner, lower emission and less carbon-intensive development in the country. Government commits in the Strategy to enhance climatic resilience and adaptive capacity and put in place mechanisms for sustainable utilization of natural resources. The Strategy directs integration of climate change risk and vulnerability assessment in the Environment Impact Assessment and the Strategic Environment Assessment. It lays the blame for emissions of green-house gases largely to agriculture, more so livestock, and in land-use change and suggests deterrent taxation and friendly regulatory environments for low carbon-pollutant activities.

4.2.4 The National Agricultural Research Systems Policy

This policy provides the foundation for research in the agricultural sector. It aims at achieving reforms in the Kenyan agricultural research systems to support the development of an innovative, commercially oriented, and modern agricultural sector. The Policy aims at achieving objectives that include problem-solving and impact driven research agenda, fast-tracking national adoption of available technologies and knowledge and enhancing capacity to access and adopt knowledge and appropriate technologies available world-wide. It directs re-focusing of research to solve problems, the harnessing of indigenous knowledge while upholding professional ethics and the adoption of innovative methods of knowledge transfer.

4.2.5 The National Agricultural Sector Extension Policy

This policy implements the ASDS on matters of agricultural extension services. It directs extension service providers to apply sustainable, dynamic, innovative and effective extension approaches and methods, especially those promoting demand-driven and beneficiary led approaches in the selection of technologies and extension messages. It promotes decentralization of extension by using clientele groups (e.g. common interest groups, smallholder associations and primary cooperatives) and general public outreach for cost-effectiveness, taking into consideration the importance of indigenous knowledge and technologies.

4.2.6 The National Productivity Policy

The Sessional Paper Number 3 of 2013 on the National Productivity Policy responds to low productivity and directs corrective measures. The Policy aims to achieve accelerated economic growth through high investment and productivity growth, being the incremental growth of 5% per year up from current less than 1%. It also aims at increased productivity awareness and consciousness level in the country from the current level of about 1 percent to 60 percent of the population. It proposes training programmes outside the formal education system for skills transfer to the labour force. It will also support technological change and innovation.

4.2.7 The National Food and Nutritional Security Policy

The Sessional Paper Number 1 of 2012 on the National Food and Nutritional Security Policy aims at achieving safe food in sufficient quantity and quality to satisfy the nutritional needs for optimal Agricultural Policies & Legislation: The Policy directs the promotion of sustainable food production systems with particular attention to increasing soil fertility, agro-biodiversity, organic methods and proper range and livestock management practices. The Policy also directs that different approaches to food production are adopted based on the agro-ecological diversity which should include promoting irrigation.

4.3 Relevant Institutions-Environmental

Table 4-1. Other Institutions

Agency	Role	Specific functions list (relating to pest and pesticide management)
Ministry of Agriculture		
Pest Control Products Board (PCPB)	Regulates the importation, exportation, manufacture, distribution, transportation, sale, disposal and use of products used for the control of pests and mitigate potential harmful effects to the environment.	- Enhance compliance of pest control products to set standards and facilitate trade. - Ensure safe, quality and efficacious pest control products are available to users - Enhance responsible use of pest control products and food safety - Improve management of pest control products lifecycle
KALRO	Research in plant health issues related to pesticide	Efficacy trials of agricultural pesticides for field and stored crops and fertilizers
Ministry of Health		
Government Chemists Department	Provision of laboratory services in the fields of public and environmental health	- Test substances and materials for chemical composition, compliance with legal specifications and their suitability for various uses - Analyses of samples for compliance to public health requirements
Directorate of Occupational Safety and Health Services (DOSHS)	Ensures safety, health and welfare of workers predisposed to pesticides.	Identify, evaluate and control biological and chemical factors in the work environment which may affect the safety and health of employed persons and the general environment.
Ministry of Industry, Investment and Trade		
Kenya Bureau of Standard (KEBS)	Prepare standards relating to pesticides and their promotion at all levels	Develop pesticide standards. Testing pesticide residues, and toxic elements in foods Certification of products
Ministry of Environment and Forestry		
National Environment Management Authority	Exercise general supervision and coordination over all	Ensure pesticide application occurs in a judicial manner without polluting the environment.

	matters relating to the environment and to be the principal instrument of the Government of Kenya in the implementation of all policies relating to the environment.	
--	--	--

The government agencies involved in pest and pesticide management are supported by several international and regional institutions, including FAO, ILRI, ICIPE, IITA, CYMMIT, CIP, ICRAF (WAC), CIAT, ICRISAT and DLCO. It should be noted that FAO will play a leading and instrumental in use of the pesticides for desert control under this project.

4.4 World Bank Group EHS Guidelines

The Environmental Health and Safety (EHSs) General Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The EHS General Guidelines contain the performance levels and measures that are normally acceptable to the WB Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. These include, EHS Guidelines for Occupational Health and Safety, EHS Guidelines for Perennial Crop Production, EHS Guidelines for Community Health and Safety (Transport of Hazardous Materials).

4.5 International Environmental and Social Management Requirements

Kenya is a signatory to several international treaties and conventions that are relevant to this project. The conventions include among others; -

4.5.1 Convention on Biological Diversity, 1992

The Convention on Biological Diversity adopts a broad approach to conservation. It requires Parties to the Convention to adopt national strategies, plans and programs for the conservation of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programs and policies. The proposed program is expected to conserve biodiversity, especially the rare and endangered species in the project area and its environs. In addition, United Nations Convention on Biological Diversity (CBD) provides a regulatory framework for the conservation of biological resources at the international level.

4.5.2 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1998

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” - household waste and incinerator ash. Based on the concept of prior informed

consent, it requires that, before an export may take place, the authorities of the State of export notify the authorities of the prospective States of import and transit, providing them with detailed information on the intended movement. The movement may only proceed if and when all States concerned have given their written consent (articles 6 and 7). The Basel Convention also provides for cooperation between parties, ranging from exchange of information on issues relevant to the implementation of the Convention to technical assistance, particularly to developing countries (articles 10 and 13).

4.5.3 Bamako Convention, 1992

The Bamako Convention is a treaty of African nations prohibiting the import into Africa of any hazardous waste. The convention came into force in 1998 and includes the need to dispose wastes in an environmentally sound manner.

4.5.4 International Plant Protection Convention (IPPC) of FAO, 1952

The IPPC is an international treaty to secure action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control.

4.5.5 World Food Security and the Plan of Action of November 1996

This declaration seeks to secure effective prevention and progressive control of plant and animal pests and diseases, including especially those which are of trans-boundary nature, such as desert locust, where outbreaks can cause major food shortages, destabilize markets and trigger trade measures. It promotes regional collaboration in plant pests and animal disease control and the widespread development and use of safe pest management methods such as integrated pest management practices.

4.5.6 United Nations Framework Convention on Climate Change, 1992

The convention seeks to regulate levels of greenhouse gases (GHGs) concentration in the atmosphere, to avoid the occurrence of climate change at levels that would harm economic development, or that would impede food production activities. In essence, the locust thrives on vegetative and forage parts of plant and therefore depleting carbon sinks. Abating the invasion menace will not save vegetation cover but allow for rejuvenation of the damaged forage.

4.5.7 FAO Guidelines on Good Practice for Aerial Application of Pesticides, 2001

When using an approved pesticide, the objective is to distribute the correct dose to a defined target with the minimum of wastage due to drift using the most appropriate spraying equipment. Acceptable spray distribution is relatively easy to achieve with most ground-based directed spraying, but spray application with fixed and rotary wing aircraft presents more complex problems. The purpose of this guide is to identify some of the problems and to suggest means of addressing them. Although the number of aircraft licensed for aerial spraying has decreased recently, where large uniform areas have to be rapidly treated, aircraft application is usually considered to be more fuel-efficient than ground spraying. Aircraft are used to apply both liquid and solid materials as well as to broadcast seed when soil conditions prohibit the use of ground equipment.

4.5.8 FAO Guidelines on Good Practice for Ground Application of Pesticides, 2001

The guidelines are aimed at decision-makers, managers, field supervisors and spray operatives. However, it must be emphasized that in some countries, legislation is already in place to control safe and efficient pesticide use and application. Accordingly, local legislation, or voluntary codes must be the first point of reference with this set of guidelines offered as additional information. This is an important point, as compliance with local legislation may have legal significance in the event of a claim against the poor field performance of a pesticide.

4.5.9 FAO Guidelines on Management Options for Empty Pesticide Containers, 2001

This guideline provides advice on the management of one-way pesticide containers following the deployment of their contents. Unless empty pesticide containers are managed correctly, they are hazardous to both mankind and the environment. There is a danger that empty containers could be reused for storing food and water, which could result in pesticide poisonings. Containers abandoned in the environment can lead to pesticide pollution in soil and groundwater. A container management scheme can minimize these risks and is part of the “life-cycle concept” as addressed in the International Code of Conduct on the Distribution and Use of Pesticides.

4.5.10 FAO Guidelines on Desert Campaign Organization and Execution, FAO Rome, 2001

This guideline is intended for use by those individuals who have the responsibility of organizing a locust control campaign in their country. Field staff, administrators, donors and other international organizations may find some of the information useful in understanding what is involved in the organization and implementation of locust campaigns. The guideline deals almost exclusively with aerial control campaigns because only aerial control can cope with large numbers of locusts in which the aim is not only to protect crops but to reduce the size of the total locust population and bring an end to the upsurge or plague. It concentrates on the resources required for a campaign as well as the organization and deployment of these resources.

4.5.11 FAO Guidelines on Desert Locust Control, 2003

This guideline is intended mainly for use by field staff involved in Desert Locust control operations, including field officers supervising control operations and pilots and engineers of spray aircraft. Some parts will be useful reference material for training new staff and providing refresher training for experienced locust officers. The information and reference data may also be useful for senior managers planning and overseeing campaigns and for donor representatives assessing technical needs. The guideline contains practical advice on equipment and techniques used to carry out locust control which is safe (minimum negative effect on humans and the environment), effective (controls locusts successfully) and efficient (effective with minimum cost).

4.5.12 FAO Desert Locust Guidelines on Safety and Environmental Precautions, 2003

This guideline is primarily intended for use by decision-makers, field officers and monitoring staff involved in the organization and execution of Desert Locust control operations. Some parts will be important reference material for training new staff as well as providing background information for experienced locust officers. Two subjects are addressed in this guideline. First, the reduction of environmental and human health risks from pesticides use during locust control is discussed. Practical recommendations are given on how to address risk reduction during the campaign preparation phase, how to implement it during the control operations, and how to evaluate it in post-campaign follow-up. The second subject is environmental and human health monitoring during locust control operations. Monitoring of control operations is necessary to assess whether adverse effects occur and under what circumstances. Such information is essential for improving control techniques and approaches. The guideline will only address operational, short-term monitoring activities and will not discuss more in-depth or long-term monitoring and research.

- FAO Desert Locust Guidelines, Section 6, Safety and Environmental Precautions (2003)
- Guidelines for personal protection when handling and applying pesticide (2020)
- Prevention of Accumulation and Disposal of Obsolete Stocks; 2009
- International Code of Conduct on Pesticide Management
- Guidelines on Good Practice for Ground Application of Pesticides, 2001;
- Guidelines on Good Practice for Aerial Application of Pesticides, 2001;
- Guidelines on Organization and Operation of Training Schemes and Certification Procedures for Operators of Pesticide Application Equipment, 2001;
- Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides, 2009;
- Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011

4.6 Applicable World Bank's Environmental and Social Standards

The ELRP is a program targeting 15 Counties in Kenya and expected to have project investments in the entire country for as long as the selected sites are feasible. However, the likely or potential locations of many of the proposed investments are unknown at this point in time. In order to reduce, minimise and mitigate adverse risks and impacts and undue harm of its development projects to the environment, all Bank-financed projects are guided by applicable environmental and social standards under the Environmental and Social Framework (ESF). The following ESSs are relevant to this project and described in detail in the ESMF.

- Assessment and Management of Environmental and Social Risks and Impacts. (ESS1)
- Labor and Working Conditions (ESS2)
- Resource Efficiency and Pollution Prevention and Management (ESS3)
- Community Health and Safety (ESS4)
- Biodiversity Conservation and Sustainable Management of Living Natural Resources (ESS 6)

- Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities (**ESS7**)
- Stakeholder Engagement and Information Disclosure (**ESS 10**)

5 INTEGRATED PEST MANAGEMENT PLAN

This chapter presents the pesticide use and approaches that will be employed in the emergency control and eradication of the locust infestation in Kenya under the ELRP.

5.1 Control Strategies and Management Approach

The principal aim of strategies designed for locust control is to reduce the size of the total population of insects and not merely to attack insects in or near crops. This is deemed the most appropriate way to achieve crop and pasture protection with such mobile pests, while preventing occurrence of plagues. This strategy also recognizes that desert locust upsurges leading to plagues occur through sequences of successful breeding by initially solitary-per behaving populations, followed by gregarious populations. While the gregarious populations are the obvious targets for spraying, their destruction does not necessarily make significant inroads into the critical mass of the population. Solitary locusts, which are not targets in practical or economic terms, migrate and continue to multiply. These desert locusts expand into an ever-increasing area for several generations and it is only when they come together into swarms and become recognisable targets that effective control can be achieved. The strategy will therefore target both the solitary and gregarious populations.

5.2 Choosing Pesticides for Locust Campaign

MoALFC has followed the World Bank's ESS 3 criteria and FAO Guidelines on locust campaign including selection of pesticides and the selected pesticides have been discussed and agreed with the Bank. The selection of the 2 pesticides for use i.e. Fenitrothion 96% which is a WHO **class II**, formulated as ULV and a biopesticide, Metarhizium for control of the locusts has followed the FAO guidelines. Below are the FAO guidelines that were considered and informed the choosing of the 2 pesticides namely:

- Efficacy – the more toxic the active ingredient (the poisonous part of the pesticides) is to the locusts, the smaller the amount of active ingredient needed.
- Safety– the product should ideally have low toxicity to mammals (humans, livestock) and other animals such as birds and fish.
- Specificity – ideally the product should be toxic to locusts but not to other types of arthropods. If they are toxic to many other types of arthropods they are called broad spectrum compounds, and are not desirable.
- Persistence – the longer the product remains biologically active in the field, the more effective it is because it can kill locusts later as they emerge from eggs or arrive in the area. However, there may be more serious effect on other organisms, i.e. greater environmental impact, from a persistent product.
- Route of entry – whether it is a contact or stomach action product will determine its suitability for different targets, e.g. flying swarms need a product with contact action.
- Speed of action – the faster the product works, the less crop damage will be caused and the better the feedback the control team has on the effectiveness of operations. However, sometimes speed of action is not important, e.g. for hopper bands far from crops.

- Shelf life – the longer a product can be stored before use the better. If it is not needed immediately it will still be effective in future years.
- Availability – locust pesticides must be available as ULV formulations in large quantities at short notice.
- Cost – pesticides are one of the most expensive elements in any control campaign so cheaper products will greatly reduce control costs.

ESS 3 Pesticide Selection Requirements

Resource Efficiency and Pollution Prevention and Management (**ESS3**) requires that in the procurement of any pesticide the Borrower will assess the nature and degree of associated risks, taking into account the proposed use and the intended users. The Borrower will not use any pesticides or pesticide products or formulations unless such use is in compliance with the EHSs. In addition, the Borrower will also not use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols or that are listed in, or meeting, the criteria of their annexes, unless for an acceptable purpose as defined by such conventions, their protocols, or annexes, or if an exemption has been obtained by the Borrower under such conventions, their protocol, or annexes, consistent with Borrower commitments under these and other applicable international agreements.

The Borrower will also not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. For any other pesticide products that pose other potentially serious risk to human health or the environment and that are identified in internationally recognized classification and labelling systems, the Borrower will not use pesticide formulations of products if: (a) the country lacks restrictions on their distribution, management, and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

ESS 3 outlines the following additional criteria that apply to the selection and use of such pesticides: (a) they will have negligible adverse human health effects; (b) they will be shown to be effective against the target species; and (c) they will have minimal effect on nontarget species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.

For any project involving significant pest management issues or any project contemplating activities that may lead to significant pest and pesticide management issues, the Borrower will prepare a Pest Management Plan (PMP). A pest management plan will also be prepared when proposed financing of pest control products represents a large component of the project.

The Project will finance the use of two pesticides (already approved by the Bank) for the desert locust control activities, a **chemical pesticide** Fenitrothion 96% which is a WHO **class II**, formulated as ULV and a **biopesticide**, Metarhizium. The selected pesticides do not use any formulated pesticide products that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies. The

selected pesticide products do not have any formulations that meet the criteria of carcinogenicity, mutagenicity, or reproductive toxicity as set forth by relevant international agencies.

Recognizing that the potential spray areas in the 15 Counties may among others contain sites that are ecologically and agronomically sensitive in nature and harbor species of flora and fauna that are critical including areas used by local communities as pasture or water sources, GoK has selected a biopesticide for use in such zones that will be mapped prior to spray operations. Biopesticide risks to the environment and applicators are minimal as it contains a fungus that is highly specific to this species of locust and safe to other species of insects, animals and humans. Fenitrothion, a conventional synthetic pesticide (organophosphate) will be used in areas identified as not having ecosystems that are considered as ecologically and agronomically sensitive.

5.3 Alternative Less Toxic Pesticides

There are new and alternative methods for desert locust control besides chemicals that can be used to protect human health and the environment such as insect growth regulators (IGRs), botanicals, semio-chemicals and bio-pesticides. Some of the envisaged alternatives and advantages of these alternatives are:

- **Bio-pesticides** (e.g. *Metarhizium anisopliae* var. *acridum*) are highly specific, have low mammalian toxicity, with possibility to produce formulation locally in small quantities and are safe to the environment.
- **Botanical insecticides** (e.g. Neem) are usually available locally and can be prepared at village level in small quantities, and have low environmental impact.
- **Semiochemicals** (e.g. pheromones) may be highly specific and safe products and can be used to reverse the process of gregarization, disperse bands and swarms. Experimental results on reduced feeding, marching increased predation, cannibalism, susceptibility to insecticide and pathogen are encouraging. However, none is available commercially.
- **Insect Growth Regulators** (e.g. Diflubenzuron and Triflumuron), which interfere with the production of chitin. IGRs are persistent, with very low environmental impact, and are selective due to its stomach action.
- **Phenylpyrazoles** (e.g. Fipronil), which are persistent, with low mammalian toxicity, and are a stomach and contact poison. Chloronicotinyls (e.g. Imidacloprid), which have low mammalian toxicity and are stomach and contact poison. Little data is available on their efficacy in Desert Locust Control.

Among the alternatives listed above, a biopesticide (*Metarhizium*) has been selected by MoALFC as the alternative less toxic pesticide for use in the project. The advantages of using biopesticides include: -

- Biopesticides are usually inherently less toxic than conventional pesticides.

- Biopesticides generally affect only the target pest and closely related organisms, in contrast to broad spectrum, conventional pesticides that may affect organisms as different as birds, insects and mammals.
- Biopesticides often are effective in very small quantities and often decompose quickly, resulting in lower exposures and largely avoiding the pollution problems caused by conventional pesticides.
- When used as a component of Integrated Pest Management (IPM) programs, biopesticides can greatly reduce the use of conventional pesticides, while crop yields remain high.

5.4 Summary of Toxicity of Selected Pesticides

Organophosphates

Fenitrothion has different characteristics and impacts on different organisms depending on the type of pesticides.

- Fenitrothion has low toxicity on mammals and fish and is not persistent in the environment. However, it is highly toxic to bees, birds and other aquatic organisms, like crustaceans and aquatic insects and has a medium toxicity to aquatic worms. It has moderate to medium potential to bioaccumulate in organisms.
- Fenitrothion has low acute toxicity in Rats, Rabbits, Guinea Pigs, in both males and females in general toxicity and neurotoxicity terms,.
- Fenitrothion is unlikely to pose a carcinogenic risk to humans.
- Fenitrothion is not genotoxic based on a range of studies in vitro and in vivo.
- Fenitrothion is not persistent in soil and leaching is not significant. Therefore there is negligible risk to following crops or of groundwater contamination. Volatilization is a significant dissipative process in the environment although, once in the vapour phase, fenitrothion is short-lived. Transport to surface water via spray drift poses a risk to aquatic species, although the duration of exposure is brief because fenitrothion dissipates in microbially active natural water systems with a half-life of less than one week. The compound will also tend to migrate to sediment.
- Health risks for avian and mammalian species following the consumption of treated vegetation, grain and contaminated insects are likely to be low. The low long-term risk to insectivorous species and birds grazing on treated grassland is not likely to arise due to: (i) the high acute toxicity of fenitrothion to insects, preventing residue build-up in this food source; (ii) the generally low persistence of fenitrothion in the environment; and (iii) the rapid decline of residues in species forming the diet.
- Aquatic organisms (fish and invertebrates) are potentially at risk, especially in the event of overspray to static water bodies. However buffer zones appropriate to each crop and monitoring wind direction to prevent spray drift should ensure that aqueous concentrations remain below the environmentally acceptable concentrations even in the event of multiple applications.
- Although fenitrothion is fat-soluble, the rates of biotransformation and excretion of metabolites largely mitigate bioconcentration.
- The risks to algal species, earthworms, soil micro-organisms and sewage bacteria are considered to be low, even in worst-case scenarios, without taking into consideration the rapid dissipation processes that occur in the environment.

- Fenitrothion is extremely toxic to honeybees and highly toxic to non-target arthropods. However, it does not have growth inhibitory activity and the effects of treatment are relatively short-lived. Most beneficial insect populations would recover quite rapidly.
- Soil microbiological processes are generally unaffected by use of fenitrothion on agricultural land.

Biopesticides

Metarhizium-In addition to their ability to control pests and diseases, the biopesticide produces **little or no toxic residue**, and partly for this reason they are usually considered to be minimal risk products for human health.

Table 5-1 below illustrates the degree of toxicity of selected pesticide classes to birdlife, aquatic life and bees, and includes the degree of persistence in the environment and potential for bioaccumulation.

Table 5-1. Pesticide Toxicity

Pesticide	Mammal	Bird	Fish	Other Aquatic	Bee	Persistence	Bioaccumulate ¹
Metarhizium							
Fenitrothion							

Source: IVM PEA

¹ Bioaccumulation in the environment, not in mammalian bodies (mammalian detoxification produces different results).

² Low toxicity, but high chronic or bioaccumulation affect on raptors, pelicans.

Key	
High Toxicity	
Medium to High Toxicity	
Medium Toxicity	
Low to Medium Toxicity	
Low Toxicity	
Data Not Found	

5.5 Proposed Pesticides For Use in ELRP

In line with FAO guidelines, the following pesticide (Fenitrothion 96% ULV and biopesticide Metarhizium) has been chosen for use to control desert locust under this project. The chosen pesticide falls under Class II of the WHO recommended pesticides suggesting that it is only moderately hazardous. Furthermore, it is not only specific to the locust but also highly effective in controlling the hoppers. Both pesticides are registered and allowed for use in Kenya.

Table 5-2. Pesticides to be purchased by MoALFC

Type	Formulation	Chemical group
Fenitrothion 96%	ULV	Organophosphate
Metarhizium	N/A	Biopesticide

5.6 Risks Associated with Pesticide Use

Evaluation of the desert locust control program and campaign identified potential environmental and occupational health risks associated with importation, shipment, transportation, storage, distribution to points of use and use of the pesticides specifically Fenitrothion.

5.6.1 Pesticide Inefficacy

The procurement of poor-quality pesticides and not confirming with the efficacy standards has the potential of adversely impacting on the natural environment during exposure.

Mitigation Measures

Testing of pesticide on arrival at the port of entry to establish its quality and conformity to the description on the label. This will be done by registered government officials–Pest Control Products Board–with the support of FAO experts. The laboratory to be used will be determined by the Pest Products Control Board in consultation with the FAO. FAO pesticide specifications will be followed. Apart from verifying the concentration of active ingredient(s), quality control will also assess levels of toxic metabolites.

5.6.2 Impacts Occupational Health and Safety

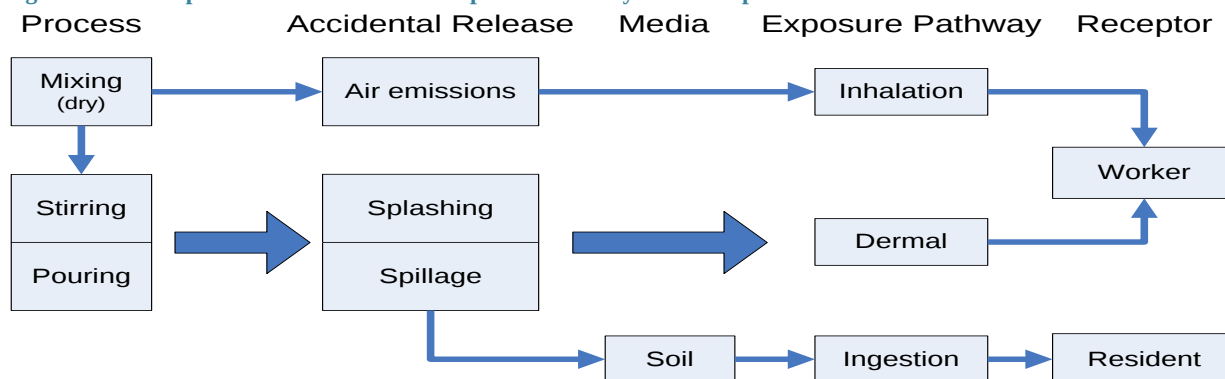
The pesticide application personnel (storekeepers, pilots, loaders, mixers, drivers) will be exposed during transport, handling, measuring, pouring, spraying and flagging (ground staff managing the site on ground for aerial spraying). Personnel may be further at risk when handling the concentrate pesticide, this is especially during tank filling for aerial spraying, or filling and re-filling of knapsack spray kits for spray runs. The exposure time of these personnel is directly related to the frequency of the activity. Exposure can also be due to deposits of pesticides from aerial spraying which is dependent on atmospheric factors like wind velocity and direction, temperature, relative humidity and the likelihood of rain. Pesticides enter the body through various pathways:

- Ingestion/swallowing through the mouth, accidental or deliberate;
- Dermal, through the skin when handling, measuring and pouring;
- Inhalation of small particles or dust when handling, spraying and flagging.

Pre-Application Exposure Pathway

Preparing pesticide solutions will involve in some cases pouring and mixing the pesticide in cans or other equipment to ensure ample mix with the water or other soluble matters. The process of mixing the pesticide can lead to exposures via inhalation, dermal contact, and incidental ingestion, mostly from releases of pesticide vapors, and solutions. Vapor releases can occur when liquid concentrated emulsions are diluted. Workers can inhale the vapors or the particulates or be exposed through dermal contact. Spills could also pose significant risk, especially for children who ingest the resulting residues that are left on surfaces such as floors. **Figure 5-1** below shows the possible modes of exposure during preparation of pesticides.

Figure 5-1. Conceptual Model for Possible Exposure Pathways from Preparation of Pesticide



Application Exposure Pathway

Inhalation of aerosol vapors during spraying is the main process for worker exposure during pesticide application. Farmers, pastoralists or pesticide handlers are mainly exposed through dermal contact with sprayed surfaces and incidental ingestion of pesticides. Leaky equipment can also lead to pesticide exposure through dermal contact and incidental ingestion by children who may come in contact with the spills before they are cleaned up.

Exposure during Disposal

Disposal is a key issue in any intervention that utilizes pesticides, especially during the decontamination process and disposal of the liquid effluent that will arise from washing and progressive rinse. Both burying and dumping can lead to dermal exposure to residents who come in contact with the soil or water in which the pesticide was disposed. Ingestion exposure can occur from drinking contaminated surface water. Once the excess formulation gets into the soil, the pesticide can reach the groundwater, which may be used as a water supply via household wells. Residents may then be exposed to this contaminated water by ingestion or by dermal contact when it is used for cleaning or drinking purposes.

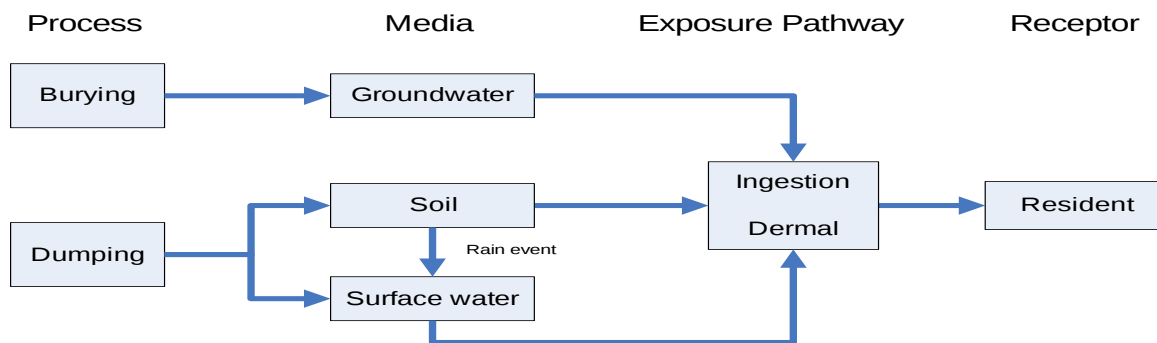


Figure 5-2. Conceptual Model for Possible Exposure Pathways from Disposal of Pesticide Formulations

Mitigation Measures

- Develop and implement Occupational Health and Safety Plan for each sub project/spray operation as part of the sub project IPMP. Prior to conducting spray

operations, once a spray area has been identified and mapped, the CPCU will be required to prepare sub project IPMP which will include OHS plan.

- Develop and implement Emergency Preparedness and Response Plan. As part of this framework IPMP, an EPRP has been prepared (**See Annex C**). For each sub project operation, a spray specific EPRP will be prepared by the CPCU.
- Use of appropriate Personal Protective Equipment (PPE) that will prevent penetration of the pesticide. Personnel (ground spraying) or pilots must use a respirator/fresh-air mask. These PPEs will be replaced frequently whenever wear and tear is identified or reported. Below are the PPE to be provided and as guided by WHO and FAO guidelines for PPE in pesticide application.
 - Broad-brimmed hat/helmet
 - Face shield or goggles (face shield preferable)
 - Respirators-disposable and replaced on a daily basis
 - 2 sets of cotton overalls per spray operator
 - Nitrile rubber, neoprene, PVC or butyl rubber gloves, without inside lining, long enough to cover forearm and replaced if torn or if wear and tear is noticed
 - Rubber boots
- Washing exposed parts of the body after work and before eating, smoking etc.
- No eating, smoking and drinking while spraying
- Reduce personnel exposure time to the pesticides (6-8hrs) and rotation of applicators to avoid/limit over exposure and potential human health impacts.
- Training and inductions for the operators, medical teams, transporters, storekeepers and field control teams on pesticide use and handling
- Training on Emergency Preparedness and Response Plan (EPRP) and awareness of the details of the pesticide Material Safety Data Sheets (MSDS) for all the operators, medical teams, transporters, storekeepers and field control team,
- Provision of medical diagnosis services for personnel and local to determine their contamination/ toxic levels and examining them for acute or chronic poisoning symptoms when such need arises. More specifically, personnel and other stakeholders involved in the campaign will be tested for acetylcholinesterase (using blood sample test kits to be procured under the project) before, during and after the campaign. There will be medical personnel from the counties to support diagnosis and treatment.
- The medical team attached to the control bases will work closely with local medical facilities (dispensaries, health centres and hospitals. Diagnostic and treatment of pesticides that may be used such as fenitrothion ULV 96% poisoning as stipulated in the FAO guidelines will be made available to medical team and local health facilities.
- All control staff, and other persons who may come into contact with pesticides, will undergo a medical examination before the start of the campaign. Pre-campaign examination establishes a baseline for future health monitoring. This will be carried out by a physician with knowledge about pesticides toxicology and who is aware of the risks to which locust control staff may be exposed. Specific attention will be paid to medical conditions that may increase susceptibility to pesticides (e.g. skin lesions, liver disease, chronic alcoholism, haemolytic anaemia, malnutrition. Blood

Cholinesterase (ChE) levels will be obtained for each control agent. These data can be used as a baseline for ChE monitoring during and after the campaign. Baseline ChE levels will be taken when the person has not been exposed to OPs or CAs for at least 30 days. Since there may be variability between laboratories or analysis methods, the same type of ChE test kit or blood analysis laboratory will be used throughout the control campaign.

Additionally, for aerial spraying

- To avoid contact, flagmen must be positioned at least 100m from the field edge and move upwind of the aircraft immediately it levels in preparation for the spray run
- Use of natural markers or balloons to mark field edges for the aircraft where practicable
- Reconnaissance flight by the pilot prior to the operation commencing.

Training

Training of all the persons (including the NYS servicemen) to be involved in aerial and ground spraying on safety and the provisions of this IPMP will be conducted. This will be facilitated by state department of crops with technical support of FAO, and the Pest Control Products Board. Training of all the persons including control team, transporting staff, storekeepers, flagmen, monitoring teams and medical staff is an imperative. A tailor-made training package as provided in the FAO guidelines targeting various groups will be disseminated (Table 7).

Table 5-3.Target campaign personnel and topical training areas

Target	Topics
Control teams	• Application techniques, equipment, maintenance • Equipment calibration • Safety measures, PPE, pesticides poisoning, first aid • Environmental precautions • Rapid assessments (efficacy, occupational health, environment)
Pesticide transport staff	• Proper handling and transport of drums and containers • Safety measures, PPE, pesticides poisoning, first aid • Environmental precautions, clean-up of spills ○ Purpose of the pesticides ○ Toxicity of the pesticides ○ Security issues, including implications of the pesticides getting into the public ○ Steps to take in case of an accident or emergency (according to FAO standards) ○ Combustibility and combustion by-products of pesticides • Handling vehicle contamination
Storekeepers	• Pesticide storage management

	• Safety measures, PPE, pesticides poisoning, first aid • Environmental precautions, clean-up of spills
Flagmen	• Safety measures, PPE, pesticides poisoning, first aid
Monitoring teams	• Monitoring techniques • All the above topics (monitoring staff should preferably participate in the training of all other campaign staff who they may need to evaluate)
Medical staff	• Recognition and treatment of pesticide poisoning

5.6.3 Impacts on Ecologically Sensitive Environments

Application of pesticides to control the locusts through (aerial and ground) spraying are likely to contaminate ecologically sensitive environments including surface water bodies, national parks, wetlands, pasture land and therefore impacting on the aquatic and terrestrial life as well as livelihoods of communities dependent on the resources as sources of food and ecosystem services.

Mitigation Measures

During campaign planning all areas in the country should be identified that are ecologically and agronomically important or particularly sensitive to pesticides. In certain areas chemical locust control may also not be allowed by law (as in the case of national parks). For each ecologically sensitive area, locust management options should be evaluated, based on the type of organisms at risk and the likely locust targets that may appear in the area. Specifically, for such areas, biopesticide as selected by MoALFC will be used.

It is important that all relevant national expertise is involved in this assessment, such as the national agencies dealing with environment, biological pest control, (inland) fisheries, beekeeping, national parks, etc. Experience has shown that it is often most effective to try to map out the various sensitive areas and make overlays with previous (or newly expected) locust infestations. This can be done using computerised geographic information systems, or directly on paper. In many locust affected countries, electronic maps of important environmental areas are now available, and the locust unit should seek assistance from the relevant national agency to exploit them.

- Undertake screening before any spray activities to identify and map out sensitive ecological and agro-ecological areas. This will be a standard operating procedure (SOP) and requirement prior to initiating spray operations and will be conducted by the CPCU and used to make informed decision on pesticide use
- Judicious choice of pesticides (i.e. Biopesticides to be used in/near potentially sensitive areas instead of fenitrothion)
- Optimum calibration of spraying equipment to reduce excess application of pesticide
- Calibration of sprayer nozzles to ensure only required amounts of pesticide are released.
- Adopt the following FAO guidelines for prevention of contamination of ecologically sensitive habitats.
 - FAO Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011
 - FAO Guidelines on Good Practice for Aerial Application of Pesticides (2001)

- FAO Guidelines on Good Practice for Ground Application of Pesticides (2001)
- FAO Guidelines on Management Options for Empty Pesticide Containers
- FAO Desert Locust Guidelines on Safety and Environmental Precautions (2003)
- Develop and implement Emergency Preparedness and Response Plan. As part of this framework IPMP, an EPRP has been prepared (**See Annex C**). For each sub project operation, a spray specific EPRP will be prepared by the CPCU.
- Carry out environmental monitoring of selected habitats and organisms including receptors like soil and water for pesticides residues before, during and after the treatment activities. (with the support and involvement of multi-disciplinary lead agencies on wildlife, water, environment, health and safety etc.)

The management measures will strictly adhere to FAO guidelines as illustrated in table below.

Table 5-4. Ecologically and Agronomically Sensitive Areas and their Management Measures

Ecologically and agronomically sensitive areas	Management Measures
National parks; nature reserves; internationally protected areas	Only biopesticide Metarhizium will be used; only low hazard pesticides
Important (inland) fisheries areas; mangrove forests	Only biopesticide Metarhizium will be used; only low hazard pesticides
Important fruit-growing areas; beekeeping areas	No pesticide applications during flowering of fruit trees; only pesticides with very low hazard to bees; set up information system to warn beekeepers of upcoming treatments.
Areas with important biological pest control programmes	Only biopesticide Metarhizium will be used; only low hazard pesticides
Areas with export crop or livestock production	Only pesticide that do not pose problems with export maximum residue limits
Areas with organic farming	Only biopesticide Metarhizium will be used; only low hazard pesticide

5.6.4 Impacts to Birds, Fishes, and Other Organisms

Pesticide application can have an impact on organisms other than the target pest. Pesticides are by their nature bio-poisons and whereas they are beneficial against pests (targets) their use may inadvertently harm other organisms (non-targets) leading to significant biodiversity losses. Non-target species of concern also include bees, birds and fish. Loss of biodiversity makes ecosystems more vulnerable to changes in the environment, with lower genetic diversity and fewer species to support fundamental ecosystem functions such as pollination. The hazard to non-target organisms is dependent upon a pesticide's acute and chronic toxicity and is also a function of the rate at which the pesticide breaks down (half-life) under various scenarios (aqueous or in-soil, UV exposure, etc.) in the environment. In addition, many pesticides break down to toxic daughter products that have their own half-life.

Kenya has selected to use the chemical pesticide Fenitrothion 96 percent formulated as ULV, is a WHO class II pesticide. Even though it is banned in the European Union because it is highly toxic to birds, honeybees and aquatic invertebrates like snails and moderately

toxic to fish, algae and earthworms, this organophosphate pesticide is effective on the desert locust. The other bio-pesticide used is *Metarhizium anisopliae* strain F52, a fungus that infects insects, primarily beetle larvae. It has been approved as a microbial pesticide active ingredient for non-food use in greenhouses and nurseries, and at limited outdoor sites not near bodies of water. No harm is expected to humans or the environment when pesticide products containing *Metarhizium anisopliae* strain F52 are used according to label instruction.

Mitigation Measures

- Undertake screening before any spray activities to identify and map out sensitive habitats and avoid spraying in such areas.
- Judicious choice of pesticides which includes selection and use of bio-pesticides in/near potentially sensitive areas
- Optimum calibration of spraying equipment to reduce excess application of pesticide
- Adhere to FAO guidelines and the SOPs for spraying based on location sensitivity and characteristics.
 - FAO Guidelines on Developing a Reporting System for Health and Environmental Incidents Resulting from Exposure to Pesticides, 2009
 - FAO Prevention of Accumulation and Disposal of Obsolete Stocks; 2009, 2011
 - FAO Guidelines on Good Practice for Aerial Application of Pesticides (2001)
 - FAO Guidelines on Good Practice for Ground Application of Pesticides (2001)
 - FAO Guidelines on Management Options for Empty Pesticide Containers
 - FAO Desert Locust Guidelines on Safety and Environmental Precautions (2003)
- Proper disposal of used containers or other wastes in accordance with FAO Container Disposal Guidelines
- Establishment of soak pits for effluent wastes disposal
- Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.
- Provide awareness and sensitisation on disposal of dead locusts to avoid bird poisoning (sweep all dead locust in a pit and cover)
- Carry out regular in-depth environmental monitoring of selected organisms, soil and water for pesticides residues during and after the treatment activities, with the support and involvement of multi-disciplinary lead agencies on wildlife, water, environment, health and safety etc.

5.6.5 Storage and Store Siting Impacts

Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be received and recorded, before storing in a secure and well-ventilated dedicated store away from stores of flammable liquids and any ignition source. Proper pesticide storage and inventory (stock control) practices makes it easier to track pesticide use and avoid overstocking which leads to disposal challenges and obsolete stocks.

It also lowers the risk of chemical fires, explosions, or spills that contaminate surface water, ground water and soil. The storage requirements should be as detailed in the safety data sheet and the labels. Since pest outbreaks are erratic and difficult to predict, there is a

danger that more pesticides than needed may be ordered leading to stockpiles. Stocks of obsolete pesticides pose a serious health and environmental problem. To avoid theft and unauthorized access to the pesticides, the areas should be well secured and guarded, and accessed by one main entrance and an emergency exit.

The store facilities should be located away from water sources to avoid contamination by accidental spills. Storage building construction should comply with local codes. The areas where the stores are sited should not be prone to floods and should be lifted from the ground level to avoid storm run-off passing through the store. The store should be adequately ventilated either mechanically or naturally to ensure there are no dead-air spaces in the store.

Mitigation Measures

- All primary pesticide storage facilities will be double-padlocked and guarded
- All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc.
- Soap and clean water will be available at all times in all the facilities
- A trained storekeeper will be hired to manage each facility
- Recommended pesticide stacking position and height in the warehouse as provided in the FAO **Storage and Stock Control Manual** will be followed
- All the warehouses will have at least two exit access routes in case of fire outbreak
- A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities.
- Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry
- All pesticides will be used and any remnants will be stored under lock and key until the next round of application.
- Application of First In/First Out (FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides
- Storage facilities are accessed by authorized personnel only
- Pesticide stacking position and height in the warehouse is followed
- The central warehouses have more than 3 exit access routes in case of fire outbreak.
- During implementation develop and implement Occupational Health and Safety Plan for addressing impacts of exposure on store operational staff including among others; provision of PPEs, and training on use of PPEs, use of fire extinguishers
- Develop and implement Emergency Preparedness and Response Plan at the stores including provision of training on emergency response by the store management team.

5.6.6 Solid Waste Impacts

Empty pesticide containers, used PPEs and cleaning materials are still considered toxic under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes. Standard procedure for solid waste disposal (includes among others empty containers, torn gloves, broken barrels) are included as Annex B. The procedure for disposal of solid waste is to be derived from guidelines put together by FAO and WHO.

The pesticide waste includes used safety equipment, used protective clothing, material used to absorb spills and cockpit filter elements (for aerial spraying), pesticide containers (drums), obsolete pesticides etc. The sources of waste for pesticides include:

- Caking due to poor methods of storage.
- Unidentifiable products due to lack of labels.
- Expired products
- Contaminated items (soils, clothing etc.).
- Empty pesticide containers.

Unless these wastes are managed correctly, they are hazardous and present a risk to communities as well as the bio-physical environment if contact and exposure is made. There is a danger that empty containers could be re-used for instance in the storing food and water, which could result in pesticide poisonings (FAO/WHO, 2008). Containers abandoned in the environment can lead to pesticide pollution in soil and groundwater. Empty pesticide containers and small quantities of unused or unwanted pesticides constitute hazardous waste and mechanisms need to be put in place to facilitate sound management of this waste. These mechanisms should be compliant with FAO guidelines (FAO, 1999). The mechanisms ensure that:

- Containers are decontaminated directly following the use of their contents by a triple rinse;
- Inappropriate use of the empty containers is prevented;
- Containers are then punctured to avoid re-use and stored awaiting disposal by an approved waste handler.

To avoid the accidental exposure of pesticides to both people and environment, the following mitigation measures are recommended:

Mitigation Measures

- Development and implement of Waste Management Plan- A Waste Management Plan has been developed as an annex B to the framework level IPMP and will be used as reference when developing sub project spray area specific Waste Management Plans before spray activities commence.
- Adopt FAO Guidelines on Management Options for Empty Pesticide Containers).
- Provide training on waste management including container disposal methods to all spray teams
- Implement the **Triple Rinse** approach to decontaminating the containers. Before storage and subsequent disposal, the containers must be rinsed thoroughly, and wash water emptied back to the spraying or mixing tanks. Empty pesticide containers should be triple rinsed, punctured and disposed of in an environmentally sound manner in compliance with FAO guidance. Ministry should purchase a drum crusher.
- Empty containers must NOT be re-used
- Ensuring and establishing a **Robust Procurement System and Plan** and **Stock Control System. Management** of order levels (good stock control) of pesticide

will keep surplus to a minimum through judicious purchase, collection, transport, storage and use of pesticides.

- Ensuring adequate pesticide shelf-life prior to purchase to avoid obsolescence. The remaining shelf-life of procured pesticides should be at sufficient to permit all stock to be used before expiry and within the scope of the project.
- Establishing a **tracking system** for solids wastes (containers) etc. where all containers must be returned to the store and accounted for.
- Establishing stores for holding empty containers prior to collection and disposal.
- As part of the FAO guidelines, MoALFC procure container crushers to crush empty tanks on site.

5.6.7 Effluent Waste Impacts

The pesticide effluent waste includes surplus diluted spray solution, rinsate among others. Unless these wastes are managed correctly, they are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment as a result of exposure. The following mitigation measures are recommended:

Mitigation Measures

- Development of Waste Management Plan- A Waste Management Plan has been developed as an annex to the framework level IPMP and will be used as reference when developing spray area specific Waste Management Plans.
- Adopt FAO guidelines for disposal of pesticide wastes
- Provide training on waste management including disposal methods of effluent wastes (rinsate) to all spray teams
- Rinsate and wash water should be emptied back to the spraying or mixing tanks
- Establish soak pits (charcoal).

5.6.8 Community Health and Safety

No segment of the population is completely protected against exposure to pesticides and the potentially serious health effects, especially to high risk groups (WHO, 1990). Members of the public, not directly involved with the spray operation, may also be affected by an aerial pesticide application so the MoALFC may have a mandatory obligation to issue “prior warnings” to any person or organization that might be affected or concerned. People exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness (FAO, 2008)

Mitigation Measures

- Develop and implement a Security Management Plan to address management of security personnel to protect project workers and protection of supplies/equipment. A Security Management Plan has been developed for the project under component 2 but will also be applied in activities under component 1.
- Develop and implement Stakeholder Engagement Plan (SEP) to guide engagement activities with the communities. A SEP has been developed for the project.

- Develop and implement Grievance Redress Management Procedures. A GRM has been developed for the project.
- Develop and implement Gender Based Action Plan. A GBV Action Plan has been developed for the project.
- Consult with and provide warnings with ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.
- Have regular public interaction forums where communities in areas which have been treated with the pesticides are informed about:
 - How to safely navigate pesticide effects on plants, livestock, and water systems
 - Precautions that are to be taken before, during and after control operations (e.g., re-entry and withholding periods)
 - Dangers of reusing empty drums
- Local communities in areas that have been treated with pesticides, they will need information on how to safely navigate its effects on plants, livestock, and water systems and what precautions are to be taken before, during and after control operations(e.g., re-entry and withholding periods, dangers of reusing empty drums).
- Citizen engagement, community empowerment, mobilization and participation will be critical to developing community-led responses that will address immediate concerns and build resilience going forward.
- Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GRM.
- Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations.
- Due to COVID-19 pandemic, World Bank has developed guidance note for consultations i.e. Technical Note: Public Consultations and Stakeholder Engagement in WB-supported operations when there are constraints on conducting public meetings March 20, 2020. Consultations and engagement during project implementation will adopt the guidelines in the technical note.
- Carry out regular in-depth environmental monitoring of selected organisms, soil and water for pesticides residues during and after the treatment activities, with the support and involvement of multi-disciplinary lead agencies on wildlife, water, environment, health and safety etc.

The general public will be kept informed about possible environmental and health effects of the pesticides, before, during and after locust control operations through local and national media, public baraza, religious gatherings and schools. This will ensure that precautionary measures are taken whenever needed and also to reduce any misunderstandings that may exist about the risks of locust control. The government spokesman's officer will coordinate this task with support Multi-Technical team and ELRP information and communications officer. The adopted communications strategy will ensure among others the following issues are considered and well-articulated:

- What should be the (technical) contents of the information? (e.g. location of treatments, general information on risks of pesticides, precautionary measures, re-entry intervals, pre harvest intervals)
- Should there be “standard” answers to certain expected frequently asked questions on environmental and health issues? (e.g. by the public, politicians, the press)
- What is the appropriate type of communication method to reach the target groups effectively? (e.g. radio, television, newspapers, extension service, locust survey/control teams)
- How should the public be informed in case of emergencies? (e.g. pesticide spills, fish kills, human intoxications)
- How does one ensure that all control teams provide the same information to the local population? (e.g. to avoid that one team instructs villagers to close a well before spraying, and a second team operating in the same district tells another village this is not needed)
- What other information sources should be involved or kept on standby? (e.g. medical information sources in case of intoxications).

Overall, NPCU and CPCU will:

- Organize awareness creation and communication activities to sensitize communities on where spraying is to be carried out and to sensitize them on ways to keep themselves and their animals and crops safe.
- The team will sensitize all involved government agencies on compliance with environmental and social safeguards with special emphasis to do no harm principle (sexual abuse, gender violence, inclusivity among others).
- The team will use the Grievances Redress Mechanism to handle grievances arising from activation of the emergency response project
- The project will use of the existing ELRP Stakeholder Engagement Processes and communication strategy to reach out and consult stakeholders.

5.6.9 Accidental Release of Pesticides

Accidental releases may occur during transportation, storage, handling and application of pesticides hence categorized as unplanned events. If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure). Prompt informed and rapid action must follow the accident to contain and minimize any adverse effects.

Mitigation Measures

- Develop and implement Emergency Preparedness and Response Plan for each County (An EPRP has been developed as part of this framework IPMP-annex C and will be referenced when developing sub project/spray area specific EPRPs) to manage accidental spills during transportation or application.
- Training on Emergency Preparedness and Response Plan (EPRP) and awareness of the details of the pesticide Material Safety Data Sheets (MSDS) for all the operators, medical teams, transporters, storekeepers and field control team

- Develop and implement Waste Management Plan for management of pesticide wastes including obsolete pesticides (A waste Management Plan has been developed as part of the framework level IPMP and will be used to prepare spray areas specific waste management plans)
- Provision of fully stocked first aid kits in stores and vehicles
- Engagement with local health facilities to support community and project staff in cases of exposure
- Only vehicles correctly equipped to carry pesticides must be used for transportation.
- Pesticide transporters and users must be **trained** and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed.
- Records must be kept of all incidents and remedial action taken.
- Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team
- Absorbent material to contain chemical spills must be available at the filling site.
- Chemical stores must be kept secure at all times. Proper storage of pesticides in accordance with FAO guidelines (Guidelines on retail distribution of pesticides with particular reference to storage and handling at the point of supply to users in developing countries) should be ensured for all supplies.
- Appropriate fire extinguishers must be provided for all locations where substantial quantities of pesticide are transported, stored or mixed.
- Use of PPE by spray teams and storekeepers
- Conduct regular analysis and monitoring of levels of cholinesterase for the operators and field control teams involved in pesticide applications;

5.6.10 Livelihood and Food Security Impacts

The use and application of pesticides through ground and aerial spraying can drift or volatilize from the treated area and contaminate pasture/grazing areas hence poisoning livestock and crops which are sources of livelihoods in the project proposed sites. Pesticide can also poison aquatic resources if they find their way into such ecosystems. The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake. This has potential to cause devastating consequences for food access and availability

Mitigation Measures

- Undertake screening before any spray activities to identify and map out sensitive ecological and agro-ecological areas. This will be a standard operating procedure (SOP) and requirement prior to initiating spray operations and will be conducted by the CPCU and used to make informed decision on pesticide use
- Judicious choice of pesticides (i.e. biopesticides could be used in/near potentially sensitive areas instead of synthetic pesticides)
- Optimum calibration of spraying equipment to reduce excess application of pesticide
- Establishment of charcoal pits for effluent wastes disposal

- Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.
- Provide awareness and sensitisation on disposal of dead locusts to avoid poultry poisoning (sweep all dead locust in a pit and cover)
- Have regular public interaction forums where communities in areas which have been treated with the pesticides are informed about:
 - How to safely navigate pesticide effects on plants, livestock, and water systems
 - Precautions that are to be taken before, during and after control operations (e.g., re-entry and withholding periods)
 - Dangers of reusing empty drums
- Ensure that local communities in areas that have been treated with pesticides are informed on how to safely navigate its effects on plants, livestock, and water systems and what precautions are to be taken before, during and after control operations (e.g., re-entry and withholding periods, dangers of reusing empty drums)
- Citizen engagement, community empowerment, mobilization and participation will be critical to developing community-led responses that will address immediate concerns and build resilience going forward and is reflected in the SEP.
- Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GRM.
- Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations.
- Carry out regular in-depth environmental monitoring of selected organisms, soil and water for pesticides residues during and after the treatment activities, with the support and involvement of multi-disciplinary lead agencies on wildlife, water, environment, health and safety etc.

5.6.11 Pilferage of Pesticides

Pesticides should be kept securely and contained during transport and storage to reduce theft, vandalism, or the possible misuse of products. Theft can be costly. Vandalism can cause human or environmental contamination. When pesticides fall in the wrong hands due to pilfering or deviation of use by control teams, the potential for exposure, misuse, contamination of biophysical environment and health impacts to the community increases due to potential contamination of water sources food commodities or spraying over-populated areas. Pesticide products should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators.

Mitigation Measures

- Establish a robust supply chain system for pesticides from entry into Kenya to arrival in spray sites
- Maintenance of record of all the stock coming in and out of the storage facilities so that all the stock can be traced accordingly. This is a mechanism aimed at preventing pilferage of pesticides.
- If pesticides are vandalized or stolen, call the police at once, so they can put it on record.

- Report the incident to the PCPB and the Police.
- All the storekeepers and managers will be trained on sound store keeping practices and procedures.
- The trainings will be organized through the auspices of the PCPB and Agrochemicals Association of Kenya.
- At the end of the spray round, unused pesticide will be kept under lock and seal until such a time that they can be re-used for further spraying and if expired they will be disposed in accordance to international disposal requirements for obsolete pesticides.
- Spray operators (spray operators must sign out all pesticide received daily and return empty sachets at the end of the day, see Distribution)
- Drivers transporting pesticide will be trained according to the guidelines listed in Pesticide Procedures.
- Distribution of pesticide will be conducted in the following manner:
 - At the national warehouse lot numbers of pesticide and quantities are registered on shelf inventory card.
 - Requisition where distribution takes place and signed for, based on sachet numbers.
 - At the end of the day, empty and full containers are returned and number checked against what was signed for. The next day all previously signed but unused containers are re-issued and again signed for by the relevant spray operator. At the end of the spray round, stock remaining = stock at start - number of stock distributed.

5.7 Integrated Pest Management Plan

5.7.1 Pre-Spray Phase

PRE-SPRAY PHASE POTENTIAL IMPACTS		
IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
Accidental spills of pesticides during road transportation to warehouse and spray sites.	■ Ensure that the drivers identified to haul the pesticide to the spray sites are well trained on adherence to road safety procedures and to the FAO standards and guidelines for the storage and transport of pesticides. ■ Ensure that only road worthy vehicles are selected for the transportation with qualified drivers.	■ MoALFC/NPCU ■ CPCU ■ Contracted transporters
Possible environmental contamination caused by warehouse exposure due to poor siting of warehouses, pilferage and vermin attack of the stored pesticides before spraying.	■ Ensure the selected warehouse is sited away from a flood plain area, water course, wells, schools, markets.	■ MoALFC/NPCU ■ CPCU
	■ Secure the selected warehouse and apply all the guidelines for Storage and Stock Control manual by FAO.	■ MoALFC/NPCU ■ CPCU
Accidental fires and injuries in the warehouses	■ All warehouses must be equipped with a fire extinguisher, thermometer, exit doors and warning signs, and proper stacking position and height as stipulated in the FAO Storage and Stock Control Manual.	■ MoALFC/NPCU ■ CPCU
	■ All the workers handling pesticides or other products and equipment in the storage facilities must all have PPE including goggles, gloves, boots, overall, dust masks etc.	■ MoALFC/NPCU ■ CPCU
	■ All spray operators and store managers must be trained on how to operate the fire extinguishers and what to do in case of fire outbreaks.	■ MoALFC/NPCU ■ CPCU
	■ Develop Emergency Preparedness and Response Plan	■ FAO

5.7.2 Spray Phase

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES		RESPONSIBLE PARTY
Occupational Health and Safety Impacts	Spray operators, drivers, storekeepers and flagmen exposure due to negligence, lack of PPEs, or unintentional exposure caused by accidents or limited pesticide knowledge.	■ Ensure PPEs provided to all the workers, supervisors, team leaders and store managers, and that all such persons receive adequate training on a regular basis on the proper use of PPE. ■ Train the team leaders, sprayers, supervisors and storekeepers on emergency procedures to take if exposure occurs accidentally ■ Ensure that team leaders and Supervisors effectively monitor the spray operations diligently and take action to correct any non-compliance issues noted right away. ■ Procurement of sprayers manufactured according to WHO specifications; ■ Prohibition of eating, drinking and smoking during work; ■ Rotation of applicators to avoid/limit over exposure ■ Ensure that only road worthy vehicles are selected for the transportation with qualified drivers. ■ Training on Emergency Preparedness and Response Plan (EPRP) and awareness of the details of the pesticide Safety Data Sheets ■ Training on purpose and properties of the pesticides ■ Training on security issues, including implications of the pesticides getting into the public. ■ Training on steps to take in case of an accident or emergency (according to FAO standards) ■ Training on handling vehicle contamination ■ Given the use of the organophosphate pesticides, ensure pre-medical examinations and regular check-up to monitor exposure to potential poisoning.		■ MoALFC/NPCU ■ CPCU ■ County Health Department ■ Spray teams ■ FAO

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
Surface Water Contamination	Contamination of surface water bodies directly or indirectly through runoff from soil. Impact on the aquatic life as well as community livelihoods. Possible release of the pesticides into the water bodies from accidental spills during the transportation, application of the pesticides.	■ Avoidance of areas or regions with surface water bodies that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ■ Use of biopesticide based on screening results ■ Optimum calibration of spraying equipment to reduce excess application of pesticide. ■ Implementing EPRP to manage accidental spills during transportation or application. ■ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies. ■ Carrying out environmental monitoring of water bodies	■ MoALFC/NPCU ■ CPCU ■ NEMA ■ KALRO ■ KFS ■ PCPB ■ KWS ■ Spray teams ■ FAO
Soil and Ground Water Contamination	Pesticides can cause beneficial soil microorganisms to decline thereby affecting soil quality. Contamination of soil during the disposal of containers. Contamination of soil is detrimental to food security as it impacts directly on agriculture.	■ Avoidance of agro-ecological areas and regions with surface water bodies that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ■ Use of biopesticide based on screening results ■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Calibration of sprayer nozzles to ensure only required amounts of pesticide are released ■ Implement EPRP to manage accidental spills during transportation or application ■ Proper management and disposal of obsolete pesticides ■ Proper disposal of pesticide containers	■ MoALFC/NPCU ■ CPCU ■ NEMA ■ KALRO ■ KFS ■ PCPB ■ KWS ■ Spray teams
Air Pollution Impacts	Use of utility vehicles on unpaved roads will cause dust emissions and increase	■ Carry out awareness-raising and provide relevant, timely information to local communities on pesticide treatment schedules and potential negative air quality impacts;	■ MoALFC/NPCU ■ CPCU ■ NEMA ■ KALRO

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	exposure to particulate matter (PM10, PM2.5) Pesticide sprays can also drift or volatilize from the treated area and contaminate air in addition ubiquitous stench of pesticides.	- Record all air quality complaints, identify cause (s), take appropriate measures; - Impose speed limits to reduce dust generation; - Carry out environmental monitoring of air quality for pesticides residues and their derivatives before, during and after the treatment activities.	- KFS - PCPB - KWS - FAO
Noise Emission	Potential sources of noise include motor vehicles and incessant noise of the spraying airplanes (where used). The noise impacts from the airplanes may be irritating and impact on community health and safety as well as to livestock and wildlife.	- Carry out awareness-raising and provide relevant, timely information to local communities on field control activities schedules and noise impacts for aerial spraying; - Working hours for the field control activities will be daytime only.	- MoALFC/NPCU - CPCU
Impacts on ecological sensitive habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, national parks reserves, forests, pasture grasslands, and water bodies.	- Avoidance of sensitive habitats and livelihoods through mapping of spray areas prior to spraying (screening). - Judicious choice of pesticides (i.e. Bio pesticides could be used in/near potentially sensitive areas instead of fenitrothion pesticides). - Optimum calibration of spraying equipment to reduce excess application of pesticide - Carrying out environmental monitoring	- MoALFC/NPCU - CPCU - NEMA - KALRO - KFS - PCPB - KWS - Spray teams - FAO
Solid Waste Impacts	Empty pesticide containers and used PPEs are considered toxic under the Basel	- Develop Waste Management Plans - Provide training on waste management including container disposal methods to all spray teams	- MoALFC/NPCU - CPCU - Spray workers

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	Convention and therefore require disposal to conform to toxic waste disposal regimes.	■ Implement the Triple Rinse approach to decontaminate the containers. Before puncturing and disposal in compliance with FAO guidance ■ Empty containers must NOT be re-used ■ Ensuring adequate pesticide shelf-life prior to purchase to avoid obsolescence. The remaining shelf-life of procured pesticides should be at sufficient to permit all stock to be used before expiry and within the scope of the project. ■ Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. ■ Establishing stores for holding empty containers prior to collection and disposal. ■ Ministry to have container crusher on specific field location to enable the crushing of the containers on site	■ FAO
Effluent Waste Impacts	The pesticide effluent waste includes surplus diluted spray solution, rinsate among others. These are hazardous to both mankind and the environment. Contaminated effluent wastes could have adverse impacts on the communities and bio-physical environment.	■ Rinsate and wash water should be emptied back to the spraying or mixing tanks ■ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides)	■ MoALFC/NPCU ■ CPCU ■ Spray teams
Community Health and Safety	Communities exposed to pesticides may suffer short-term acute health effects such	■ Avoidance of agro-ecological areas and regions with that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening).	■ MoALFC/NPCU ■ CPCU ■ FAO

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	as nausea, headaches, sore eyes, skin rashes and dizziness.	■ Judicious choice of pesticides which includes choice of using biopesticides in/near potentially sensitive areas (water bodies, pastureland, protected areas) etc. ■ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those nearby environmentally sensitive sites. ■ Have regular public interaction forums, paying particular attention to the needs of persons with disabilities, indigenous persons and other members of vulnerable groups, where communities in areas which have been treated with the pesticides. are informed in a language and communications medium they understand, and which is accessible to them about: ○ How to safely navigate pesticide effects on plants, livestock, and water systems ○ Precautions that are to be taken before, during and after control operations (e.g., re-entry and withholding periods) ○ Dangers of reusing empty drums ■ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GRM. ■ Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations. ■ Ensuring treatment medicines for pesticide exposure are available ■ Ensure first Aid kits are available in the storage facilities and the transport vehicles	

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
Accidental Release of Pesticides	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	- Only vehicles correctly equipped to carry pesticides must be used for transportation. - Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed. - Preparation of an EPRP which has details of all appropriate authorities that must be notified (Environment, Water, Police, Fire Department etc.) - Records must be kept of all incidents and remedial action taken. - Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team - Absorbent material to contain chemical spills must be available. - Chemical stores must be kept secure at all times. Proper storage of pesticides in accordance with FAO guidelines should be ensured for all supplies. - Appropriate fire extinguishers must be provided for all locations where substantial quantities of pesticide are transported, stored or mixed. - Use of PPE by spray teams and storekeepers	- MoALFC/NPCU - CPCU - Spray teams - FAO
Livelihood and Food Security Impacts	Pesticide can poison aquatic resources if they find their way into ecosystems. The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation	- Avoidance of agro-ecological areas and regions with that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). - Judicious choice of pesticides which includes choice of using biopesticides in/near potentially sensitive areas (water bodies, pastureland, protected areas) etc.	- MoALFC/NPCU - CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	also builds the contamination in the animals through their feeding pathways and water intake.	■ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites. ■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Establishment of soak pits for rinsate disposal ■ Have regular public interaction forums, paying particular attention to the needs of persons with disabilities, indigenous persons and other members of vulnerable groups, where communities in areas which have been treated with the pesticides. are informed in a language and communications medium they understand, and which is accessible to them about: ○ How to safely navigate pesticide effects on plants, livestock, and water systems ○ Precautions that are to be taken before, during and after control operations (e.g., re-entry and withholding periods) ○ Dangers of reusing empty drums ■ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GRM. ■ Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations.	
Impacts to Birds, Fishes, and Other Organisms	Pesticide application can have an impact on organisms other than the target pest. Loss of biodiversity makes	■ Avoidance of agro-ecological areas and regions with critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening).	■ MoALFC/NPCU ■ CPCU ■ KALRO

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	ecosystems more vulnerable to changes in the environment.	■ Judicious choice of pesticides which includes selection and use of bio-pesticides in/near potentially sensitive areas. ■ Optimum calibration of spraying equipment to reduce excess application of pesticide ■ Adhere to FAO the SOPs for spraying based on location sensitivity and characteristics ■ Proper disposal of used containers or other wastes in accordance with FAO Container Disposal Guidelines ■ Establishment of soak pits for effluent wastes disposal ■ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites.	
Storage and Store Siting	Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be received and recorded, before storing in a secure and well-ventilated dedicated store away from stores of flammable liquids and any ignition source. The store facilities should be located away from water sources to avoid	■ All primary pesticide storage facilities will be double-padlocked and guarded ■ All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. ■ Soap and clean water will be available at all times in all the facilities ■ A trained storekeeper will be hired to manage each facility on store inventory ■ Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed ■ All the warehouses will have at least two exit access routes in case of fire outbreak ■ A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities.	■ MoALFC/NPCU ■ CPCU

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
	contamination by accidental spills. Storage building construction should comply with local codes. The areas where the stores are sited should not be prone to floods and should be lifted from the ground level to avoid storm run-off passing through the store. The store should be adequately ventilated either mechanically or naturally to ensure there are no dead-air spaces in the store.	- Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry - All pesticides will be used and any remnants will be stored under lock and key until the next round of application. - Application of First In/First Out (FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides - Storage facilities are accessed by authorized personnel only - Pesticide stacking position and height in the warehouse is followed - The central warehouses have more than 3 exit access routes in case of fire outbreak	
Pilferage of Pesticides	Pesticides falling in the wrong hands due to pilfering have potential for exposure.	- Establish a Robust Supply Chain System for pesticides from entry into Kenya to arrival in spray sites - Maintenance of record of all the stock coming in and out of the storage facilities so that all the stock can be traced accordingly. This is a mechanism aimed at preventing pilferage of pesticides. - Pesticide products should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators. - Pesticides should be kept securely and contained during transport and storage to reduce theft, vandalism, or the possible misuse of products.	- MoALFC/NPCU - CPCU - PCPB - National Police Service - Store Managers - Spray Teams - Drivers

SPRAY PHASE POTENTIAL IMPACTS AND MITIGATION			
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	RESPONSIBLE PARTY
		■ If pesticides are vandalized or stolen, call the police at once, so they can put it on record. ■ Report the incident to the PCPB regulatory body. ■ All the storekeepers and managers will be trained on sound store keeping practices and procedures. ■ The trainings will be organized through the auspices of the PCPB and Agrochemicals Association of Kenya. ■ At the end of the spray round, unused pesticide will be kept under lock and seal until such a time that they can be re-used for further spraying and if expired they will be disposed in accordance to international disposal requirements for obsolete pesticides. ■ Spray Operators (spray operators must sign out all pesticide received daily and return empty sachets at the end of the day, see Distribution) ■ Drivers transporting insecticide will be trained according to the guidelines listed in Pesticide Procedures. ■ Use of inventory card containing, lot number, quantities, end of spray round reconciliation of stock	

5.7.3 Post Spray Phase

POST SPRAYING PHASE POTENTIAL IMPACTS AND MITIGATION		
IMPACT/ISSUES	MITIGATION MEASURES	SPONSIBLE PARTY
Pilferage and Community Exposure, Environmental Contamination from any remaining pesticides not used	■ Keep storage facilities up to standards described in FAO Pesticide storage and stock control manual; Storage of all pesticides, empty packaging, barrels and tubs in storage facilities ■ Ministry through multi-disciplinary teams is expected to undertake environmental monitoring of sensitive ecological sites, residue sampling and evaluating the environmental and health impacts post the control activities campaign	■ MoALFC/NPCU ■ CPCU ■

POST SPRAYING PHASE POTENTIAL IMPACTS AND MITIGATION		
IMPACT/ISSUES	MITIGATION MEASURES	SPONSIBLE PARTY
Community Exposure from vehicles and secondary warehouses	■ End-of-program cleaning/decontamination of interior and exterior of vehicles ■ End-of-program cleaning/decontamination of the interior of all secondary warehouses. ■ Collection of all the solid wastes at the secondary storage facilities and transferring to central warehouse. ■ Ministry through multi-disciplinary teams is expected to undertake environmental monitoring of sensitive ecological sites, residue sampling and evaluating the environmental and health impacts post the control activities campaign	■ MoALFC/NPCU ■ CPCU ■ Spray Teams ■ FAO
Environmental Contamination and Resident Exposure from spray disposal activities	■ Sprayer progressive rinse, spray operator bathing, washing of overalls, PPE and cloths used to cover furniture, ■ Ensure that a soak pit (with charcoal) is constructed for disposing residual water after clean-up ■ Storage of empty sachets until disposal option selected by the country. ■ Procurement and distribution of barrels for progressive rinse, and wash-tubs for personal hygiene; ■ Ministry through multi-disciplinary teams is expected to undertake environmental monitoring of sensitive ecological sites, residue sampling and evaluating the environmental and health impacts post the control activities campaign	■ MoALFC/NPCU ■ CPCU ■ Spray Teams ■ FAO
Residential exposure from contact with secondary warehouses	■ Decontaminate by cleaning all the secondary warehouses to ensure that exposure incidents are minimized. ■ Collect all the solid waste to the central warehouses for further disposal ■ Ministry through multi-disciplinary teams is expected to undertake environmental monitoring of sensitive ecological sites, residue sampling and evaluating the environmental and health impacts post the control activities campaign	■ MoALFC/NPCU ■ CPCU ■ Spray Teams ■ FAO

5.8 Monitoring Indicators

5.8.1 Pre-Spray Phase

PRE- SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Accidental Spills of pesticides during road transportation to warehouse and spray sites (Human Health and Environmental impacts)	- Number of road accidents and spills reported - Records showing drivers training - Evidence of road worthy vehicles certificate from the transport authority - Copies of driver's license as proof of qualification	Once before the selection of vehicles and drivers preferably before the training.	- MoALFC/NPCU - CPCU - Spray Teams
Possible environmental contamination caused by warehouse exposure due to poor siting of warehouses, pilferage and vermin attack of the stored pesticides before spraying	Storage facility located outside of floodplain, away from nearby schools, hospitals, water courses	- Once before the spray operations begin - Quarterly monitoring of warehouse condition to identify any structure defects for repair	- MoALFC/NPCU - CPCU
	Storage facilities fulfils the FAO Storage and Stock Control Manual	- Once before the spray operations begin - Quarterly monitoring on warehouse condition to identify any structure defects for repair	- MoALFC/NPCU - CPCU
Accidental Fires and injuries in the Warehouses	Presence of firefighting equipment, thermometers, warning signs and at least 3 exits access in the warehouse Cases of fire successfully arrested	- Once before the spray operations begin - Annual monitoring of extinguisher to ensure it is in good condition	- MoALFC/NPCU - CPCU - Fire Inspection Firm/Expert
	Availability of PPE to all the workers.	Daily monitoring and supervision of all operators accessing the warehouse	CPCU
	Training in fire prevention and fighting	Once before the spray operations begin	- MoALFC/NPCU - CPCU

PRE- SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	Existence of an Emergency Response Plan		■ Fire Department

5.8.2 Spray Phase

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Occupational Health and Safety Impacts	Spray operators, drivers, storekeepers and flagmen exposure due to negligence, lack of PPEs, or un-intentional exposure caused by accidents	■ Record indicating training has been conducted on, Emergency procedures, PPE use ■ Ability to respond as required when exposure incidents are encountered. ■ Availability and level of utilization of PPE for all spray teams including storekeepers, drivers ■ Pre and post medical examinations of the control teams ■ All non-compliance documented for corrective action	■ Training to be undertaken once during the overall spraying period ■ Daily monitoring of operators by team leaders to ensure full use of PPE	■ MoALFC/NPCU ■ CPCU ■ County Health Department ■ Spray Team Leaders
	Additional Transporter Training	■ Records to indicate training has been conducted ■ Occupational Health and Safety Policy – including on use of PPE, Training	■ Training undertaken before commencement of duty ■ Testing of personnel before, during and after field control activities	■ MoALFC/NPCU ■ CPCU ■ County Health Department

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
		■ Labour Management Procedures ■ Training Records ■ Testing and monitoring the acetylcholinesterase (pesticide biosensor) blood level of personnel involved in the locust control. ■ pre and post medical examinations of the control teams ■ SOPs available to workers for safe field control activities		
Surface Water Contamination	Contamination of surface water bodies directly or indirectly through runoff from soil. Impact on the aquatic life as well as community livelihoods Possible release of the pesticides into the water bodies from accidental spills during the transportation, application of the pesticides.	■ Analysis of water for pesticide residues (Maximum Residue Levels (MRL))	■ Done once before and once after field monitoring activities	■ MoALFC/NPCU ■ CPCU ■ KWS ■ NEMA ■ KALRO ■ FAO
Soil and Ground Water Contamination	Pesticides can cause beneficial soil microorganisms to	■ Sampling and analysis of soil samples for pesticide residue	■ Done once before and once after field monitoring activities	■ MoALFC/NPCU ■ CPCU ■ KWS

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	decline thereby affecting soil quality. Contamination of soil during the disposal of containers Contamination of soil is detrimental to food security as it impacts directly on agriculture.	(Maximum Residue Levels (MRL)		■ NEMA ■ KALRO ■ KFS ■ FAO
Air Pollution Impacts	Use of utility vehicles on un-paved roads will cause dust emissions and increase exposure to particulate matter (PM10, PM2.5) Pesticide sprays can also drift or volatilize from the treated area and contaminate air in addition ubiquitous stench of pesticides.	■ Air sampling and analysis to check for pesticide residue levels	■ Done once before and once after field monitoring activities	■ MoALFC/NPCU ■ CPCU ■ NEMA
Noise Emission	Potential sources of noise include motor vehicles and incessant noise of the spraying airplanes (where used). The noise impacts from the airplanes may be irritating and impact on community health and	■ Information made available on noise events	■ Before each campaign where elevated noise is anticipated	■ MoALFC/NPCU ■ CPCU ■ NEMA

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	safety as well as to livestock and wildlife.			
Impacts on Ecological Sensitive Habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, national parks reserves, forests, pasture grasslands, and water bodies.	■ Maps showing sensitive areas and choice of pesticide used ■ Monitoring of biota for pesticide residues (Maximum Residue Levels (MRL))	■ Mapping done before, field control activities ■ Analysis of biota done after spraying	■ MoALFC/NPCU ■ CPCU ■ KWS ■ KFS ■ NEMA ■ KALRO ■ FAO
Solid Waste Impacts	Empty pesticide containers are considered toxic under the Basel Convention and therefore require disposal to conform to toxic waste disposal regimes.	■ Training records on waste handling ■ Empty containers decontaminated (triple rinse) and punctured ■ Waste collected by a licensed waste handler ■ Monitoring of soil, water and biota for pesticide residues (Maximum Residue Levels (MRL))	■ Check on training records before activities ■ Reconciliation of inventory for remaining stock of pesticides and empty containers after field monitoring activities	■ MoALFC/NPCU ■ CPCU
Effluent Waste Impacts	The pesticide effluent waste includes surplus diluted spray solution, rinsate among others. These are hazardous to both mankind and the environment. Contaminated effluent wastes could have	■ Soak-pits with charcoal available to take store rinse water and at end-of-day clean up points for effluent waste collection.	■ Once before commencement and periodically to check if charcoal is used up.	■ MoALFC/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	adverse impacts on the communities and bio-physical environment.			
Community Health and Safety	People exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.	■ Routine weekly checks of waste management arrangements should be undertaken. ■ Analysis of soil, water and biota for pesticide residues (Maximum Residue Levels (MRL)) ■ Availability of exposure treatment medicine in the hospitals ■ Percentage of treatment medicines available at health facilities ■ Availability of first aid kits in storage facilities and hired vehicles ■ Public awareness (communications) campaigns ■ Records of the GRM	■ Analysis for MRLs Before, during and after locust control operations. ■ Periodically monitor availability and expiry dates of the medicines	■ MoALFC/NPCU ■ CPCU ■ KWS ■ NEMA ■ KALRO ■ KFS ■ FAO
Accidental Release of Pesticides	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of	■ EPRP in place and relevant staff are familiar with the Plan. ■ Contact list of first responders available at storage site, transportation vehicles and with the field personnel	■ Check list of first responders before commencement of activities ■ Reconcile quantities (stock) of pesticide leaving and returning to warehouse for every spraying activity	■ MoALFC/NPCU ■ CPCU ■ KWS ■ NEMA ■ KALRO ■ KFS

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	(receptors like water, flora, soils) and risks to fauna (exposure).	- Records of stock tracing - Training records of transporters and sprayers - Incident records maintained - MSDS of pesticide available in the store and in the transport vehicles - Pesticide stores secure	Ensure store is manned at all times	
Livelihood and Food Security Impacts	Pesticide can poison aquatic resources if they find their way into ecosystems. The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.	- Agro-ecological zones mapped out and biopesticides selected for those areas - Socio-economic status of community before and after field control activities	Before and after commencement field control activities	- MoALFC/NPCU - CPCU - KWS - NEMA - KALRO - KFS - FAO
Impacts to Birds, Fishes, and Other Organisms	Pesticide application can have an impact on organisms other than the target pest. Loss of biodiversity makes ecosystems more vulnerable to changes in the environment.	- Sensitive habitats mapped out before spraying - Monitoring of biota for pesticide residues (Maximum Residue Levels (MRL))	Before and after commencement of field control activities	- MoALFC/NPCU - CPCU - KWS - NEMA - KALRO - KFS - FAO

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Storage and Store Siting	Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact. Pesticides should be received and recorded, before storing in a secure and well-ventilated dedicated store away from stores of flammable liquids and any ignition source. The store facilities should be located away from water sources to avoid contamination by accidental spills. Storage building construction should comply with local codes. The areas where the stores are sited should not be prone to floods and should be lifted from the ground level to avoid	■ Storage facility located outside of floodplain, away from nearby schools, hospitals, water courses ■ Storage facilities fulfills the FAO Storage and Stock Control Manual ■ Presence of firefighting equipment, thermometers, warning signs and at least two exits access in the warehouse ■ Adequate natural (or mechanical) ventilation available on site ■ Training records on fire prevention and fighting	■ Once before the spray operations begin ■ Periodic monitoring on warehouse condition to identify any structure defects ■ Periodic monitoring of extinguisher to ensure it is in good condition	■ MoALFC/NPCU ■ CPCU

SPRAY PHASE MONITORING INDICATORS				
IMPACT TYPE	IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
	storm run-off passing through the store. The store should be adequately ventilated either mechanically or naturally to ensure there are no dead-air spaces in the store.			
Pilferage of Pesticides	Pesticides should be kept securely and contained during transport and storage to reduce theft, vandalism, or the possible misuse of products. Pesticides falling in the wrong hands due to pilfering have potential for exposure, Pesticide products should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators.	■ Store Inventory Records ■ Signed Stock cards showing pesticide movements ■ Training records ■ Record and location of obsolete pesticides ■ Guards and other security controls	■ Daily accounting of pesticide and tally of used sachet ■ Periodic monitoring of the inventory/stock taking	■ MoALFC/NPCU ■ CPCU ■ National Police Service

5.8.3 Post Spray Phase

POST SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Pilferage and Community Exposure, Environmental Contamination from any remaining pesticides not used	■ Presence of a dedicated and trained storekeeper ■ Stock records up-to-date ■ Facility double-padlocked and guarded ■ Facility physically secure ■ Stock reconciliation ■ Cases of theft or pilferage reported	■ Daily stock reconciliation ■ Periodic monitoring of the warehouse to ensure that it does not have structural problems.	■ MoALFC/NPCU ■ CPCU
Community exposure from vehicles and secondary warehouses	■ Evidence of interiors and exteriors of vehicles cleaned ■ Evidence of cleaning of all the secondary warehouses ■ Cases of passenger exposure	■ Daily ■ Secondary warehouses will be cleaned at the end of spray operations however daily cleaning of the warehouses will be done for hygiene reasons	■ MoALFC/NPCU ■ CPCU
Environmental contamination and resident exposure from spray disposal activities	■ Reported cases of residential exposure ■ Evidence of progressive rinsing during all post spray clean ups ■ Evidence of soak pits in all the return sites for clean-up designed and constructed in the acceptable format ■ Evidence of empty containers awaiting recapture by manufacture	■ Daily	■ MoALFC/NPCU ■ CPCU

POST SPRAY PHASE MONITORING INDICATORS			
IMPACT/ISSUES	MONITORING INDICATORS	MONITORING FREQUENCY	RESPONSIBLE PARTY
Environmental contamination and resident exposure from spray disposal activities	- Reported cases of residential exposure - Evidence of progressive rinsing during all post spray clean ups - Evidence of soak pits in all the return sites for clean-up designed and constructed in the acceptable format - Evidence of empty containers triple rinsed and punctured	Daily	- MoALFC/NPCU - CPCU
Residential Exposure from contact with secondary warehouses	Level of decontamination of warehouses after spray operations end	- Decontamination to occur at the end of the spray operations. - Daily cleaning and collection of waste to be undertaken.	- MoALFC/NPCU - CPCU

Table 5-5. Estimated Mitigation Budget

Item	Kshs
Purchase of pesticides	550,140,000
Purchase of motor vehicles	132,324,800
Training of spray teams	135,312,980
Purchase of PPE's	35,520,000
Purchase of ICT equipment	9,594,000
Purchase refined fuels and lubricants for transport	20,000,000
Hire of transport, equipment	314,207,200
Purchase of general office supplies (papers, pencils, forms, small office equipment	846,800
Contracted professional services	66,836,615.90

Daily Subsistence Allowance (NYS and Various county commissioners)	112,217,604.10
Total	1,377,000,000

6 IPMP IMPLEMENTATION ARRANGEMENT

The Component 1 of the project will be implemented by the MoALFC through a two-tiered institutional arrangement: National, and County levels. This IPMP will be implemented by the coordination units established at the national and county levels.

- **National Project Coordination Unit:** -A National Project Coordination Unit (NPCU) has been established comprising of officers responsible for day-to-day implementation of activities under the leadership of the National Project Coordinator (NPC). These include for component 1, the National Project Coordinator, Component 1 Leader, Environmental Specialist, Social Standards Specialists, GBV Expert, Grievance Redress Expert, Monitoring and Evaluation Specialist, Financial and Procurement Specialists.
- **County Project Coordination Unit:** - The Project will use the existing County Project Coordinating Units (CPCUs) for P154784-KCSAP and P153349 NARIG that are established headed by the County Project Coordinator (CPC) who also double as either the Crops or Livestock Specialist. The CPCU members include, the CPC, Livestock/Crops Specialists, Environment and Social Standards Specialist, Monitoring and Evaluation Specialist, Finance and Procurement Officers. The CPCU will engage services of technical experts on need basis.

The table below summarizes the roles of the other various actors to be involved in the IPMP implementation.

Table 6-1: Institutional arrangement for Desert Control and Implementing the PMP

Institution	Roles/Responsibilities
MoALFC	Lead agency responsible for coordination, capacity building and resource mobilization Also leads on implementing this IPMP
DLCO-EA	Control operation and capacity building
FAO	Coordination, capacity building and resource mobilization; and technical support through all states of the campaign
NYS	Ground control operation and pesticide application
KWS	Provision of surveillance aircrafts
KFS	Provision of surveillance aircrafts
Kenya Air force	Provision of spray aircrafts and vehicles for ground spray
Research institutions (ICIPE, KALRO, UoN,	Research and technology development
PCPB	Registration and recommendation of pest control products Testing and certification of imported pesticides
County governments	Surveillance/ monitoring, sensitization and provision of control personnel
World Bank	Financial support
AAK	Capacity building on safe use of pesticides

6.1 Environmental and Social Risk Management Instruments

The Environmental Management and Coordination Act (EMCA) 1999 and EMCA (amendment) 2015, classifies projects into **High, Medium** and **Low** risk. It further lists projects that would fall under each of the risk classifications. The ELRP is categorized as **High-Risk** project falling under Agriculture (8A) (aerial spraying), which requires preparation of ESIA study report.

However, due to the emergency nature of the project, a waiver will be sought by the MoALFC from NEMA to instead use sub project specific IPMPs rather than conducting ESIA/ESMP studies for each spray operation and subject the same to the approval process as per the EIA/EA regulations which is lengthy and would negate the emergency nature of and context of the project.

6.1.1 Preparation and Review of Sub Project IPMPs

This framework level IPMP has been developed for this project and as part of the ESMF and remains the principal instrument that will guide application and use of pesticides in this project. The framework level IPMP will be used to guide the preparation of sub project level IPMPs prior to undertaking spray activities in a selected area (s) within the 15 Counties.

Once a spray area (sub project) is identified to be infested by locusts, through the surveillance activities aimed at monitoring the breeding sites and migration of the desert locusts and a decision is made to undertake spraying, sub project IPMPs will be prepared prior to commencement of the spray operations. The sub project IPMPs will be prepared by the environmental and social specialists in each of the established County Project Coordination Units with the assistance of the Sub County Technical Teams. The project may also engage independent consultants preferably NEMA registered lead expert to prepare IPMPs on its behalf in the event that an increased demand in spray areas is experienced.

The IPMPs will be submitted to the environmental and social specialists located at the NPCU for review and approval before spray operations begin.

The contents of the IPMPs reports will include the following; -

- Introduction and nature of the project;
- Stakeholder Engagement
- Baseline Data (location of the project including the bio-physical and socio-economic characteristic of area that may be affected by the project's activities;
- Policy, Legal and Regulatory Framework For Pest and Pesticide Management In Kenya
- Integrated Pest Management Plan
- Institutional Arrangements and Coordination Mechanism
- Annex (OHS Plan, Waste Management Plan, Emergency Preparedness)

6.1.2 Sub Project Screening

Sub project screening will be undertaken once a decision is made to undertake spraying in an area based on the surveillance activities. Screening will be conducted in order to map and understand the bio-physical characteristics of the targeted spray area (sub project). Screening is expected to identify any ecological sensitive habitats including wetlands, surface and ground water bodies, important bird areas, parks, reserves, as well as agro-ecological zones, grazing areas and agricultural activities that may be adversely affected by the application of synthetic pesticides specifically Fenitrothion which has been selected for use in this project.

Based on the outcome of the screening, a determination on the pesticide to use will be recommended and indicated in the screening form. In principle, use of the biopesticide (metarhizium) already selected will be recommended in all cases where sub project areas infested by the desert locust have been identified to have ecological sensitive habitats.

Screening will be undertaken using a screening form (see annex D) before commencement of spray operations and will be undertaken by the environmental and social specialists based at the CPCU with the assistance of the Sub County Technical Teams. The screening reports will be submitted to the environmental and social specialists located at the NPCU for review and approval before spray operations begin.

6.2 Capacity Building

The locust control activities at the national level will be implemented by the MoALFC. The MoALFC has experience in implementing different projects supported by the World Bank financing which used the Environmental and Social Operational Policies including Kenya Climate Smart Agriculture Project, the National Agriculture and Rural Inclusive Growth Project and the Regional Pastoral Livelihood Resilience Project and others.

In order to strengthen the capacity of the NPCU, CPCU and other implementing agencies, the following capacity building efforts are recommended. The World Bank and FAO will train the NPCU on topics highlighted in the table below. The NPCU will thereafter provide training to the CPCU and sub county technical teams on the topics outlined below supported by FAO. To ensure that the message and quality of training is assured, NPCU will besides using FAO, will engage consultants familiar with Bank's ESF, ESS and the other relevant instruments to support the county-based trainings.

Table 6-2. Capacity Building

Training Topic	Target	Trainers
Monitoring of impacts of pesticides on soil, water, health, biodiversity, livestock etc.	NPCU, CPCU, NEMA, KWS, KFS, DVS, KALRO, KEPHIS	FAO
County Project Coordinating Unit		
IPMP	CPCU	NPCU
Monitoring of impacts of pesticides on soil, water, biodiversity, livestock etc	CPCU	NPCU
Sub County Technical Teams		
Monitoring of impacts of pesticides on soil, water, biodiversity, livestock etc	Sub County Technical Teams	NPCU and CPCU

6.3 Monitoring

The MITT on desert locusts is the main policy and technical advisory body that supports MoALFC to proactively address the locust crisis facing Kenya. Members of the MITT are drawn from the following institutions: Ministry of Agriculture-Plant Protection services, Kenya Agricultural Research Organization (KALRO), Kenya Plant Health Inspectorate Service (KEPHIS), Pest Control Products Board (PCPB), DLCO-EA, FAO, University of Nairobi (UoN), International Centre for Insect Physiology and Ecology (Icipe), Centre for Agricultural and Biosciences International (CABI), Joint Agriculture Secretariat (JAS) and Council of Governors (CoG). The MITT will have expanded to include other agencies such as NEMA, KWS, KFS, KALRO, DVS and Pests Control Products Board (PCPB) among others for monitoring effects of the chemicals being used in locust control on human health, water, soils, livestock and wildlife. Monitoring will be undertaken regularly as outlined in the monitoring plan and at the end of the operations.

6.4 Monitoring Roles and Responsibilities

6.4.1 NPCU Environmental and Social Specialists

The MoALFC/NPCU has recruited 1 environmental specialist and 1 social specialist who will provide oversight, review of screening reports, review of IPMPs, monitoring and evaluation of all the control activities. The specialists will ensure that monitoring of the spray operations are undertaken and findings reported periodically so that needed technical assistance to ensure compliance is provided.

6.4.2 CPCU Environmental and Social Specialists

At the County level, project coordinating units will be established and will also include 1 environmental specialist and 1 social specialist who will provide oversight, screening of proposed sub projects, preparation of IPMPs monitoring and evaluation of all the control activities.

6.4.3 National Environment Management Authority

The EMCA 1999 and (amendment) Act 2015, places the responsibility of environmental protection on NEMA as the coordinating agency. NEMA is charged with the overall role of providing oversight in regard to monitoring for all project activities that have potential impacts on the environment in Kenya. NEMA will undertake periodic monitoring of the projects by making regular site inspection visits to determine compliance with the projects ESIA's approved and will further rely on the submitted reports submitted for each project annually as required by EMCA as a way of monitoring. NEMA is mandated to provide approvals and ESIA licence based on the ESIA reports submitted, without NEMA's approval implementation of project do not move forward. The ELRP is categorized as a **high-risk** category and therefore requires the preparation of ESIA for review and approval by NEMA for each operational sites/areas. However, due to the emergency nature of the project, a waiver will be sought by the MoALFC from NEMA to instead use the IPMPs rather than conducting ESIA studies for each spray operation and subject the same to the approval process as per the EIA/EA regulations which is lengthy and would negate the emergency nature of and context of the project. All monitoring reports as well as annual

environmental audit report will be submitted to NEMA as specified by the environmental assessment and audit regulations.

6.4.4 Monitoring Approaches

The following approaches will be employed to attain thorough monitoring, environmental safety and effectiveness:

- **Monitoring – rapid assessments**

This is monitoring carried out by the control teams themselves. The following activities will entail part of a rapid assessment.

- **Spray monitoring**

Basic pesticides application parameters will be collected for each individual control operation. They include the exact control location, pesticides data, and weather conditions during spraying and equipment settings. The FAO Spray monitoring form covers all these issues and control teams will fill it out for each sprayed target. Since the application of pesticides is the most expensive part of a locust control campaign, incorrect spraying may be very costly. Spray monitoring is therefore essential, both from an economic and an environmental point of view.

- **Efficacy Assessment**

Efficacy assessments are made to verify whether the pesticides and the control technique are effective. Efficacy will be checked regularly, even for such a pesticide with which one has experience. Further advice on locust mortality assessments is provided in FAO guidelines.

- **Dedicated Operational Monitoring**

The safeguards team of ELRP and a support team comprising of relevant Government agencies (State departments of crops, livestock, fisheries, irrigation, health, COG, KCSAP, KALRO, PCPB, KEPHIS, KWS, KFS, WRA, NEMA) Private and partner institutions (AAK, FAO, ICIPE, World Bank, USAID, GIZ etc.) will monitor the operations. What to monitor will be determined by the expertise and the funds available for the activity and with reference FAO guidelines which spells out among other suggestions for priority setting. The rule, for monitoring is to address those issues that are considered to be a potential problem, either by the campaign staff or by the general public. Among other parameters they will monitor; spray for an independent verification of equipment calibration and the execution of the treatment by control teams using FAO Spray monitoring form; Efficacy assessments to done based on FAO guidelines; Monitoring human health for Occupational exposure and External exposure, Internal exposure which is an indicator for organophosphate absorption is the depression of acetylcholinesterase (in red blood cells) and pseudocholinesterase (in blood plasma).

This can be tested after taking a blood sample and subsequent analysis using a field test kit For Desert Locust control, cholinesterase field test kits preferred because these avoid transport of samples to a laboratory (which may be far away from the control site) and allow immediate corrective action, if needed. Good, robust and easy to use field test kits

will be procured and made available for use. Monitoring pesticides residues useful to monitor pesticides residues after locust control treatments to evaluate whether the withholding periods recommended by the pesticide manufacturers are valid under local conditions or to confirm that no contamination of protected areas occurs when recommended buffer zones are respected. Emergency sampling; emergency situations, e.g. if wildlife mortality has been observed, accidental spillage has occurred; beekeepers have claimed that locust control has caused them damage, etc. In these cases, the monitoring team may need to take samples immediately, for later residue analysis. It is important that sampling is carried out as soon as possible. Sampling will be guided by FAO indicative sample sizes.

6.4.4.1 Monitoring on Implementation level of the IPMP

For successful implementation of the ELRP's IPMP, regular monitoring and evaluation of activities undertaken by all actors involved in DL control program should be undertaken. The focus of monitoring and evaluation will be to assess effectiveness of the IPMP and the capacity level in all actors involved in DL prevention and control program. More importantly, to assess the involvement of Pastoralist/Farmer Groups and the extent to which IPM techniques are being adopted in crop production, and the economic benefits that farmers derive by adopting IPM techniques. It is also crucial to evaluate the prevailing trends in the benefits of reducing pesticide distribution; application and misuse (see Table 7).

Indicators that require regular monitoring and evaluation during the IPMP implementation include the following:

- The IPM capacity building performance at all level: Number of program staffs, spray teams who have successfully received IPM training in IPM methods; evaluation of the training content, methodology and trainee response to training through feedback
- Numbers of Pastoralist/Farmer Organizations consulted on the spraying activities; emphasize the number of women trained; assess Pastoralist/Farmer Groups understanding of the importance of IPM
- Economic benefits: decreased loss as a result of DL infestation and increased livestock/crop productivity due to adoption of IPM practices;
- Social benefits: improvement in the health status of livestock keepers/farmers
- Numbers of IPM networks operational and types of activities undertaken
- Efficiency of pesticide use and handling and reduction in pesticide poisoning and environmental contamination
- Levels of reduction of pesticide use and reduction in pesticide poisoning and environmental contamination
- Overall assessment of activities that are going according to plans; activities that need improvements; and remedial actions required

■ Finalizing Monitoring Activities

Various activities related to environmental and health monitoring will continue for some time after the control activities have stopped.

Post-campaign Health Examinations

- **Occupational exposure.** Locust control staffs run the highest risk of being exposed to, and possibly poisoned by, insecticides. It is therefore important that insecticide exposure is regularly monitored.
- **External exposure.** External exposure to insecticides can be monitored using absorbent pads that are fixed, before insecticide spraying or handling, to certain parts of the body. The pads are stored after treatment in a refrigerator, transported to the laboratory, and analyzed for insecticide residues. If the pads are also fixed inside the protective clothing, the level of protection provided can be assessed too. A second method to assess external exposure is to mix a (fluorescent) tracer with the insecticide. Control staffs subsequently carry out handling and spraying as usual. The tracer can be visualized after the control operation (for fluorescent tracers this can be done at night, back at the camp, using a battery-powered UV light). This method is only qualitative but is an effective way of demonstrating potentially hazardous control practices.
- **Internal exposure.** A commonly used indicator for organophosphate absorption is the depression of acetylcholinesterase (in red blood cells) and pseudocholinesterase (in blood plasma). This can be tested after taking a blood sample and subsequent analysis using a field test kit or in a specialized laboratory

Monitoring Ecological Side-Effects

One of the main constraints for ecological monitoring of Desert Locust control is that the exact location of the insecticide treatments will often only be known very shortly before spraying. Many spray targets are identified the evening before treatment, and sometimes only on the day itself. This means that pre-spray observations or sampling are generally impossible. As a result, the scope of the ecological monitoring that can be carried out is relatively limited.

Three approaches to operational ecological monitoring can generally be used in Desert Locust control: observations, measurements and experiments.

- **Observations.** Observations are (mostly) qualitative assessments of the direct impact of a treatment, e.g. fish kills, behavioral changes in birds, large bee mortality, etc.
- **Measurements.** Measurements are all quantitative assessments of the impact of an insecticide treatment. Normally this will be the difference in a biological parameter between untreated and treated plots.
- **Blood cholinesterase (ChE) depression** is an indicator of exposure to organophosphates and carbamates. It is a non-destructive technique, and useful for livestock. Brain ChE levels can only be measured in dead animals and may be used to confirm whether casualties were the result of spraying. Comparisons should be made with ChE levels in non-exposed organisms.

6.5 Estimated Budget

Table 6-3. Overall Estimated Costs Budget For implementation of IPMP

Activity	Description	Unit cost, US\$
Training and awareness on the ESF, ESSs, ESMF, IPMP, SMP, GBV Action Plan, LMP	Workshops	150,000.00
Training and awareness on environmental monitoring targeting.	Workshops	150,000.00
Awareness creation and sensitisation of local communities on adverse effects of pesticides and mitigation measures	Electronic and print media Community meetings	250,000.00
Pre and post spray medical test	Medical tests targeting spray control teams and regular blood test to check exposure/toxicity levels through the acetylcholinesterase blood test.	1,000,000.00
Pesticide environmental monitoring	Analysis of samples of water, soils, crops and livestock to ascertain exposure levels.	500,000. 00
Preparation of sub project IPMPs	Development of sub project IPMPs including Waste Management Plans; Emergency Preparedness Plans etc	200,000.00
Recruitment of environmental and social specialists	Implement ESMF, IPMP, GBV, LMP, SMP etc	1,500,000.00
Grievance Redress Management	Meetings and consultations etc	150,000.00
Contingency	Unforeseen activities	200,000.00

Table 6-4. Operational Cost Budget

Item	Kshs
Purchase of pesticides	550,140,000
Purchase of motor vehicles	132,324,800
Training of Spray teams	135,312,980
Purchase of PPE's	35,520,000
Purchase of ICT equipment	9,594,000
Purchase refined fuels and lubricants for transport	20,000,000
Hire of transport, equipment	314,207,200
Purchase of general office supplies (papers, pencils, forms, small office equipment	846,800
Contracted professional services	66,836,615.90
Daily Subsistence Allowance (NYS and Various county commissioners)	112, 217,604.10
Consultations	2,000,000.00
Contingencies	5,000,000.00
Total	1,384,000,000

7 REFERENCE

1. 6th Report of FAO/WHO Joint Meeting on Pesticide Management and 8th Session of the FAO Panel of Experts on Pesticide Management, 9 – 12 October 2012.
2. Davis, M., The global problem of obsolete pesticides and the FAO strategy for solutions FAO, Geneva, May 2011.
3. FAO (1985a) Guidelines for Packaging and Storage of Pesticides
4. FAO (1985b) Guideline on Good Labeling Practice for Pesticides
5. FAO (1985c) Guideline for the Disposal of Waste Pesticide and Pesticide Containers on the Farm
6. FAO (2001a): Guidelines on Desert Locust control
7. FAO (2001c): Guidelines on Good Practice for Aerial Application of Pesticides
8. FAO (2001d): Guidelines on organization and operation of training schemes and certification procedures for operators of pesticide application equipment,
9. FAO (2003): Desert Locust Guidelines on Safety and environmental precautions
10. FAO (2007): International Workshop on the Future of Biopesticides in Desert locust Management. Saly, Senegal, 12-15 February 2007. Food and Agriculture Organization of the United Nations, Rome
11. FAO (2007): International Workshop on the Future of Biopesticides in Desert locust Management. Saly, Senegal, 12-15 February 2007. Food and Agriculture Organization of the United Nations, Rome
12. FAO (2009a): FAO Desert Locust Control Committee thirty-ninth Sessions. Food and Agriculture Organization of the United Nations, Rome
13. FAO (2009a): FAO Desert Locust Control Committee Thirty-ninth Sessions. Food and Agriculture Organization of the United Nations, Rome
14. FAO (2009b): Second international workshop on the future of biopesticides for desert locust management (Rome, 10-12 February 2009). Food and Agriculture Organization of the United Nations, Rome
15. FAO (2009b): Second international workshop on the future of biopesticides for desert locust management (Rome, 10-12 February 2009). Food and Agriculture Organization of the United Nations, Rome
16. FAO (2014): The FAO Commission for Controlling the Desert Locust in South-West Asia
17. Food and Agriculture Organization (2001): Desert Locust Guidelines
18. Food and Agriculture Organization (2001b): Guidelines on good practice for ground application of pesticides.
19. Food and Agriculture Organization (2014): The FAO Commission for Controlling the Desert Locust in South-West Asia
20. Government of Kenya (2016a); Kenya Climate Smart Agriculture Project (KCSAP) Environmental and Social Management Frameworks (ESMF)
21. Government of Kenya (2016b); The National Agricultural and Rural Inclusive Project (NARIGP) Environmental and Social Management Frameworks (ESMF)
22. Government of Kenya (2019); Registered Pest Control Products for use in Kenya, publication by Pest Control Products Board (PCPB)
23. Government of Kenya (2020); Draft Locust Contingency response project
24. Government of Kenya Draft Wildlife Policy 2007-Draft

25. Government of Kenya Constitution
26. Government of Kenya Environmental Management and Coordination Act 1999
27. Government of Kenya Forest Act
28. Government of Kenya Forest Policy 2005
29. Government of Kenya National Environmental Sanitation and Hygiene Policy-July 2007
30. Government of Kenya National Policy on Environment and Development Sessional Paper No. 6 of 1999
31. Government of Kenya Occupational Health and Safety Act
32. Government of Kenya Public Health Act
33. Government of Kenya The Employment Act
34. Government of Kenya The Lakes and Rivers Act Chapter 409 Laws of
35. Government of Kenya Vision 2030
36. Government of Kenya Water Act 2002
37. Government of Kenya Wildlife Conservation and Management Act
38. Hassan ali A., Njagi P.G.N., Bashir M.O. (2005): Chemical ecology of locusts and related acridids. *Annual Review of Entomology* 50: 223-245.
39. Hassanali A., Njagi P.G.N., Bashir M.O. (2005): Chemical ecology of locusts and related acridids. *Annual Review of Entomology* 50: 223-245.
40. hazard and guidelines to classification: 2004.
41. Hunter D.M. (2005): Mycopesticides as part of integrated pest management of locusts and grasshoppers. *Journal of Orthoptera Research* 14: 197-201.
42. Hunter D.M. (2005): Mycopesticides as part of integrated pest management of locusts and grasshoppers. *Journal of Orthoptera Research* 14: 197-201.
43. ICIPE (2004): Optimisation, validation and transfer of pheromone technology to national locust control organizations. Phase III. First scientific and financial report (November 2003 to May 2004) ICIPE Tropical Insect Science for Development, Nairobi
44. Pesticide Action Network (PAN) Africa (2010): Report on workshop on Management of locust control and participation of civil society Nord-Sud Hotel - Bamako, February 2010
45. Ramesh C Gupta (2006); toxicology of organophosphate & carbamate compounds book doi: 10.1016/b978-012088523-7/50003-x
46. Republic of the Gambia (2004): pest management plans for the Gambia locust control project (January 2005 -December 2008)
47. Tahar Rachadi (2010); Locust control handbook CIAT Publication
48. World Bank (2006), Pest Management Guidebook
49. World Bank (2017), Environmental and Social Framework
50. World Bank Project Appraisal Document (PAD), ELRP
51. World Bank Project ESCP/ELRP
52. World Bank Project ESRS/ELRP
53. World Health Organization (2005); The WHO recommended classification of pesticides by hazard and guidelines to classification: 2004.

7.1 Annex A. Stakeholders Consulted



**MINISTRY OF AGRICULTURE LIVESTOCK FISHERIES AND COOPERATIVE
EMERGENCY LOCUST RESPONSE PROJECT**

7.2 Annex B. Pesticide Waste Management Plan

**PESTICIDE WASTE MANAGEMENT PLAN FOR EMERGENCY LOCUST
RESPONSE PROGRAM.**

Background

This Pesticide Waste Management Plan has been prepared for the Emergency Locust Response Program (ELRP) which will use pesticides to control the locusts. The ELRP is a World Bank financed project to Government of Kenya's (GoK), Ministry of Agriculture, Livestock Fisheries and Cooperatives (MoALFC). Kenya has also selected to use the chemical pesticide Fenitrothion 96 percent ULV, which is a WHO class II, formulated as ULV and the biopesticide Metarhizium. This document is an annex to the Integrated Pest Management Plan (IPMP) that has been prepared for the project and should be read alongside the Integrated Pesticide Management Plan.

Statutory Requirements For Waste Management in Kenya

Kenya has waste management regulations cited as the Environmental Management and Co-ordination (Waste Management) Regulations, 2006. These regulations govern the transportation and disposal of wastes including hazardous wastes which pesticide wastes are categorized as such. The management of pesticide wastes from the ELRP will comply to the regulations as cited.

Acknowledging that there are international regulations for management of pesticide wastes including FAO and WHO guidelines and for which Kenya is a signatory to, the ELRP will use these regulations as and when needed and in particular when the Kenyan regulations are less stringent.

Improper disposal of pesticide waste, such as unused chemicals and empty pesticide containers, can create serious harm to humans and animals; it may also lead to irreversible environmental damage. Six types of pesticide wastes that will be generated by the ELRP and will require proper disposal are:

- Empty pesticide containers,
- Excess pesticide mixture that are left unused after an application,
- Unused pesticide,
- Obsolete pesticide,
- Rinse water from containers and application equipment,
- Material generated from cleanup of spills and leaks, and
- Contaminated personal protective equipment.

1. Empty Containers

Empty containers of pesticide often still have residues of pesticides inside them. So, even after they are used and emptied, they are considered hazardous waste that can cause damage to the environment and to human and animal health. Empty containers, when re-used to store water and food, may lead to poisoning and those left in the environment will generate pesticide contamination in soils and underground water sources.

Mitigation/Disposal Measures

- All used and empty containers should be labelled and have a “used” date on them.
- Empty containers will be decontaminated by either triple rinsing or pressure rinsing. Triple rinsing empty containers is the recommended method by the FAO and involves washing out the container three times. Triple rinsing can remove over 99.99% or more of pesticide residue. Similar result can be achieved with integrated pressure rinsing using specialized spray equipment.
- Triple rinsing or pressure washing should be done immediately after emptying the container to prevent any improper use of the containers.
- Empty paper and plastic bags will be shaken clean and triple rinsed before disposal.
- Holes will be punctured in containers to make sure they cannot be re-used for any other purpose.
- Crushing of the containers is recommended and MoALFC will purchase crushers for this purpose.
- Unrinsed pesticide containers must be stored separately from properly rinsed containers and must be treated as if they contained pesticide.
- Unrinsed containers must be capped, stored upright in a roofed or covered secure (locked) area and on an impervious surface.
- There should be no visible or noticeable pesticide residue on either the inside or outside of the container.
- All rinsate should be removed from the inside of the container following rinsing procedures.
- Empty containers meeting the above criteria will be stored in locked storage until proper disposal. Such containers will be stored separate from unrinsed pesticide containers.
- Empty drums will never be left open: Evaporation of wastes can create a hazard—drums will be kept closed until they are ready to be cleaned.

How to properly clean empty pesticide containers

Unrinsed pesticide containers can still hold enough material to harm people and the environment. Care should be taken in cleaning such containers.

- Workers should be trained on cleaning the pesticide containers; they should read and understand all safety and environmental precautions on the product label.
- They should wear PPE, such as goggles or face shields, chemical-resistant aprons, gloves and chemical-resistant boots or shoes.
- Ensure different pesticide rinsates are not mixed together.
- Every container that has been rinsed should be labeled clearly with the rinse date.
- Rinsate should not be dumped on the ground or into storm drain.

Triple Rinsing Empty Containers (plastic and metal containers)

- Empty the container's contents into a spray tank, turning the container so that any

product trapped in the handle can flow out. Once flow is down to a drip, drain the container an additional 30 seconds.

- Immediately begin rinsing. Do not wait, or the product may become difficult to remove.
- Fill the empty container one-quarter full of clean water.
- Replace the cap on the container. With the container opening facing to your left, shake the container about 6 inches left to right. Shake the container about twice per second for 30 seconds.
- Drain rinse water into spray tank as described above.
- Fill the empty container one-quarter full of clean water a second time.
- Recap the container. With the opening of the container pointed toward the ground, shake the container about 6 inches up and down. Then drain the rinse water into the spray tank.
- Finally, fill the empty container one-quarter full for a third time with clean water. Recap the container. With the container in the normal upright position, shake the container about 6 inches up and down. Pour the rinse water into the spray tank.
- Carefully rinse residue from the outside of the container into the spray tank.
- Carefully rinse cap over spray tank opening.
- Look closely at the container inside and out to make sure that all pesticide has been removed; if not, rinse until all pesticide is removed—then allow the containers to dr.
- Store rinsed containers where they will be protected from rain until they can be disposed of properly.
- Puncture the container at least three times with 1–inch holes on the top and bottom and then have the container crushed.

Disposal of Empty Pesticide Container

The final step is to dispose of the rinsed pesticide container properly. Improperly disposed empty pesticide containers can still pose an environmental hazard and is a source of pollution. Disposal options vary and depend on the container construction (metal, plastic, or paper) and the availability of facilities for disposing of or recycling the pesticide containers.

Mitigation/Disposal Measures

- Empty containers will be punctured on the top, side and bottom to prevent future use. They will then be crushed, rendering them incapable of holding any liquid. Crushing is a process that involves compaction and the pressure of the crusher deforms the container. Because the project will use steel drums, aluminum and plastic containers, the containers in this project will be crushed.
- Empty containers should not be burned even when cleaned because the fire may generate environmentally persistent toxic emissions.
- Empty containers should not be buried either. Burying the empty containers potentially uses up scarce land and can be a danger to animals. Furthermore, plastic containers are highly stable and do not biodegrade, so, if buried, they will remain intact indefinitely.
- Clean secondary packaging, such as pallets and outer cardboard cartons, which have not come into direct contact with pesticides can be assumed to be uncontaminated. This can be disposed of as municipal waste.
- Empty containers should be transported by a NEMA licensed transporter of waste and disposed in a NEMA licensed disposal site.

2. Excess Pesticide Mixture

Excess mixture is diluted pesticide that is leftover in the spray tank after a pesticide application. It is important to properly dispose of any excess mixture. This means getting rid of the chemical so that poses no harmful effect to the environment, as well as people and animals.

Mitigation /Disposal Measures

- Avoid excess mixtures by measuring and calibrating correctly.
- Fill the spray tank with only the amount of pesticide required to do the job.
- Spray excess mixture on a different site if possible.

3. Excess Product

Excess product is unused pesticide that is still good but no longer needed arising from the applicator buying excessive amounts.

Mitigation/Disposal Measures

- Good stock management: buy only pesticide that is needed for one season or single use.
- Determine if you can safely go over the job and use up the amount that may be leftover, particularly if the pesticide is being used on weeds or on insects.
- Determine if there is another party that can use the excess product.
- Check with supplier or manufacturer of product to see if they will take excess product back.
- Check with the relevant government agency if there is a waste collection program where the agency collects excess products.
- If unable to return product, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime or charcoal. Then pour the unwanted pesticide into the hole and cover hole with soil.

4. Obsolete Pesticides

Obsolete pesticides are pesticides that cannot be used for the purpose for which they were intended and must be processed for destruction so as to render them harmless. Pesticides become obsolete when they have been banned-and it is therefore illegal to use them; because they have deteriorated physically or chemically so that they are no longer in the form they were supplied in; or after they have lost their pesticidal properties and are no longer effective against pests. Obsolete pesticides can be potentially more hazardous than new pesticides. Thus, care should be taken in handling obsolete pesticides.

Mitigation/Disposal Measures

- Ensure comprehensive stock control and inventory: avoid purchasing excess pesticides that cannot be used before they deteriorate.
- Buy the correct pesticide for the project.
- Store pesticide properly to avoid damages to pesticide caused by poor storage or handling.
- Regularly check condition of the pesticides and their storage containers.
- Ensure proper labeling of pesticides so that pesticides are not incorrectly considered to be obsolete.
- Determine if recently purchased pesticide that is not needed can be used in a different project before it becomes obsolete.

- Check with supplier or manufacturer of product to see if they will take product back
- Check with the relevant government agency if there is a waste collection program where the agency collects excess products.
- If unable to return product, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime. Then pour the unwanted pesticide into the hole and cover the hole with soil. This may apply for small quantities of pesticides. For large quantities, MoALFC will utilize the FAO guidelines for disposal of obsolete pesticides.

5. Rinse Material from Containers and Spray

Improperly disposed rinse water from pesticide application equipment has great potential for causing ground and surface water contamination, as well as harm to humans and animals, because it still contains pesticide residue. Proper procedures should be observed to avoid contamination from pesticide rinse water.

Mitigation/Disposal Measures

- Applicators will minimize rinse water by washing equipment only when necessary.
- Rinse the pesticide container or spray equipment over an impermeable surface and in a way that allows recovery of the rinsate.
- If the rinsate contains no debris, it can be used the same day as part (up to 5%) of the water (or other liquid) portion of the next spray mixture of that chemical.
- Apply rinsate to the original site, provided registered rates are not exceeded and the application is consistent with label directions.
- Apply rinsate to other project areas that need spraying.
- If none of the above condition applies, dig a hole 50 cm deep and cover the bottom of the pit with a 25 to 40 mm layer of hydrated lime. Then pour the unwanted pesticide into the hole and cover the hole with soil. This will be applicable to small quantities of rinsate.
- Applicators will not discharge rinse water to the ground, roadway, septic system, ditches, streams, toilets, sink, or water bodies to avoid pollution.
- The best way to dispose of the rinsate (rinse water used to remove pesticide residue from a container) is to add it to the spray mixture and apply it according to the label directions. Rinsate can also be collected to sue later in a spray mix or for disposal.

6. Pesticide Spill Clean-Up Material

When handling pesticides, accidents happen. When they do, proper clean-up of the spillage is essential to remove all health and environmental hazards created by the spill. But that is not all, the material used to collect and clean up spills and leaks of pesticide must also be properly managed to prevent environmental contamination. Generally, materials such as sawdust, clay, shredded newspaper, absorbent pads, or other absorbents can be used to absorb liquid pesticides and water/detergent mixtures used to clean pesticide stained surfaces. If improperly disposed, such material can cause harm to humans who come into contact with it, as well as harm to the environment.

Mitigation/Disposal Measures

- Once liquid spills have been absorbed, sweep up and collect the contaminated absorbent materials, and seal them in a heavy-duty plastic bag or metal bucket for disposal.
- Use a plastic dustpan to sweep up spills. Metal dustpans can spark and ignite flammable

pesticides.

- Sweep up dry pesticide spills for reuse. It may be applied to a labeled use site or stored for future use if the pesticide has not become wet or contaminated with soil or other debris. Otherwise, collect the dry spill in a heavy-duty plastic bag for disposal.
- Discard any PPEs that may have been contaminated in the clean-up process.

7. Contaminated Personal Protective Equipment

It is not uncommon for personal protective equipment (PPE) such as overalls, goggles, boots, and gloves, to be used in protecting the wearer from dangerous pesticides. Because PPEs are designed to keep dangerous pesticides away from the mouth, nose, and skin of the person wearing it, they end up collecting the contaminants. It is therefore important to take steps to ensure the PPEs are disposed in a manner that ensures that contaminants are not released in an area where they could cause harm.

Mitigation/Disposal Measures

- Keep pesticide-contaminated PPEs away from other clothing or laundry and wash it separately; No handler should take their contaminated PPE home with them.
- If PPE will be reused, clean it before each day of reuse according to the instructions from the PPE manufacturer unless the pesticide labeling specifies otherwise.
- If there are no instructions or requirements, wash PPE meticulously in detergent and hot water.
- Items that cannot be washed by a washer and dryer, such as goggles, boots, and gloves, should be thoroughly handwashed. Wear protective gloves when handling such contaminated items.
- Thoroughly dry the clean PPE before it is stored or put it in a well-ventilated place to dry.
- Store clean PPE separately from personal clothing and away from pesticide-contaminated areas.
- Properly cleaned PPE can then be disposed of as regular garbage.
- If washing of clothing or boots fails to remove the waste, then such material must be destroyed. They should be packed in sturdy bags and returned to the control base where proper destruction should be undertaken. Proper destruction can include burning of the material if it is material that can be burned without excess environmental degradation. Clothing or PPE can also be buried.
- Handler employers must discard coveralls or other absorbent materials that have been drenched or heavily contaminated with an undiluted pesticide that has the signal word “DANGER” or “WARNING” on the labeling. These contaminated items must not be reused.
- PPE that has been damaged or designated as one-time use or has expired or reached its use limit should also be destroyed.
- In instances where disposable PPE garments are not contaminated by anything other than normal dirt and dust, it is worth the time and effort to participate in a disposable protective clothing recycling program in order to reduce the rather large environmental impact of all that PPE ending up in landfills where it will never biodegrade.

Pesticide Waste Management Plan

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
Occupational Health and Safety Impacts	Improper disposal of pesticide waste can create serious harm to applicators and other workers involved through exposure.	- Provide emergency transport to medical facility in case of pesticide exposure. - Provide healthcare staff with any information about the pesticide(s) to which the person may have been exposed. - Provide medicine to treat pesticide poisoning. - Train workers on first aid for pesticide exposure. - Keep workers who are not responsible for pesticide waste management out of the pesticide rinsing as well as the storage and disposal zones. - Provide regular training on handling pesticide waste. - Monitor handlers working with pesticide waste. - Ensure PPEs provided to all the workers, supervisors, team leaders and store managers, and that all such persons receive adequate training on a regular basis on the proper use of PPE. - Train the team leaders, sprayers, supervisors and storekeepers on emergency procedures to take if exposure occurs accidentally - Ensure that team leaders and supervisors effectively monitor the spray operations diligently and take action to correct any non-compliance issues noted right away. - Prohibition of eating, drinking and smoking during work; - Rotation of applicators to avoid/limit over exposure - Ensure that only road worthy vehicles are selected for the transportation with qualified drivers. - Training on Emergency Preparedness and Response Plan (EPRP) and	- PPEs provided and workers trained on proper use. - Training manual prepared - Training on handling and using pesticides as well as first aid training held. - Healthcare workers provided with pesticide information. - Medicine stocked with hospital - Emergency transport vehicle provided. - Emergency phone number provided.	- MoALFC/NPCU - CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		awareness of the details of the pesticide Safety Data Sheets Given the use of the organophosphate pesticides, ensure pre-medical examinations and regular check-up to monitor exposure to potential poisoning.		
Community Health and Safety Impacts	- Improper disposal of pesticide waste can also cause serious harm to community members through exposure. - Communities exposed to pesticides may suffer short-term acute health effects such as nausea, headaches, sore eyes, skin rashes and dizziness.	- Avoidance of areas or regions with critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). - Use of biopesticide based on screening results - Awareness creation to the community on pesticide waste dangers and how to protect from pesticide waste. Training should also include dangers of reusing empty pesticide containers. - Provide emergency transport to medical facility in case of pesticide exposure. - Provide treatment to communities exposed to pesticides during the spray operations - Train on emergency first aid response and ensure first aid kits are available in storage facilities and transport vehicles. - Ensuring treatment medicines for pesticide exposure are available at the medical center. - Ensure proper storage of pesticide waste containers, put warning signs on pesticide storage areas. - Label pesticide empty pesticide containers as dangerous and containing waste. - Lock storage facilities for empty pesticide containers. - Fence the storage area to avoid community entry and if possible, have a guard on duty. - Properly discard PPEs such as goggles	- Training manual prepared - Training on pesticide dangers conducted. - Healthcare workers provided with pesticide information. - Medicine stocked with hospital - Emergency transport vehicle provided. - Emergency phone number provided. - Proper storage structure of pesticides constructed and locked. - Warning signs at pesticide storage area provided. - Pesticide containers labelled as dangerous, including empty containers. - PPE disposal system situated. - Community based grievance redressal mechanism set up.	- MoALFC/NPCU - CPCU - County Health Department

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		or boots; ensure that community members are unable to access them. ▪ Ensure that the project executers and host community are able to address the grievances on access and equity within the agreed GRM. ▪ Warnings must be given in ample time to beekeepers, owners of adjacent crops, livestock owners and those responsible for nearby environmentally sensitive sites. ▪ Have regular public interaction forums, paying particular attention to the needs of persons with disabilities, indigenous persons and other members of vulnerable groups, where communities in areas which have been treated with the pesticides. are informed in a language and communications medium they understand, and which is accessible to them about: ▪ How to safely navigate pesticide effects on plants, livestock, and water systems ▪ Precautions that are to be taken before, during and after control operations (e.g., re-entry and withholding periods) ▪ Dangers of reusing empty drums ▪ Public awareness (communications) campaigns will keep the public informed about possible environmental and health effects of pesticides, before, during and after locust control operations.		
Surface Water Contamination Surface water contamination can result from empty contaminated pesticide containers, used and contaminated PPEs, obsolete pesticide waste, excess and unused pesticide mixture, spill	▪ Contamination of surface water bodies directly or indirectly through runoff from soil. ▪ Impact on the aquatic life as well as community livelihoods.	▪ Avoidance of areas or regions with surface water bodies that are critical to habitats and livelihoods through mapping of spray areas prior to spraying (screening). ▪ Use of biopesticide based on screening results	▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently applied. ▪ Empty containers properly disposed of.	■ MoALFC/NPCU ■ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
response material, and pesticide rinsate.	Possible release of the pesticides into the water bodies from accidental spills during the transportation, cleaning, storage and disposal of pesticide containers.	- Optimum calibration of spraying equipment to reduce excess application of pesticide. - Implementing EPRP to manage accidental spills during transportation or application. - Carrying out environmental monitoring of water bodies - Provide training on waste management including container disposal methods to all spray teams - Implement the Triple Rinse approach to decontaminate the containers. - Empty containers must NOT be re-used - Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. - Establishing storage for holding empty containers prior to collection and disposal. - Rinsate and wash water should be emptied back to the spraying or mixing tanks. - Establish soak pits (with charcoal to filter, adsorb and retain the pesticides) - Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies.	- Comprehensive stock and inventory done. - Tracking system for containers established. - Proper storage structure of pesticides constructed and locked.	
Impacts on Ecological Sensitive Habitats	Application of pesticides can create a potential risk of polluting ecologically sensitive habitats such as wetlands, national parks reserves, forests, pasture grasslands, and water bodies.	- Avoidance of sensitive habitats and livelihoods through mapping of spray areas prior to spraying (screening). - Judicious choice of pesticides (i.e. Bio pesticides could be used in/near potentially sensitive areas instead of fenitrothion pesticides). - Optimum calibration of spraying equipment to reduce excess application of pesticide - Carrying out environmental monitoring	- Training manual prepared - Training on proper pesticide disposal done. - Triple rinse cleaning method consistently applied. - Empty containers properly disposed of. - Comprehensive stock and inventory done. - Tracking system for containers established. - Proper storage structure of	- MoALFC/NPCU - CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		- Provide training on waste management including container disposal methods to all spray teams - Implement the Triple Rinse approach to decontaminate the containers. - Empty containers must NOT be re-used - Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. - Establishing storage for holding empty containers prior to collection and disposal. - Rinsate and wash water should be emptied back to the spraying or mixing tanks. - Establish soak pits (with charcoal to filter, adsorb and retain the pesticides).	pesticides constructed and locked.	
Accidental Release of Pesticides Waste obsolete/unused/excess pesticide mixture	If such spillage occurs, this may result in a fire (pesticides are flammable), injury to humans and livestock (exposure), contamination of (receptors like water, flora, soils) and risks to fauna (exposure).	- Only vehicles correctly equipped to carry pesticides waste must be used for transportation. - Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed. - Preparation of an EPRP which has details of all appropriate authorities that must be notified (Environment, Water, Police, Fire Department etc.) - Records must be kept of all incidents and remedial action taken. - Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team - Absorbent material to contain chemical spills must be available at the filling site. - Chemical stores must be kept secure at all times. Proper storage of pesticides	- Documentation made on type of vehicle. - Training manuals prepared - Training videos made - EPRP documentation done. - Documentation of absorbent material made. - PPE provided and workers trained on use. - Material to contain chemical spills provided. - Record keeping mechanism in place.	- MoALFC/NPCU - CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		in accordance with FAO guidelines should be ensured for all supplies. ▪ Appropriate fire extinguishers must be provided for all locations where substantial quantities of pesticide are transported, stored or mixed. ▪ Use of PPE by spray teams and storekeepers		
Livelihood and Food Security Impacts	▪ Pesticide can poison aquatic resources if they find their way into ecosystems. ▪ The contamination pathways are through surface run offs, deposit on off target organisms, bioaccumulation also builds the contamination in the animals through their feeding pathways and water intake.	▪ Avoidance of areas or regions with critical habitats and livelihoods through mapping of spray areas prior to spraying (screening). ▪ Use of biopesticide based on screening results ▪ Optimum calibration of spraying equipment to reduce excess application of pesticide. ▪ Implementing EPRP to manage accidental spills during transportation or application. ▪ Provide training on waste management including container disposal methods to all spray teams ▪ Implement the Triple Rinse approach to decontaminate the containers. ▪ Empty containers must NOT be re-used ▪ Establishing a tracking system for solids wastes (containers) etc. where all containers must be returned to the store and accounted for. ▪ Establishing storage for holding empty containers prior to collection and disposal. ▪ Rinsate and wash water should be emptied back to the spraying or mixing tanks. ▪ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides).	▪ Training manual prepared ▪ Training on proper pesticide disposal done. ▪ Triple rinse cleaning method consistently applied. ▪ Empty containers properly disposed of. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Proper storage structure of pesticides constructed and locked.	■ MoALFC/NPCU ■ CPCU
Storage and Store Siting	▪ Poor siting and design of pesticide storage facilities including pesticide waste storage could lead to	▪ The store facilities should be located away from water sources to avoid contamination by accidental spills.	▪ Storage units constructed ▪ Security manuals of storage units.	■ MoALFC/NPCU ■ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
	exposure and contamination of the bio-physical environment as well as human health risks due to contact.	▪ All primary pesticide storage facilities will be double-padlocked and guarded ▪ All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. ▪ Soap and clean water will be available at all times in all the facilities. ▪ A trained storekeeper will be hired to manage each facility. ▪ Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed. ▪ All the warehouses will have at least two exit access routes in case of fire outbreak. ▪ A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities. ▪ Warning notices will be placed outside of the store in both English and the local language (s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry ▪ Storage facilities are accessed by authorized personnel only	▪ Inventory sheet of available cleaning agents. ▪ Storage and warehouse plans.	
Stealing of Empty Pesticide Containers	Empty pesticide containers can attract some people who may want to steal them and use them for storage. Stolen empty containers may still prove harmful to community members especially if they still contain waste residue.	▪ Maintenance of record of all the stock coming in and out of the storage facilities so that all the stock can be traced accordingly. This is a mechanism aimed at preventing pilferage of pesticides. ▪ Pesticide products including empty containers ready for disposal should always be kept in a secured storage area that is accessible only to those who are trained to use these products, such as storekeepers and licensed applicators.	▪ Inventory records maintained. ▪ Training manuals. ▪ Training videos ▪ Storage manuals.	■ MoALFC/NPCU ■ CPCU

IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ If pesticides storage facility is vandalized and waste containers stolen, the police should be called at once, so they can initiate an investigation. ▪ Report the incident to NEMA. ▪ All the storekeepers and managers will be trained on sound store keeping practices and procedures. ▪ At the end of the spray round, unused pesticide will be kept under lock and seal until such a time that they can be re-used for further spraying and if expired they will be disposed in accordance to international disposal requirements for obsolete pesticides. ▪ Spray Operators (spray operators must sign out all pesticide received daily and return empty containers at the end of the day,) ▪ Drivers transporting pesticides will be trained according to the guidelines listed in Pesticide Procedures in case of spills of excess pesticides; obsolete pesticides etc.		

7.3 Annex C. Emergency Preparedness and Response Plan

PESTICIDE EMERGENCY PREPAREDNESS AND RESPONSE PLAN (EPRP) FOR EMERGENCY LOCUST RESPONSE PROGRAM.

Background

This Pesticide Emergency Preparedness and Response Plan (EPRP) has been prepared for the Emergency Locust Control Program (ELRP) which will use pesticides to control the locusts. The ELCP is a World Bank financed project to Government of Kenya's (GoK) Ministry of Agriculture, Livestock Fisheries and Cooperatives (MoALFC). Kenya has also selected to use the chemical pesticide Fenitrothion 96 percent ULV, which is a WHO class II, formulated as ULV and the biopesticide Metarhizium.

This document is an annex to the Integrated Pest Management Plan (IPMP) that has been prepared for the project and should be read alongside the Integrated Pesticide Management Plan. Pesticide related emergencies include primarily accidental spills and leakages (including pesticide wastes) that can occur during transportation, application and storage and are likely to contaminate the bio-physical and socio-economic environment including human health impacts and risks with adverse consequences. This EPRP will be used by the CPCU to guide in development of sub project specific EPRP for identified spray areas. CPCU will develop sub project EPRP prior to commencement of spray operations.

Pesticide Spills, Leakages and Fires

A spill is an accidental release of any amount of pesticide (including pesticide waste), small or large. Spills may be relatively minor, involving one or a few leaking containers but can also be major, such as when a sprayer overturns spilling its contents, or when a truck overturns on a public highway or roads.

Pesticides are toxic to humans and other living organisms. Pesticides spills can contaminate ground and surface water, soil and air; damage plants; injure livestock, wildlife; and endanger the health of the applicator and emergency responders as well as the public/communities. Pesticide spills and fires may also cause financial loss due to cleanup, liability claims, and fines assessed by government agencies. There are three common ways pesticide spills occur:

1. Pesticides spills **during transportation**
2. Pesticide spills **during storage**
3. Pesticide spills **during mixing and application**

A. Management of Pesticide Spills During Transportation

Before pesticides arrive at the spraying site, they have to be transported. Transport related accidents can occur during transport from manufacturer or distributor to the project storage, or from the storage area to the point of use. Transport spills are mostly attributable to vehicle accident, damaged containers, or improperly secured containers tumbling or falling off moving vehicles. A transportation spill can result in serious personal injury to the transport vehicle operators, as well as to the immediate public. Moreover, spills on roadways can enter waterways and cause serious environmental damage. Care should

therefore be taken to prevent such mishap. When transporting pesticides, the project will observe the following procedures:

i. Vehicle Safety

- Pesticides will only be transported in the back of a flatbed truck. The flatbed truck will have side and tail racks and if possible, the pesticide will be placed in locked compartments.
- The truck bed will have steel/plastic beds for easier cleanup if a spill occurs.
- Transport vehicles will be kept in good working condition and will be inspected before any trip: brakes, tires, fluids, lights, etc., will be regularly checked.
- Only employees tasked with transportation of pesticides will be allowed to ride in the cab of the truck. No employee shall ride in the back with the pesticides.
- The pesticide truck shall not be left unattended when transporting pesticides. This ensures there is someone present in the event of an emergency and also protects against any trespass by a member of the public.
- A sign indicating “Chemical Storage Warning – Authorized Persons Only” should be prominently displayed on the vehicle, preferably in English, Swahili, and local vernacular language, especially in the event the vehicle is left unattended or parked.
- A cell phone will be in the vehicle at all times for emergency assistance. In addition, transport vehicle will have emergency contact numbers such as fire, police and hospital displayed in the vehicle cab.
- A spill kit will be maintained in the vehicle. The spill kit will contain hydrated lime, activated carbon, bleach, absorbent materials, containment “snakes”, tools (shovel, scoops, dustpans), warnings signs, ropes, storage bags, etc.
- The vehicle shall also have two pairs of PPE kits. The PPE kits shall include chemical resistant gloves, coveralls, splash goggles, respirator, boots etc.

ii. Pesticide Transportation

- Containers will be inspected upon loading for leaks; ensure all caps, plugs, and other openings are tightly closed and that there are no pesticides on the outside of the containers.
- Pesticides shall be transported in containers with intact, undamaged, and readable labels.
- An inventory log will be taken before departure and immediately upon arrival.
- Containers will be handled only by trained employees (wearing PPE) to prevent damage.
- Containers will be anchored securely to keep them from rolling or sliding.
- Care will be taken to protect containers from extreme temperature during transport.

iii. Vehicle Operators

- The transport vehicle shall have two operators: a driver and an assistant who shall ride in the cab of the truck.
- Vehicle operators shall be trained in basic emergency response procedures for containing pesticide spills. This includes training on notifying authorities in the event of a spill.
- Vehicle operators will be supplied with and trained on PPE use. Pesticides should never be handled without proper PPE.

- Drivers shall be trained to drive courteously and cautiously at all times. Drivers carrying pesticide should drive at or below the speed limit and should adjust speed with changing weather. Vehicle operators will not use phones or electronic gadgets when driving the car.
- Vehicle operators will not smoke cigarettes or use any drugs/alcohol while transporting pesticides.
- Unauthorized persons will not ride in the pesticide transport vehicle.
- Vehicle operators will regularly inspect the pesticide containers in the course of transportation to ensure they are properly secured.
- Vehicle operators should have a copy of each product being transported in the vehicle prior to leaving the loading area. The information should include the active ingredients in the pesticide, how to offer first aid in case of exposure, as well as storage and disposal procedures, and emergency phone numbers.

Mitigating/Responding to Pesticide Spills During Transportation

As careful as people try to be, pesticide spills can and do occur. The spill may be minor, involving only few drips from a container, or it may be major, involving large amounts of pesticide. Regardless of the magnitude of the spill, the overall objectives of a proper response will involve applying three steps, or the “Three C’s” of spill management:

1. CONTROL the spill.
2. CONTAIN the spill.
3. CLEAN IT UP.

1. CONTROLLING THE SPILL

- a) ***Protect yourself:*** -Workers operating the transport vehicle should wear appropriate PPE (chemical resistant gloves, chemical resistant coveralls, footwear, eye protection, respirator, etc.) before contacting the spill or breathing its fumes.
- b) ***Stop the source of the Spill:*** -Workers operating the transport vehicle will be trained to act immediately to control the source of the spill. If it can be done safely, the vehicle operators should plug the leak, place a leaky container inside a larger one, or do whatever necessary to limit the size and duration of the initial leak.
- c) ***Protect others:*** - Workers operating the vehicle will be trained in offering first aid to anyone exposed to the contamination. They should then secure the site by isolating the spill area. Spill site should not be left unattended until pesticide is cleaned up and area is decontaminated; Rope, cordon, or mark off the site, warn the public to keep well back. If necessary, obtain assistance from the base, police or security unit.

2. CONTAINING THE SPILL

- a) ***Confine the spill:*** -As soon as the source of the leak is under control, workers operating the transport vehicle should move quickly to keep the spill in a small area as possible. For small spills, use containment “snakes” to surround the spill and keep it confined. For larger spills, use a shovel, rake, or other tool to make a dike or use soil, sand, or other absorbent material on the spill. Spill may be covered by a plastic tarp especially if it is solid material. Any absorbent material used in confining the spill as well as plastic covers must be disposed of properly as

pesticide waste.

- b) **Protect water sources:** -Workers should prevent spill from reaching any water source such as ditch, drain, well, sinkhole, river, etc., by blocking or redirecting it. If spill contaminates a stream, pond, or other waterway, it must be immediately report to the relevant authorities.
- c) **Report the spill:** - Workers should call relevant authorities as well as the project base supervisor to report spill.
 - If it is a large spill that is potentially flammable, workers must call the fire department for assistance.
 - If the spill may expose the public to pesticides or pesticide residues, workers must contact public health officials.
 - If anyone is poisoned by contacting the spill or there is suspected exposure that may lead to poisoning, a call to the hospital emergency room should be made and the hospital should be provide with relevant information about the pesticide.
 - Workers should have the product label and any other relevant information about the pesticide being transported for the benefit of emergency responders.

3. CLEANING THE SPILL

- a) **Sweep up absorbent material** – Workers should wear appropriate PPE. Sweep up any absorbent materials and other contaminated items and place them in a leak–proof container such as an empty drum. Add absorbent as necessary until all the liquid is absorbed.
- b) **Decontaminate area:** -If the pesticide was spilled on an impervious surface, use a heavy–duty detergent to clean and decontaminate the area.
 - Work the cleaning material into the spill area with a coarse broom. Then add fresh absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
 - If minor spill occurred on soil, apply activated charcoal to contaminated soil.
 - For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.
- c) **Clean equipment and vehicle:** - Workers must clean any equipment and vehicles contaminated either as a result of the original accident or during clean–up procedure.
 - Workers cleaning transport vehicle and equipment must wear proper PPE.
 - Porous material and equipment that cannot be effectively decontaminated must be discarded properly as pesticide waste.
- d) **Decontaminate yourself:** - Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
 - Workers must wash thoroughly with detergent and water.
 - Any part of skin that might have been exposed must be washed. Face, neck, hands and forearms must be washed.
- e) **Document larger spills:** -For all large spills that take place during transportation,

keep a record of the containment and cleanup activities as well as a record of conversations with authorities and public about the spill.

- Photograph any damage as well as the cleanup process if possible.
- Report the spill to appropriate agency, when necessary.

B. Management of Pesticide Spills During Storage

Spills during storage are mostly due to damaged containers, improper storage conditions, and in some instances, due to natural causes such as flooding. Stored pesticide may also ignite causing fire. As such, serious human exposure and environmental contamination can occur if pesticides are improperly stored. Proper storage of pesticides will therefore protect workers, the environment, and the people who live and work near the storage area from potential spills and exposure.

In addition, proper storage prolongs pesticide chemical shelf-life by preventing damages from temperature extremes or excess moisture. Proper storage also safeguards pesticide from theft, vandalism and unauthorized use. When storing pesticides, the following procedures will be observed:

1. **Site:** – Pesticide storage facilities should be located away from human and livestock habitat and will be in an area that is not known to flood
 - The facility should be preferably away from water bodies
 - The storage facility should be built as a separate structure dedicated for pesticide storage and should not be used as an office space.
 - The storage facility should be further situated such that runoff from spills and leaks cannot contaminate surface water, drains, wells, etc.
2. **Storage Area Exterior:** - Storage facility should be preferably built with fireproof material and the floor should be waterproof.
 - Facility should be secured against theft, vandalism, and unauthorized access.
 - Warning signs shall be visibly posted around the storage facility in English, Kiswahili and local vernacular language. As an example, the warning signs shall state “DANGER – PESTICIDES –KEEP OUT.” The warning signs shall be placed on walls, doors, and windows. Signs should be legible, at least 50 feet from the building.
3. **Storage Area Interior:** - Pesticides, especially liquids ones, should preferably be stored on a waterproof cement floor.
 - Storage buildings should only be used for purposes of storing pesticides, nothing else.
 - Building interior should be well lighted and dry.
 - Proper ventilation should be observed: Buildings should be equipped with exhaust fans to prevent vapor accumulation, and heat buildup (vent fans so that no people, animals, or plants are exposed to the fumes).
 - Temperature should be controlled: Interior should be insulated to help maintain a constant room temperature (pesticides should never freeze or become excessively hot) Insulate according to the temperature recommended on the pesticide label.
 - Storage should consist of metal shelves with lips for storing pesticides off the

floor (wooden shelves are unacceptable because they can absorb spilled pesticides; large metal drums and nonmetallic containers should be kept on pallets).

- Storage building should include an area for storing properly rinsed, empty containers awaiting disposal.
- Liquid pesticide and highly toxic pesticides should be stored on low shelves to minimize the potential for exposure if the containers are broken or begin to leak.
- Storage building should have fire extinguishers near the door where it is accessible. It should also be fitted with fire warnings such as smoke detectors or alarms.
- Storage building should have a secured outside shutoff for all electrical and water systems.
- Emergency phone numbers will be posted at each phone in the storage and on the walls of storage facility; the numbers shall include numbers for police/fire/ambulance, hospital numbers, and emergency workplace team.
- An up-to-date inventory of all the stored pesticides shall be physically and electronically kept, each container will be marked with its purchase and use dates.
- Storage buildings shall include a fully equipped first aid kit.

Mitigating/Responding to Pesticide Spills During Storage

Pesticide that is spilled during storage should be dealt with the same way as any spill that occurs during transport. Workers should employ the three C's—Contain, Control, Cleanup.

1. **Wear PPE:** Only trained personnel should be involved in the spill cleanup.
 - Workers must put on PPE, including chemical resistant gloves, respirators, and overalls.
 - Workers must not smoke, drink or eat during the clean-up.
2. **Control the spill:** Workers should identify the source of the spill and stop the spill as quickly as possible by restoring the container to its upright position, closing a leaky valve or hose, or putting a secondary container in place to catch the leaking solution.
 - Pesticide bags that are broken or soaked through need to be carefully placed in a secondary container, such as a drum or a heavy plastic bag.
3. **Contain the spread:** When the leak has been stopped, contain the spread of the spill by creating dams of absorbent material in the path of the spilled liquid.
 - If it is a large spill that potentially affects people living in the immediate vicinity of the spill, emergency authorities should be notified, and such persons should be immediately evacuated.
4. **Cleanup:** begin prompt clean up as soon as the situation has been stabilized. Quick response to a spill will prevent the chemical from leaching or washing away in a rainstorm.
 - If possible, use a fan for ventilation during cleanup.
 - Use absorbent material such as clay, pet litter, vermiculite, absorbent pillows, or activated charcoal to capture the spilled liquid.
 - Absorbent material should then be swept or shoveled into a plastic or steel container and disposed as pesticide waste.

- Cover dry pesticide spill with plastic tarp, and if possible, have them collected and put back in an empty storage container.
- 5. **Decontaminate the area:** - If the pesticide was spilled on an impervious floor, use a heavy-duty detergent to clean and decontaminate the area.
 - Work cleaning material into the spill area with a coarse broom. Then add fresh absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
 - If minor spill occurred on soil, apply activated charcoal to contaminated soil.
 - For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.
- 6. **Decontaminate yourself:** - Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
 - Workers must wash thoroughly with detergent and water.
 - Any part of skin that might have been exposed to the pesticide must be washed. Face, neck, hands and forearms must also be washed.
 - Workers should decontaminate all equipment that was used in cleaning the spill and dispose any waste appropriately as pesticide waste.
- 7. **Report the spill:** - If the spill contaminated a water source, workers should report it as soon as possible to the relevant regulatory authority such as the National Environmental Management Authority (NEMA).
 - Spill should also be reported to the project base immediately.

Management of Pesticide Fires During Storage

Fires involving pesticides are extreme hazards; some pesticides are flammable, some are explosive. All pesticides are likely to produce highly toxic fumes when burned. These fumes may be harmful to people (including firefighters), animals, or plants. Runoff water from fighting a fire is likely to contain pesticide residue. This may contaminate soil, sewers, streams, lakes, wells, or other water sources. Because of the potential harm of pesticide fires, specific steps that should be taken to reduce or prevent them include:

1. Ensuring the storage structure adheres to the National Fire Code, National Building Code, National Electrical Codes, etc.
2. Posting signs on all storage entrances to show that pesticides are present.
3. Installing fire and smoke detectors in the storage area.
4. Refraining from the use of open flames for welding, burning, cutting, or heating in the pesticide storage site.
5. Keeping fire extinguishers near the storage area.
6. Keeping a list of stored pesticides in an easy to reach location away from the storage area.
7. Keep emergency phone numbers handy.

Mitigating/Responding to Pesticide Fire During Storage

In the event of a storage pesticide fire, prompt and responsible action is essential.

1. Depending on the size of the fire, workers should immediately evacuate the premises.
2. Workers may attempt to extinguish fire using fire extinguishers if there is no risk to them from the fire and if it is a smaller fire. For small fires, workers may also use fog,

foam, or dry powder. If only water is available, use it as a fine spray or fog. Use only as much water as absolutely necessary. Do not use water jets because they can break bags and glass containers. If using water to fight pesticide fires, workers should not to spread the contamination to the surrounding area through water runoff.

3. Workers should immediately notify the fire department and inform the firefighters of the nature of the pesticides involved in the fire.
4. Workers should provide emergency-response personnel with safety data sheets (SDS), which include vital technical and emergency information.
5. Workers should isolate the area by keeping people away. Establish a security perimeter to discourage onlookers.
6. If significant smoke is generated, workers should evacuate all people and animals in the vicinity, especially those downwind.
7. Contain small fires with fog, foam, or dry powder. If only water is available, use it as a fine spray or fog. Use only as much water as absolutely necessary. Do not use water jets because they can break bags and glass containers. If using water to fight pesticide fires, be careful not to spread the contamination to the surrounding area through water runoff.
8. Workers should ensure water and spilled chemicals are being contained. For larger fires, workers should consider withdrawing and allowing the fire to burn out. This option is preferred over the use of water to fight the fire since use of water can lead to widespread environmental contamination. If runoff water cannot be avoided, build dikes to contain the contaminated water.
9. Workers should clean all equipment and all clothing exposed to the fire. All personnel involved should shower after fighting the fire.

C. Management of Pesticide Spills During Mixing and Application

Spills that occur during the mixing process are often due to human error, while spills during the application of the pesticide often arises from equipment malfunction. During mixing and application, the applicator is the one likely to be dangerously exposed to the pesticides. There is risk of the pesticide splashing on the skin, eyes and body of the applicator, as well as the possibility of inhalation. To ensure safety, workers should observe the following when mixing and applying pesticides.

1. Pesticide applicators must always wear PPE before mixing and applying pesticides.
2. Applicators should never eat, drink, or smoke while handling pesticides.
3. Only workers who are approved to be at the mixing and application site should be allowed access to the area.
4. Good washing facilities should be maintained at the pesticide mixing and application site and applicators must wash after mixing or applying pesticides.
5. Applicators should review the label of each pesticide before opening the pesticide container to ensure familiarity with mixing and usage instructions.
6. Pesticide mixing area should be away from other people, livestock, plants etc.
7. Applicators should be trained in proper spraying techniques.
8. Pesticides should not be mixed in areas where a spill or overflow could enter a water supply.
9. If possible, pesticides should be mixed on a concrete pad so that spilled pesticide can be removed and not absorbed in the ground.
10. If mixing indoors, ensure adequate ventilation and light.

11. Only mix pesticides when the weather conditions are appropriate. Avoid rainy weather or extreme heat.
12. When pouring from a container, keep the container at or below eye level to avoid splashing or spilling on your face or on your protective clothing.
13. To prevent unnecessary spills, close container after each use.
14. A spill kit will be maintained at the mixing and application site. The spill kit will contain hydrated lime, activated carbon, bleach, absorbent materials, containment “snakes”, tools (shovel, scoops, dustpans), warnings signs, ropes, storage bags, etc.

Mitigating/Responding to Pesticide Spills During Mixing and Application

The most hazardous activities involving pesticides are mixing and loading of concentrates. Use no more than the amount called for to prevent injury to applicator, exposed plants and/or animals and to prevent excess residues. Do not combine pesticides unless the combination is called for on the label or you have consulted an authority. In the event of a spill during mixing and application, apply the three C’s—Contain, Control and Clean up.

1. **Wear PPE:** Only trained personnel should be involved in the spill cleanup.
 - Workers must put on PPE, including chemical resistant gloves, respirators, and overalls.
 - Workers must not smoke, drink or eat during the clean-up
2. **Contain the spill:** - Workers should do everything possible to immediately identify the source of the leak or spill.
 - If it is a toppled container, workers should restore the container to its upright position. If there is any leaky hose or valve, a secondary container should be put in place to catch the leaking solution.
 - If the material is a liquid, construct a dam to prevent it from spreading.
 - Pesticide bags that are broken or soaked through need to be carefully placed in a secondary container, such as a drum or a heavy plastic bag.
3. **Control the spill:** -When the leak has been stopped, contain the spread of the spill by creating dams of absorbent material in the path of the spilled liquid.
 - If it is a large spill that potentially affects people living in the immediate vicinity of the spill, emergency authorities should be notified, and such persons should be immediately evacuated
 - Isolate the contaminated area. Rope off the area or use chalk to draw a line around it. Keep people at least 30 feet away from the spill.
4. **Clean up the spill:** - After the spill is under control, workers should begin prompt clean up. Quick response to a spill will prevent the chemical from leaching or washing away in a rainstorm.
 - Use absorbent material such as clay, pet litter, vermiculite, absorbent pillows, or activated charcoal to capture the spilled liquid.
 - Absorbent material should then be swept or shoveled into a plastic or steel container and disposed as pesticide waste.
 - Cover dry pesticide spill with plastic tarp, and if possible, have them collected and put back in an empty storage container.
5. **Decontaminate the area:** - If the pesticide was spilled on an impervious floor, use a heavy-duty detergent to clean and decontaminate the area.
 - Work cleaning material into the spill area with a coarse broom. Then add fresh

- absorbent material to soak up the now contaminate cleaning solution. Repeat process as needed to ensure that the area is thoroughly decontaminated.
- If minor spill occurred on soil, apply activated charcoal to contaminated soil.
 - For larger spills on soil, remove topsoil 2–3 inches, until no visible stain or odor is observed. Cover the remaining soil with at least two inches of lime, then cover the fresh topsoil.
6. **Decontaminate yourself:** - Workers must clean themselves as soon as they are finished with the spill and equipment cleanup.
 - Workers must wash thoroughly with detergent and water.
 - Any part of skin that might have been exposed to the pesticide must be washed. Face, neck, hands and forearms must also be washed.
 - Workers should decontaminate all equipment that was used in cleaning the spill and dispose any waste appropriately as pesticide waste.
 7. **Decontaminate equipment:** - Workers must decontaminate any equipment that was contaminated either as a result of the original accident or during clean-up procedure. Workers must wear PPE. Porous material such as brooms and sponges and equipment that cannot be effectively decontaminated must be discarded properly as pesticide waste.
 8. **Report the spill:** - If the spill contaminated a water source, workers should report it as soon as possible to the relevant regulatory authority such as the National Environmental Management Authority (NEMA). Spill should also be reported to the project base immediately.

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
Precautions to void harmful impacts of pesticide spills on Occupational Health and Safety Impacts Pesticide spills can cause serious sometimes deadly to workers involved in transport, storage, mixing and applying pesticides.	Pesticide spills that occur during transport, storage or mixing and application can create serious harm to applicators and other workers who are exposed to the spill.	- Provide PPE including training on proper use and storage. - Provide training on handling pesticides and cleaning spills, including training on fire safety. - Provide emergency transport to medical facility in case of pesticide exposure. - Provide first aid kit. - Provide healthcare staff with any information about the pesticide(s) to which the person may have been exposed. - Provide medicine to treat pesticide exposure. - Train workers on first aid for pesticide exposure. - Provide regular training on handling pesticides. - Monitor handlers working with pesticide waste. - Provide washing facilities in the storage and mixing site for those exposed to pesticides during cleanup.	- PPEs provided and workers trained on proper use. - Training manual prepared - Training on handling and using pesticides as well as first aid training held. - Healthcare workers provided with pesticide information. - Medicine stocked with hospital - Emergency transport vehicle provided. - Emergency phone numbers provided. - Wash facilities built. - First aid kit provided in the transport vehicle, storage facility and mixing location.	- MoALFC/NPCU - CPCU
Precautions to avoid harmful impacts of pesticide spills on Community Health and Safety Impacts Pesticide spills can cause serious sometimes deadly harm to community members who get exposed to the pesticide during transport, storage, mixing and applying pesticides.	Exposure	- Awareness creation to the community on pesticide waste dangers and how to protect from pesticide spills. Training should also include dangers of accessing sites where there has been a spill. - Provide emergency transport to medical facility in case of pesticide exposure. - Train workers and community members residing close to storage location on emergency first aid response and ensure first aid kits are available in storage facilities and transport vehicles. - Ensure treatment medicines for pesticide exposure are available at the medical center.	- Training manual prepared - Training on pesticide dangers conducted. - Healthcare workers provided with pesticide information. - Medicine stocked with hospital - Emergency transport vehicle provided. - Emergency phone number provided. - Proper storage structure of pesticides constructed and locked. - Warning signs at pesticide	- MoALFC/NPCU - CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		▪ Ensure proper storage of pesticide inside storage building. ▪ Install warning signs on pesticide storage structure. ▪ Ensure site of storage is situated away from community members. ▪ Label empty pesticide containers as dangerous and not for use. ▪ Build storage facility with fire resistant material to help prevent spread of fires and provide fire alarms ▪ Lock storage facilities. Fence the storage area to avoid community entry and if possible, have a guard on duty. ▪ Properly discard PPEs such as goggles or boots; ensure that community members are unable to access the discarded material. ▪ Ensure that the project executers and host community are able to address the grievances when a spill occurs.	storage area provided in English, Swahili, and local language. ▪ Pesticide containers labelled as dangerous, including empty containers. ▪ PPE disposal system situated. ▪ Community based grievance redressal mechanism set up. ▪ Storage facility constructed from fire resistant material. ▪ Fire alarm monitoring set up.	
Precautions to avoid harmful impacts of pesticide spill on surface water contamination Surface water contamination can result directly or indirectly from spills and leakages running into the water. Such contamination impacts aquatic life as well as community livelihoods.	Exposure from spill of the pesticides into the water bodies during transportation, storage or mixing and application.	▪ Provide training on the three C's- Control, Contain, Cleanup. ▪ Rinsate and wash water should be emptied back to the spraying or mixing tanks. ▪ Establish soak pits (with charcoal to filter, adsorb and retain the pesticides) ▪ Pesticide applicators will never wash themselves, their overalls, or their PPE in any water bodies, or where wash water will drain to water bodies. ▪ Train workers to ensure that they avoid spill going to waterways. ▪ Build storage facility away from water ways.	▪ Training manual prepared. ▪ Training on the "three C's" done. ▪ Comprehensive stock and inventory done. ▪ Tracking system for containers established. ▪ Storage structure located away from water ways.	▪ MoALFC/NPCU ▪ CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
Precautions to avoid harmful impacts of spill on ecological sensitive habitats Pesticide spills can create a potential risk of polluting ecologically sensitive habitats such as wetlands, national parks reserves, forests, pasture grasslands, and water bodies.	Exposure from spill of the pesticides into ecological sensitive habitats during transportation, storage or mixing and application.	- Identifying and map out sensitive ecological and agronomical areas and avoid spraying in those areas. - Site storage away from ecologically sensitive areas. - Provide training on the three C's- Control, Contain, Cleanup.	- Map identifying sensitive ecological areas prepared. - Training sessions held focussing on “no spray” areas. - Training manual prepared. - Training on the “three C’s” done - Storage structure located away from ecologically sensitive area.	- MoALFC/NPCU - CPCU
Precautions to avoid risk of spills during transportation If spillage occurs during transportation, it may cause harm to workers, the public and the environment. Transport spills may also result in a fire (pesticides are flammable), causing injury to humans and livestock(exposure), contamination of water, flora, soils, and risks to fauna (exposure).	Exposure	- Only vehicles correctly equipped to carry pesticides must be used for transportation. - Keep current on preventive maintenance. - Make sure vehicle has first aid kit including current medication. - Pesticide transporters and users must be trained and be familiar with recommendations detailed on the product Material Safety Data Sheet and procedures to be followed. - Preparation of an EPRP which has details of all appropriate authorities that must be notified (Environment, Water, Police, Fire Department etc.) - Records must be kept of all incidents and remedial action taken. - Training on EPRP and awareness of the details of the pesticide MSDS for all the operators, medical teams, transporters, storekeepers and field control team - Absorbent material to contain chemical spills must be available in the vehicle. - Fire extinguishers must be kept in the transport vehicle - PPE and spill kit must be kept in the vehicle.	- Documentation made on type of vehicle used to carry pesticides. - Training manuals prepared - Training videos made - EPRP documentation done. - Documentation of absorbent material made. - PPE provided and workers trained on use. - Material to contain chemical spills provided. - Record keeping mechanism in place. - Spill kit provided - Emergency numbers placed on vehicle - Cell phone for emergency in vehicle.	MoALFC/NPCU CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		- Inspect containers before loading. - Make sure containers are properly secured.		
Precautions to avoid risk of spill during storage Spillage occurring during may cause harm to workers, the public and the environment. Storage spills may also result in a fire (pesticides are flammable), causing injury to humans and livestock(exposure), contamination of water, flora, soils and risks to fauna (exposure). Poor siting and design of pesticide storage facilities could lead to exposure and contamination of the bio-physical environment as well as human health risks due to contact	Exposure / spills	- All primary pesticide storage facilities will be double-padlocked and guarded - All the storage facilities will be located away from nearby watercourses, domestic wells, markets, schools, hospitals etc. - Soap and clean water will be available at all times in all the facilities. - A trained storekeeper will be hired to manage each facility. - Recommended pesticide stacking position and height in the warehouse as provided in the FAO Storage and Stock Control Manual will be followed. - Storage will have at least two exit access routes in case of fire outbreak. - Storage will be properly ventilated and lighted. - A fire extinguisher will be available in the storage facilities and all workers will be trained on how to use the available firefighting facilities. - Warning notices will be placed outside of the store in both English and the local language(s) with a hazard symbol (skull and crossbones sign), and also a caution symbol against unauthorized entry - All pesticides will be used and any remnants will be stored under lock and key until the next round of application. - Application of First In/First Out (FIFO) approach in pesticide distribution will be practiced avoiding accumulation of expired pesticides.	- Storage units constructed away from water sources - Security manuals of storage units. - Inventory sheet of available cleaning agents. - Storage and warehouse plans. - Fire extinguishers provided - Emergency numbers provided. - Security agents for storage hired. - Spill kit - Washing station	- MoALFC/NPCU - CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
		- Storage facilities are accessed by authorized personnel only - Pesticide stacking position and height in the warehouse is followed. - The central warehouses have more than 3 exit access routes in case of fire outbreak. - Have a spill kit in the storage area. - Have a washing station close to the storage area.		
Precautions to avoid risk of spill during Mixing and Application of pesticides Spills occur during the mixing process due to human error, or equipment malfunction. There is risk of the pesticide splashing on the skin, eyes and body of the applicator, as well as the possibility of inhalation.	Exposure / spills	- Wear PPE such as face shield or goggles, chemical resistant rubber gloves, apron, long sleeves, pants, and chemical resistant rubber boots. - Fill tank halfway with water, add pesticide, then finish filling tank. - Use only recommended amounts. - Close container after use. - Wash or decontaminate after handling pesticides. - Do not spray during inclement weather. - Read label before mixing. - Do not mix more than needed.	- PPE provided - Training manuals on proper spraying and mixing. - Spill kit provided.	- MoALFC/NPCU - CPCU
Precautions to reduce risks during pesticide spill clean-up risks	Contamination /exposure	- Wash all personal protective equipment in the field with soap and water then wash again with warm soapy water at the station. - Return all equipment to proper storage area. - Bathe or shower as soon as possible after coming into contact with pesticide. - Wash clothing separate from other laundry. - In case of a spill apply the “three C’s” - Provide first aid kit - Provide emergency to hospitals - Provide medicine to hospitals for treatment of pesticide exposure		- MoALFC/NPCU - CPCU

Emergency Preparedness Response Plan				
IMPACT TYPE	IMPACT/ISSUES	MITIGATION MEASURES	MONITORING	RESPONSIBILITY
Precautions to reduce pesticide fire hazards	Exposure/spills	▪ Store combustible pesticides away from heating sources. ▪ Install a fire detection system. ▪ Train employees to use a fire extinguisher. ▪ Train o first aid and provide first aid equipment, ▪ Provide spill kit. ▪ Provide fire extinguishers and emergency phone numbers. ▪ Build with fire resistant material. ▪ Notify fire department ▪ Provide emergency response teams with SDSs, labels, the emergency plan, and a site map. ▪ Establish a security perimeter to discourage onlookers. ▪ Contain contaminated runoff water and leaking pesticide onsite by building berms. ▪ Consult with emergency responders to decide whether to allow the fire to burn out.	▪ Fire detector and alarm installed ▪ Training manual on fire ▪ Storage layout manual ▪ Storage construction plan ▪ Emergency numbers provided ▪ Fire extinguishers installed. ▪ First aid training manuals ▪ Spill kit documented ▪ PPE documented	▪ MoALFC/NPCU ▪ CPCU