

최종 보고서

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Enhancing the Resilience of Communities and Ecosystem in  
the Upper Athi River Catchment Area, Kenya

## 환경사회영향평가보고서

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## CH 1. 국문요약



## 국문 요약

물은 사회, 경제, 환경영역에서 한 국가의 발전에 상당한 역할을 한다. 물은 사회 경제적 선이며 국가의 지속적 개발을 위해 중대하다. 사회적 선으로서 물은 가정의 필요와 생활, 건강을 뒷받침하며 경제적 선으로서 농업과 산업 활동을 지원한다. 물은 농업, 에너지, 가공, 제조, 의료, 광산업, 건축, 운송과 같은 수많은 생산부문에 주요한 투입물이기도 하다. 또한, 물은 수생생물을 부양하고 잔여물을 없애는 중대한 환경적 서비스를 제공한다(NWMP, 2013).

케냐는 만성적인 물 부족 국가이다. 이것은 물 수요가 이용가능하고 재생 가능한 담수 자원보다 크다는 것을 의미한다. 재생가능한 담수 잠재성이 연간 1인당 1,000 m<sup>3</sup>보다 적으면 그 국가는 부족 등급으로 분류된다. 현재 케냐의 자연 담수공급량은 연간 1인당 650 m<sup>3</sup>이며, 2025년 그 양이 겨우 235 m<sup>3</sup>로 될 것으로 예측된다. 이것은 이웃국가인 우간다와 탄자니아(각각 1인당 담수공급량이 2,940, 2,696 m<sup>3</sup>)와 비교된다. 물공급 예측에 따르면 약 56%의 인구가 안전한 물에 접근할 수 있다. 수자원에 대한 더 이상의 탐사가 제한되어 있으며 국가적으로 수자원 분포의 불균형이 존재한다(WASREB, 2018).

아티 유역은 특히 물이 부족한 유역으로서 연간 1인당 담수공급량이 162 m<sup>3</sup>에 불과해 케냐의 자연 담수공급량보다도 적다. 이 유역은 물이 부족하므로 물 이용성을 향상시키기 위한 추가적인 노력이 필요하다. 이러한 상황은 유역의 대부분이 제한된 수자원을 가진 건조와 반건조 지역이라는데 기인한다. 아티 유역은 또한 기후변화로 인해 악화된 가뭄과 홍수 발생을 자주 겪고 있다. 긴 우기 동안 호우가 내려 특히 상하류 유역 강둑의 붕괴를 일으키고 있다. 케냐 2030 장기계획에서 제시된 야심찬 국가 사회경제 개발 전략을 시행하고 물 공급체계와 생태계, 사회의 회복력을 강화하기 위해서는 부족한 수자원을 좀더 효율적으로 관리하고 협력할 필요성이 있다.

국가환경관리청(NEMA)는 기후변화기금(GCF)의 케냐 승인기관으로서 한국환경산업기술원(KEITI)와 협력하여 이러한 노력에 기여하고자 10만불 규모의 사업제안을 계획하고 있다. 그 사업 명칭은 '아티강 유역의 사회와 생태계 회복력 향상'이다.

사업의 목적은 통합수자원관리를 통해 물 안정성을 증대하고 취약인구의 건강과 복지를 향상시키는데 있다. 이러한 목적들은 가정 및 상업용 물 공급 계획을 개발, 이용하여 취약 인구의 회복력을 강화함으로써 이루어질 것이

다.

#### 사업내용

이 사업은 아티 상류 유역에서 통합수자원관리를 통해 물 안정성을 증가시키는 것을 목적으로 한다. 이 목적은 수자원 관리를 개선하고 수질 자동측정 및 유역 이해관계자들에 대한 조기 경보 정보 전파, 수자원관리 조직과 주정부 사이의 적응 계획을 통해 이루어질 수 있을 것이다. 주 정부의 기후 위험을 고려한 수자원 관리 장기계획 능력 향상 또한 강화될 것이다.

본 사업은 세 가지로 구성되어 있다.

구성 요소 1: 통합수자원관리를 위한 제도적 제어와 기술능력 향상

이 요소의 중심은 물과 기후관련 제도적 및 통제 구조를 강화하고 국가정보센터를 설치, 훈련 및 능력개발 프로그램을 지원하는데 있다.

구성 요소 2: 통합수자원관리 및 물 이용성 개선

이 요소의 중심은 현대적 기후-수문 관찰 및 감시 시스템 설치, 데이터 수집, 분석, 전달, 예보 시스템 개선, 가정 및 경제용 물 저장시설 개발, 품질향상, 유역 보존에 있다.

구성 요소 3: 이해관계자 참여, 정보, 기후 비상사태에 대한 지역사회 반응 향상

이 요소의 중심은 이해관계자의 참여 개선, 지역사회에 대한 정보, 서비스 전파, 물 안정성 관점에서 여성과 청년들을 위한 안전하고 지속가능한 방법 제공, 비상사태 대비 태세와 비상물자, 운영 강화로 생활을 개선하는데 있다.

궁극적으로 이 사업이 수행되면 물 기반시설 보수를 통해 음용수 공급이 증가되어 약 336,500명이 직간접적인 이익을 얻을 것이다. 또한 유역 보호와 회복을 보장하는 방법을 통해 추가적으로 900,000명이 이익을 볼 수 있을 것이다. 더구나, 수자원이용자협회(WRU) 같은 국가와 지역사회 수준의 조직을 강화함으로써, 지역 물 이해관계자들이 수자원관리, 유역보존, 다른 수자원문제에 관한 의사 결정 과정에 활발하게 참여하게 될 것이다.

#### 환경사회적 요구사항

환경에 대한 악영향과 심대한 피해를 감소, 최소화, 저감하기 위해서, 모든 GCF사업은 보호 수단으로 보통 일컬어지는 환경사회 정책과 절차에 의해 지도를 받는다. 본 사업 특히 구성 요소 2는 비록 지역적 규모이기는 하나 긍정적 및 부정적 환경사회영향을 미칠 것으로 예상됨에 따라서 세계은행의

운영 정책(OP 4.01, 환경 평가)을 유발한다. 세계은행의 분류에 따르면 본 사업은 그 영향이 상대적으로 저감하기 쉽고 가역적인 B범주로 분류된다. 이로 인해 사업 시행자들이 부정적인 환경사회영향을 다룰 수 있는 사업을 선별하고 조치들을 조직할 수 있도록 도움을 주는 환경사회관리 기본구조(ESMF)가 요구된다.

### ESMF의 목적

GCF는 GCF 재원조달을 위해 제안된 모든 활동에 대해 환경사회적 실사가 수행될 것을 요구한다. 실사의 목적은 그 사업 행위들이 환경사회적 보호 규약을 준수하도록 보장하는데 있다.

따라서, ESMF는 사업에 대한 높은 수준의 환경사회적 선별을 도와주는 참조 지침서로 기여함으로써 환경사회적 영향을 가능한 많이 회피하고 최소화하는 것을 목적으로 한다. 그러한 영향이 불가피할 경우에는, ESMF는 영향을 확인, 평가하며 케냐 정부의 환경사회법률과 GCF의 환경사회 정책, 세계은행의 보호 정책을 준수하여 필요한 저감 대책의 개요를 제시한다. 아울러 그것은 사업 시행 중에 명시되고 관리할 필요가 있는 가능한 환경사회적 위험과 저감대책을 요약하고 있다.

ESMF를 아래의 다섯 단계에서 반복하는 방식으로 준비하였다.

- 1단계: 최초 사업시행단위(PIU)와 협의, 착수보고서 준비
- 2단계: 이해관계자 참여 및 평가 수행을 통해 상이한 이해관계자들과의 협의 유형, 관련성, 수준 파악
- 3단계: 상류 아티 구역의 자연 및 수자원, 생계와의 연관성을 개략적으로 파악하기 위한 환경사회, 경제적 특징에 대한 기준선 개발 및 기술
- 4단계: 대안 및 시나리오, 사업 수행과 결정에 영향을 미치는 외부 요인에 대한 개관
- 5단계: 다양한 이해관계자 협의를 통해 ESMF, ToR 개발, 공개 및 확정  
시행 중에 ESMF는 시행자들이 사업으로 인한 환경사회적 영향을 확인하고 평가, 관리하는데 도움을 줄 것이다. 또한 PIU가 사업 순환의 균형을 잡고 사업 계획자들과 환경사회적 관리를 책임지는 직원들 간에 조기 개입할 수 있도록 보장해 줄 것이다.

본 ESMF의 주 내용은 다음과 같다; 상류 아티 구역의 기초 현황, 정책, 법률, 제도 기초 토대 개요, 위험 및 영향을 확인하고 범주화하며 평가하는 방법, 환경사회영향평가(ESIA) 절차, ESMF시행 추정 비용. 부록에는 PIU에게 환경사회적 선별, 평가, 관리 계획, 감시 과정에 대한 지침을 제공하는

기본도구가 포함돼 있다.

**정책, 법률 및 제도 개관**

GCF 외에 무엇보다 세계은행, IFC의 보호규정 정책, 아래 핵심적인 법률 수단들을 개관하였다.

- 케냐 헌법
- 환경관리 및 조정 법률(EMCA, 1999, 2015년 개정)
- 환경영향 평가 및 감사 규칙(2003)
- 환경관리 및 조정 (수질) 규칙(2006)
- 환경관리 및 조정 (폐기물 관리) 규칙(2006)
- 환경관리 및 조정 (소음 및 진동) 규칙(2009)
- 물에 관한 법률(2016)
- 주 정부 법률(2012)
- 국가 물 관련 정책 초안(2018)

**잠재적인 환경사회적 영향**

제안된 사업은 특히 지점 수준에서 긍정적 및 부정적 환경사회적 영향을 수반할 수 있다.

**긍정적 영향 요약**

긍정적 영향	제안된 향상 대책
물 안정성 개선	사업시행단위는 확인된 수자원시설들이 접근가능하고 신뢰할 수 있으며 시의 적절한 물 공급을 제공할 수 있는 방식으로 개발될 수 있도록 보장하여야 한다.
공중보건 개선	수인성 질환을 줄이기 위해, 먹는 물이 수자원시설들과 수질을 점검하는 개선된 수질 감시 시스템을 통해 이용될 수 있어야 한다.
고용 창출	인근 지역사회 구성원들이 건설 단계에 숙련 혹은 반숙련 노동자로서 고용되어야 한다.
지역 경제 활성화	건설 기간에 우선권은 지역 경제에 주어져야 한다. 예를 들면, 건설 노동자들에게 지역 음식과 음료 판매, 지역사회로부터 건설

경제적 생활 수준 향상	차제 공급이 있다. 깨끗한 물을 찾기 위해 여성들이 소비하던 시간을 다른 소득 활동에 사용할 수 있다. 또한, 수인성 질환 치료에 사용될 돈을 다른 목적에 사용 가능하다.
전문성 강화 및 기술 개발	환경사회적 관리에 참여하는 사람들의 전문성을 향상시키고 교육함으로써 장래 사업관리 기술을 개선할 수 있다.
성 친화적, 호응적 학습 환경 개선	물 접근성 개선으로 인해 여성과 여자 아이들이 물을 찾기 위해 사용하던 시간이 줄고 교육 및 빈곤 감소에 효과적이다.

**부정적 영향과 제안된 저감대책**

부정적 영향	제안된 저감 대책
고형 폐기물	<ul style="list-style-type: none"> <li>적정한 수집, 보관, 재활용 및 재사용을 통해 건설 폐기물을 최소화하여 폐기물을 생산적 용도로 전환</li> <li>최종 처분은 지방 정부가 승인한 위생적인 매립지나 투기 장소에서 시행</li> </ul>
액상 폐기물	<ul style="list-style-type: none"> <li>최종 처분 전에 폐기물 처리</li> <li>모든 사업행위의 설계 단계에서 적정한 폐기물 처리시설이 제공되도록 보장</li> <li>모든 액상 폐기물은 봉쇄 대책에 맞춰 보관함으로써 토양 오염을 저감</li> </ul>
소음 및 진동	<ul style="list-style-type: none"> <li>사전 사업대상지 주변 지역사회에 대한 인식 제고</li> <li>NEMA가 지정한 작업시간 준수</li> <li>미사용 차량, 트럭, 굴착장비 엔진중지</li> <li>건설 차량 및 장비의 적정 관리</li> </ul>
대기 오염	<ul style="list-style-type: none"> <li>작업 장소와 접근 도로에 정기적 살수</li> <li>운송 중 화물 피복</li> <li>잘 정비된 차량, 트럭, 장비 운영</li> <li>양질의 연료 및 윤활유 사용</li> <li>사업 장소 먼지 발생 억제</li> </ul>
수질 오염	<ul style="list-style-type: none"> <li>어떠한 쓰레기, 찌꺼기, 기름 폐기물, 연료, 폐기된 오일도 배수구 혹은 수체에 방</li> </ul>

	<ul style="list-style-type: none"> <li>· 류되지 않도록 처리</li> <li>· 적절한 연료 저장 탱크와 장소 확보</li> <li>· 차량, 트럭, 장비의 유지 및 청소는 지구 밖에서 시행</li> <li>· 공중 화장실 설치</li> <li>· 캠프 설치, 건설 활동 중 유실 방지대책 수립</li> </ul>
토양 및 토지 훼손	<ul style="list-style-type: none"> <li>· 나지가 날씨 요인에 노출되지 않도록 가능한 개간 최소화</li> <li>· 고유종 혹은 대나무 같은 추천 녹화 식물을 이용해 개간 지역 재식생화</li> <li>· 호우 시에 건설 작업 회피</li> </ul>
보건 및 직업 안정성에 대한 영향	<ul style="list-style-type: none"> <li>· 모든 계약자가 환경, 보건, 안전 계획을 시행토록 요구</li> <li>· 건설 노동자에 대한 교육, 개인 안전도구 및 장비 제공</li> <li>· 현장 주변 울타리 설치, 사고 및 부상을 줄이기 위해 출입문에 경비 배치</li> </ul>

물 저장시설 개보수 후에 발생 가능한 다른 문제들에는 사람 혹은 가축의 익사 사고, 오염된 물에 의한 수인성 질병, 여수로 붕괴에 따른 인명파 재산 손실 등이 있다. 잠재적인 악영향을 줄이기 위해서 PIU는 건설 단계에 엄격한 대책들을 고려해야 하며 정기적인 수자원 구조물들의 안전과 효율에 대한 감시가 이루어지도록 해야 한다.

본 ESMF는 환경사회적 보호규정이 적절하게 관리되도록 지속적인 지역사회의 참가, 협의, 참여를 상당히 강조한다. 또한, 기능적인 민원시정시스템(GRM)을 추천한다. 사업 결과에 따라 발생하는 문제나 불평들이 효과적이면서 신속히 관리될 수 있도록 각 하부 사업에 대해 ESMF가 수립될 것이다.

#### 사업 시행 협정

사업시행단위(PIU)와 관리 컨설턴트들은 사업 시행중에 ESMF를 사용하고 참조할 것이다. 적절하게 환경사회관리계획(ESMP)을 ESMF 지침에 따라 사업 시행 중에 준비할 것이다. 필요한 저감 계획을 개발하고 이해자들이 그 계획을 준수하도록 하는 것은 PIU의 관련 보호규정 담당자와 관리 컨설턴트의 책임이다.



**Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK  
GREEN CLIMATE FUND FUNDING PROPOSAL**

#### 공공 협의 및 정보 공개

본 ESMF는 GCF와 세계은행 절차가 요구하는 공공 협의와 확인을 포함하는 참여적 과정을 통해 준비되었다. 또한, 세계은행의 보호규정 운영 정책(OP/BP 4.01)은, 환경사회 영향에 대해 영향을 받는 집단과 이해관계들과 공공 협의를 할 것을 요구한다. 보호규정을 다루기 위해 준비된 모든 핵심 서류들은 케냐 헌법과 세계은행 정보공개 정책에 따라서 의무적으로 공개하여야 한다.

#### 역량 개발 및 교육

역량 개발은 대개 훈련, 세미나, 워크숍과 단기 코스 형태로 국가 및 주 차원의 시행기관과 사업조정 직원을 대상으로 시행될 것이다. 이것은 사업의 환경사회적 측면을 성공적으로 시행하기 위해 수행될 것이다.

#### ESMF 시행 비용

ESMF를 시행하는데 소요되는 비용은 사업기간 동안 시행 모니터를 포함해서 약 280,000 USD로 추정된다. 주요 비용 항목에는 확인된 사업행위에 대한 ESIA 용역, 역량개발 및 훈련, 환경 감사, ESMF/ESIA에 대한 환경 모니터링, 감독 및 이행 추적이 있다.



## CH 2. 환경사회영향평가





# Environmental and Social Management Framework

# Enhancing the Resilience of Communities and Ecosystems in the Upper Athi River Catchment Area, Kenya

## Environmental and Social Management Framework



A report prepared by the Government of Kenya, with technical support from Korea Environmental Industry & Technology Institute

## EXECUTIVE SUMMARY

Water plays a significant role in the national development of a country with respect to social, economic and environmental spheres. It is a social and economic good, which is critical for the sustainable development of the country. As a social good, water supports domestic needs, life and health, and as an economic good, water supports critical productive activities such as agriculture and industry, and is a major input in many productive sectors like agriculture, energy, processing and manufacturing, hospitality, mining, construction and transport. In addition, water provides critical environmental services like support to aquatic life and disposal of residuals (NWMP, 2013)

Kenya is a chronically water scarce country. This means that the demand for water is greater than the available renewable freshwater resources. A country is categorised “water-scarce” if its renewable freshwater potential is less than 1,000 cubic metres per capita per annum. Kenya’s natural endowment of renewable freshwater is currently at 650 cubic metres per capita per annum. By 2025, Kenya is projected to have a renewable freshwater supply of only 235 cubic metres per capita per annum. This compares unfavourably with the neighbouring countries of Uganda and Tanzania, which have per capita levels of 2,940 cubic metres and 2,696 cubic metres, respectively. Estimates of water supply in the country indicate that only about 56 percent of the population has access to safe water. Further exploration of water resource is limited and there is disparity in the distribution of water resources across the country (WASREB, 2018).

The Athi Catchment Area (ACA) (Figure 1) is a particularly water scarce catchment with a freshwater supply of 162 cubic metres per capita/year, which is far below the above-mentioned Kenya’s endowment. The catchment area has a negative water balance and therefore requires additional effort to enhance their water availability. This situation is attributed to the fact that most areas in the catchment are arid and semi-arid with limited water resources. The catchment also suffers from frequent drought and flooding events exacerbated by climate change. During the long rainy seasons, extreme heavy rains give rise to bursting of the riverbanks especially in the upper and lower catchments. In order to implement the ambitious national socio-economic development strategy in Kenya’s Vision 2030, strengthen the resilience of water supply systems, ecosystems and communities’ dependent on these water sources, there is a need for more efficient governance and management of the scarce water resources.

The National Environment Management Authority (NEMA), Kenya’s nationally Accredited Entity (AE) to the Green Climate Fund (GCF), in collaboration with the Korea Environmental Industry and Technology Institute (KEITI), plans to contribute to these efforts through a proposed \$10 million project titled **‘Enhancing the resilience of communities and ecosystems in the Athi River Catchment Area’** submitted to the GCF.

The GCF project’s objectives are to increase water security through Integrated Water Resource Management (IWRM) and to enhance the health and well-being of the vulnerable population within the ACA. This will be done through the development and utilisation of water supply schemes for domestic and commercial use to strengthen the resilience of vulnerable populations.

## PROJECT DESCRIPTION

This Project seeks to increase water security through Integrated Water Resource Management within the Upper Athi Catchment Area. This will be achieved by improving water resource management, dissemination of hydromet and early warning information to catchment stakeholders and adaptation planning between water sector institutions and county governments. In addition, the capacity of county governments to enhance long-term planning for water resource management taking into consideration climate risks will be strengthened.

The project has three components with a series of sub-components, namely:

**Component 1: Enhanced institutional governance and Integrated Water Resource Management.**

This component will focus on developing decision support tools (DSTs) to enhance the capacity of stakeholders on water resources management. Water resource management DSTs will support and structure the process of exploring case-specific options with the help of a combination of different methods, data and/ or models. The information provided will impart knowledge, incorporate best practices and thereby enable users to determine an optimal or best adaptation approach.

**Component 2: Increased access to potable water for domestic and commercial use.** This component will focus on promoting the development of water harnessing and storage facilities for communities and local institutions in the counties. The Upper ACA has a number of degraded water storage facilities including water pans, sand dams and rock catchments that should provide critical access to water for communities. The project intends to rehabilitate these facilities to enhance water access for communities in close proximity to the structures.

**Component 3: Strengthened adaptation planning, institutional and regulatory framework.** This component will focus on strengthening institutional and regulatory framework by investing in capacities for enforcing the water regulations, supporting the four counties to develop their County Environmental Action Plans and Sub-Catchment Management Plans for improved adaptation planning.

Ultimately, it is expected that approximately 456,531 individuals will benefit - either directly or indirectly - from the project by having increased potable water supply through rehabilitation of water infrastructure. The wider community will also benefit through measures that ensure the protection and rehabilitation of the catchment area. Moreover, by strengthening the capacity of national and community level institutions such as Water Resources Users Associations (WRUAs), these local water stakeholders will actively participate in decision-making processes regarding water resources management, catchment conservation and other water-related issues.

## ENVIRONMENTAL AND SOCIAL REQUIREMENTS

In order to reduce, minimise and mitigate adverse impacts and undue harm of its development projects to the environment, all GCF projects are guided by environmental and social policies and procedures commonly referred to as safeguard instruments. Implementation of the Project (especially Component 2) is anticipated to have both positive and negative environmental and social impacts albeit on local scale and hence the project has triggered one of GCF's performance standard PS1: Assessment and management of environmental and social risks and impacts. As per the GCF's risk category classification, the project has been assigned 'Category B'. These impacts will be relatively easy to mitigate and reversible. This calls for an Environmental and Social Management Framework (ESMF)



## Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL

that provides a general impact identification framework to assist project implementers to screen the projects and institute measures to address adverse environmental and social impacts

### OBJECTIVE OF THE ESMF

The GCF requires that environmental and social due diligence is undertaken on all activities proposed for GCF financing. The purpose of the due diligence is to ensure that these activities comply with their environmental and social safeguards.

Therefore, this ESMF will serve as a reference manual to assist in the high-level environmental and social screening of the project in order to avoid and minimise environmental and social impacts as much as possible. Where they cannot be avoided, the ESMF identifies and assesses such impacts and outlines necessary mitigation measures following relevant Government of Kenya's environmental and social legislation, GCF environmental and social policies, and World Bank's safeguards policies amongst others as well as international best practice. It also summarises likely environmental and social risks and their mitigation measures that need to be specified and managed during project implementation.

This ESMF was prepared in an iterative manner in the following five phases:

**Phase 1:** Initial consultation with the Project Implementation Unit (PIU) and the preparation of an inception report.

**Phase 2:** Conducting a stakeholder engagement and assessment, which provided guidance in the type, relevance and level of consultations with the different stakeholders.

**Phase 3:** Describing and developing a baseline of the biophysical characteristics and the socio-economic conditions within the Athi Catchment. This helped to provide an overview of natural and water resources as well as linkages to livelihoods within the Upper ACA.

**Phase 4:** Review of the different options and scenarios and the external factors that may influence their performance thus informing decision-making.

**Phase 5:** Developing of the ESMF and Terms of Reference (ToR) following consultations with various stakeholders, disclosure to stakeholders and its finalisation.

During implementation, the ESMF will assist project proponents to identify, assess and manage the environmental and social impacts of the project. It will aid the PIU to align the project cycle and ensure that there is early engagement between project planners and compliance staff responsible for environmental and social management.

This ESMF provides the following: a baseline context of the Upper ACA; an overview of policy, legal and institutional frameworks; a methodology to identify, categorise and rate risks and impacts; procedures for Environmental and Social Impact Assessments (ESIA) and cost estimates for implementing the ESMF. In the appendices, this ESMF includes sample tools to guide the PIU through the environmental and social screening, assessment, management planning and monitoring processes. The GCF requires that environmental and social due diligence is undertaken on all activities proposed for GCF financing. The purpose of the due diligence is to ensure that these activities comply with their environmental and social safeguards.

## POLICY, LEGAL AND INSTITUTIONAL REVIEW

Other than the GCF, World Bank and IFC safeguard policies, the following key legal instruments among others were reviewed.

- Constitution of Kenya
- Environmental Management and Coordination Act (EMCA, 1999, amended 2015)
- Environmental Impact Assessment and Audit Regulations, 2003
- Environmental Management and Coordination (Water Quality) Regulations, 2006
- Environmental Management and Coordination (Waste Management) Regulations, 2006
- Environmental Management and Coordination (Noise and Excessive Vibration Pollution (Control) Regulations, 2009
- Water Act, 2016
- County Governments Act, 2012
- Draft National Water Policy, 2018

## POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The proposed project is likely to have both positive and negative environmental and social impacts particularly at site level.

### Summary of positive impacts and proposed enhancement measures

Positive Impacts	Proposed Enhancement Measures
<b>Improved Water Security</b>	The PIU should ensure that the identified water infrastructures are developed in a manner that will ensure provision of accessible, reliable and timely water supply.
<b>Improved Public Health</b>	In order to reduce incidences of water borne diseases, the project should ensure that potable water is made available through the different water infrastructures and enhanced use of the monitoring systems to check on water quality.
<b>Employment Creation</b>	The proposed project interventions should ensure that adjacent communities are employed during the construction phase as skilled, semi-skilled and unskilled labourers.
<b>Simulation of local economies</b>	During the construction period, priority should be given to local businesses e.g. vendors of food/beverages to the construction workers and local supply for some construction inputs from the communities.
<b>Improved economic living standards</b>	The time that women would ordinarily use to look for clean water will be spent on other income generating activities. In addition, the money that would be used to treat water borne diseases will be used to improve living conditions.
<b>Capacity strengthening and skill development</b>	Capacity building and training of all those that will be involved in the management of environmental and social safeguards of the project to enhance their skills for managing future projects is encouraged.
<b>Increased gender friendly and responsive learning environments</b>	Increased access to water will reduce the time that women and girls would ordinarily use to look for water. This has an effect on education, and poverty reduction.

**Summary of negative environmental and social impacts and proposed mitigation measures**

Negative Impacts	Mitigation Measures
<b>Solid waste</b>	<ul style="list-style-type: none"> <li>• Minimisation of construction waste (proper collection, storage, recycling or reuse) to ensure those materials that would otherwise be disposed as waste are diverted for productive use</li> <li>• Final disposal should be at approved sanitary landfills or dump sites approved by the local government</li> </ul>
<b>Liquid waste</b>	<ul style="list-style-type: none"> <li>• All wastewater shall be treated prior to final disposal.</li> <li>• All project activities should ensure proper wastewater facilities for proper discharge of liquid waste are provided or available during design stages</li> <li>• All liquid wastes will be stored in accordance with the containment measures to mitigate soil contamination.</li> </ul>
<b>Noise and vibration</b>	<ul style="list-style-type: none"> <li>• Sensitisation of surrounding communities of the rehabilitation projects in advance</li> <li>• Ensure adherence to NEMA designated working hours</li> <li>• Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use</li> <li>• Proper maintenance of construction vehicles and equipment</li> </ul>
<b>Air pollution</b>	<ul style="list-style-type: none"> <li>• Ensure regular watering of the site and access roads</li> <li>• Cover materials during transportation</li> <li>• Operate well maintained vehicles, trucks and other equipment</li> <li>• Use good quality fuel and lubricants</li> <li>• Suppress dust generation at project sites</li> </ul>
<b>Water pollution</b>	<ul style="list-style-type: none"> <li>• No garbage/refuse, oily wastes, fuels/waste oils should be discharged into drains or water bodies</li> <li>• Fuel storage tanks/sites should be properly secured</li> <li>• Maintenance and cleaning of vehicles, trucks and equipment should take place offsite</li> <li>• Provide toilet facilities for construction workers</li> <li>• Construction activities, including camps to include measures to control runoff</li> </ul>
<b>Soil and land degradation</b>	<ul style="list-style-type: none"> <li>• Minimise land-clearing areas as much as possible to avoid unnecessary exposure of bare ground to the elements of the weather.</li> <li>• Re-vegetate cleared areas using indigenous plant species or recommended landscaping plants such as bamboo.</li> <li>• Avoid construction work during heavy rains.</li> </ul>
<b>Project induced labour influx</b>	<ul style="list-style-type: none"> <li>• Develop and implement labour influx management measures while undertaking an ESIA</li> <li>• Prepare, disseminate and implement Grievance Redress Mechanisms (GRM) that take into consideration labour engagement</li> <li>• Ensure applicable commitments made in the social and environmental documents are reflected in the civil works bid documents including ToRs and contracts and penalties clearly indicated</li> <li>• The contractors should as far as possible engage the local skilled and unskilled labour within the project area during construction stages</li> <li>• Ensure local communities are given priority in relation to employment</li> </ul>

	<ul style="list-style-type: none"> <li>• Ensure that all workers have contracts with terms and conditions that are consistent with Government of Kenya labour laws and polices</li> <li>• Every worker should also sign a code of conduct – covering issues such as zero tolerance of unacceptable conduct, Gender Based Violence, sexual harassment, sexual exploitation and abuse of children</li> </ul>
<p><b>Impacts on Human Health and Occupational Safety</b></p>	<ul style="list-style-type: none"> <li>• The Project will require all contractors to implement an Environmental, Health and Safety (EHS) plan</li> <li>• Construction workers will be educated and provided with adequate and right safety tools and equipment.</li> <li>• The site shall be fenced off and provided with security at the access gates to reduce potential accidents and injuries to the public.</li> </ul>

Other issues that could arise after rehabilitation of the water storage infrastructure include accidental drowning of people and livestock, water borne diseases in the case of contamination of the exposed water and breaking of spillways leading to loss of life and assets. To mitigate potential negative impacts, the PIU should ensure stringent measures are taken into consideration during the construction phase. In addition, regular monitoring of the safety and efficiency of the water structures should be conducted.

This ESMF places great emphasis on continuous community engagement, consultation and participation to ensure the environmental and social safeguard issues are properly managed. The ESMF also recommends a functional Independent Redress Mechanism (IRM). This will be set up for each sub-project to ensure any issues or complaints that arise because of the projects are managed effectively and promptly.

## **PROJECT IMPLEMENTATION AGREEMENTS**

The Project Implementation Unit (PIU) and the management consultants will use and refer to this ESMF during implementation of the Project. Environmental and Social Management Plans (ESMPs) will be prepared following guidelines in the ESMF. It remains the responsibility of the relevant safeguard officers of PIU and management consultant to ensure that the necessary mitigation plans are in place and enforced.

## **PUBLIC CONSULTATIONS AND DISCLOSURE**

This ESMF has been prepared through a participatory process involving public consultation and validation as required by the GCF, World Bank procedures and requirements in the Constitution of Kenya (2010). GCF's performance standards – PS 1: Assessment and management of environmental and social risks and impacts requires public consultation with affected groups and other stakeholders about the project environmental/social impacts throughout the funding proposal cycle. In terms of disclosure, it is mandatory that all key documents prepared to address safeguards are made available to the public to ensure the greatest degree of transparency.

## **CAPACITY BUILDING AND TRAINING**

The capacity building requirements will mostly be in the form of trainings, seminars/ workshops and short courses for project staff from the implementing institutions and project coordinating staff at the national and county levels. This will be undertaken to ensure successful implementation of the environmental and social aspects of the project.



## **COST IMPLICATION OF ESMF**

It is estimated that a budget provision of about USD 280,000 shall be made available for the full implementation of this ESMF, including monitoring over the project duration. Major cost items budgeted for include services related to preparation of ESIA for identified activities, training and capacity building for relevant teams, Environmental Audits, environmental monitoring and supervision and performance tracking of ESMF/ESIA.

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## **ACRONYMS AND ABBREVIATIONS**

ACA	Athi Catchment Area
AE	Accredited Entity
AP	Affected Person
ARCA	Athi River Catchment Area
ASAL	Arid and Semi-Arid Land
CEAP	County Environmental Action Plan
CSO	Civil Society Organisation
DST	Decision Support Tool
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management Coordination Act
ENNCA	Ewaso Ng'iro North Catchment Area
ENSO	El-Nino/Southern Oscillation
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESP	Environmental and Social Policy
ESS	Environmental and Social Safeguard
FGD	Focus Group Discussions
GCF	Green Climate Fund
GoK	Government of Kenya
IRM	Independent Redress Mechanism
IFC	International Finance Corporation
ITCZ	Inter Tropical Convergence Zone
IWRM	Integrated Water Resources Management
KEITI	Korea Environmental Industry and Technology Institute



## **Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL**

KII	Key Informant Interview
KMD	Kenya Meteorological Department
KRC	Korea Rural Community Corporation
LVNCA	Lake Victoria North Catchment Area
LVSCA	Lake Victoria South Catchment Area
MoWS	Ministry of Water and Sanitation
NDMA	National Drought Management Authority
NEC	National Environment Committee
NEMA	National Environment Management Authority
OS	Operational Safeguards
PCU	Project Coordination Unit
PIU	Project Implementation Unit
PMU	Project Management Unit
RVCA	Rift Valley Catchment Area
SCMP	Sub-Catchment Management Plan
SDGs	Sustainable Development Goals
TCA	Tana Catchment Area
ToR	Terms of Reference
WB	World Bank
WHO	World Health Organisation
WRA	Water Resources Authority
WRUAs	Water Resource Users Associations

## GLOSSARY

<b>Catchment</b>	An extent or an area of land where all surface water from precipitation converges to a single point at a lower elevation where the stream joins another body of water such as a river, lake, reservoir, estuary, wetland, sea or ocean.
<b>Dam</b>	Embankment build in a concave location, perpendicular on the stream in a valley, where with one (earth or concrete) wall a big reservoir is made to store water. In the context of catchment management planning in Kenya, dams are considered small if volume <50,000 cubic metres. All dams between 50,000 cubic metres and 5 M cubic metres are classified as medium-sized dams.
<b>Gender</b>	Refers to the socially constructed rather than biologically determined roles of men and women as well as the relationships between them in a given society at a specific time and place. These roles and relationships are not fixed, but can and do change. They are usually unequal in terms of power, freedom, agency and status as well as access to and control over entitlements, resources and assets.
<b>Groundwater</b>	The water present beneath Earth's surface in soil pore spaces and in the fractures of rock formations.
<b>Gully</b>	A landform created by running water, eroding sharply into soil. Typically triggered off by surface runoff from compacted soil surfaces that limit infiltration of rainwater and hence often starting from roads, cattle tracks and other denuded soils.
<b>Habitat</b>	An ecological or environmental area that is inhabited by a particular species of animal, plant, or other type of organism. The term typically refers to the zone in which the organism lives and where it can find food, shelter, protection and mates for reproduction.
<b>Inundation</b>	The term 'flooding' is used when dry areas become wet temporarily—either periodically or episodically—and that 'inundation' is used to denote the process of a dry area being permanently drowned or submerged.
<b>Operation &amp; Maintenance</b>	Operation and maintenance refers to all of the activities needed to run a water supply and sanitation scheme, except for the construction of new facilities. The overall aim of operation and maintenance is to ensure efficiency, effectiveness and sustainability of water supply and sanitation facilities.
<b>Resilience</b>	The ability of a system, society, community, or individual exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
<b>Risk significance</b>	The probability of occurrence is the likelihood for a risk to occur and can be characterised in terms of the degree to which it will happen. The risk significance indicates the relationship between probability and severity or magnitude of impacts. The entities or organisations that will be implementing



## Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL

the proposed activities are best positioned to define the probability of occurrence and severity or magnitude of impacts.

<b>Safe water coverage</b>	Percentage of the population with access to a source of safe water supply (borehole, piped water or protected spring) within walking distance (1500 m).
<b>Scenario</b>	A combination of assumptions about the options in place. This includes the options that are possible or assumed to be implemented, external factors that influence their performance (climate, economic conditions, etc.), projections or forecasts of the future (population growth rate, urbanisation rate, agricultural productivity, water use or demand rates, economic parameters, etc.), and government policy affecting either selection or performance.
<b>Stakeholders</b>	Individuals, groups, communities or governments who: (a) are affected or likely to be affected by the activities; and (b) may have an interest in the activities. The stakeholders of an activity will vary depending on the details of the activity.
<b>Water balance</b>	Comparison of the quantities of water supplied drained and removed that affect the change in storage over a certain period in a given area.
<b>Water demand</b>	Amount of water required to cover the needs of specific users or uses, including the environment.
<b>Water security</b>	The reliable availability of an acceptable quantity and quality of water for health, livelihoods and production, coupled with an acceptable level of water-related risks.

## CHAPTER 1: INTRODUCTION

---

### 1.1 BACKGROUND

Water plays a significant role in the national development of a country with respect to social, economic and environmental spheres. It is a social and economic good, which is critical for the sustainable development of the country. As a social good, water supports domestic needs, life and health, and as an economic good, water supports critical productive activities such as agriculture and industry, and is a major input in many productive sectors like agriculture, energy, processing and manufacturing, hospitality, mining, construction and transport. In addition, water provides critical environmental services like support to aquatic life and disposal of residuals (National Water Master Plan, 2013).

Kenya is a chronically water scarce country. This means that the demand for water is greater than the renewable freshwater resources that the country can access. A country is categorised “water-scarce” if its renewable freshwater potential is less than 1,000 cubic metres per capita per annum. Kenya’s natural endowment of renewable freshwater is currently at 650 cubic metres per capita per annum. A country is categorised “water-scarce” if its renewable freshwater potential is less than 1,000 cubic metres per capita per annum. By 2025, Kenya is projected to have a renewable freshwater supply of only 235 cubic metres per capita per annum. This compares unfavourably with the neighbouring countries of Uganda and Tanzania, which have per capita levels of 2,940 cubic metres and 2,696 cubic metres respectively. Estimates of water supply in the country indicate that only about 56 per cent of the population has access to safe water. Further exploration of water resource is limited and there is disparity in the distribution of water resources across the country (WASREB, 2018).

In terms of water resource management, the loss, depletion and degradation of water resources attributed to anthropogenic factors and climate change continues to affect the quantity and quality of water. Harvesting and storage of water in the country is still very low. This has been mainly due to weak investment and financing of requisite infrastructure as well as low adoption of appropriate technologies. In water supply and sanitation services, there is increasing demand for water due to rising population and expansion of economic activities across sectors. The sewerage coverage is low besides rapid increase in urbanisation. According to the Impact report no. 10 (WASREB, 2018), there is still inefficiency in operations of water service institutions.

Lack of a clear national investment plan for the sector, coupled with inadequate public financing resources and limited stakeholder participation, especially the private sector has led to minimal achievements in the fulfilment of investment and financing requirements. In addition, water has not been adequately priced as an economic good; this hinders self-financing as a strategy for sustainable service. The sector has not fully explored alternative sources of funds such as through climate finance, as well as models of financing including enabling subsidies, that allow water access for the vulnerable and underserved while still allowing for full cost-coverage (WASREB, 2018).

The Water Act, 2016 mandates the Water Resources Authority (formerly Water Resources Management Authority) to manage, regulate and conserve all water resources in an effective and efficient manner by involving the stakeholders, guaranteeing sustained access and equitable allocation of water while ensuring environmental sustainability (Water Act, 2016). To do this effectively, the Water Resources Authority (WRA) has divided the country into six water catchment areas, namely Athi Catchment Area (ACA), Ewaso Ng’iro North Catchment Area (ENNCA), Lake Victoria North Catchment Area (LVNCA), Lake Victoria South Catchment Area (LVSCA), Rift Valley Catchment Area (RVCA) and Tana Catchment Area (TCA) (National Water Master Plan, 2030).

One of the statutory ways to promote an effective catchment management strategy is for WRA to 'provide mechanisms and facilities for enabling the public and communities to participate in managing the water resources within each catchment area'. One such mechanism is the establishment of Water Resource User Associations (WRUAs). The Water Resources Management Rules, 2007 define WRUAs as 'an association of water users, riparian land owners, or other stakeholders who have formally and voluntarily associated for the purposes of cooperatively sharing, managing and conserving a common water resource'.

## 1.2 THE PROJECT

The Athi Catchment Area (ACA) (Figure 1) is a particularly water scarce catchment with a freshwater supply of 162 cubic metres per capita per year, which is far below the above-mentioned Kenya's endowment. Given this negative water balance, there is a need for additional effort to enhance the catchment's water availability. This situation is attributed to the fact that most areas in the catchment are arid and semi-arid with critically limited water resources. The catchment also suffers from frequent drought and flooding events exacerbated by climate change. During the long rainy seasons, extreme heavy rains give rise to bursting of the riverbanks especially in the upper and lower catchments. In order to implement the ambitious national socio-economic development strategy espoused in Kenya's Vision 2030, strengthen the resilience of water supply systems, ecosystems and communities' dependent on these water sources, there is a need for more efficient governance and management of the scarce water resources.

The National Environment Management Authority (NEMA), Kenya's nationally Accredited Entity (AE) to the Green Climate Fund (GCF), in collaboration with the Korea Environmental Industry and Technology Institute (KEITI), plans to contribute to these efforts through a proposed \$10 million project titled '**Enhancing the resilience of communities and ecosystems in the Athi River Catchment Area**'. This proposal was submitted to the GCF Secretariat in 2016.

The **objectives** of the proposed project are:

- To increase water security through Integrated Water Resource Management (IWRM); and
- To enhance the health and well-being of the vulnerable population within the ACA.

The draft proposal further outlines three key components around which the project is structured:

- Component 1:** Enhanced institutional governance and Integrated Water Resource Management
- Component 2:** Increased access to potable water for domestic and commercial use
- Component 3:** Strengthened adaptation planning, institutional and regulatory framework



Figure 1: Athi Catchment Area (NWMP, 2030)

### 1.3 THE ESMF

This feasibility study was commissioned as part of the requirements from GCF as part of the NEMA proposal. The GCF requires that environmental and social due diligence is undertaken on all activities proposed for GCF financing. The purpose of the due diligence is to ensure that these activities comply with their environmental and social safeguards.

The purpose of the ESMF is to ensure that planned activities and interventions under the project are undertaken in a manner that avoids and minimizes environmental and social impacts as much as possible. Where they cannot be avoided, the ESMF identifies and assesses such impacts and outlines

necessary mitigation measures following relevant Government of Kenya’s environmental and social legislation, and World Bank’s safeguards policies amongst others as well as international best practice. It summarises likely environmental and social risks and their mitigation measures that need to be specified and managed during project implementation.

Given the nature of the activities, this project is classified as Environmental Assessment Category B according to both World Bank and GCF safeguard policies (Figure 2). Category B Partial Assessment projects are likely to have limited environmental and social impacts, and these impacts will be relatively easy to mitigate and reversible. This calls for an ESMF that provides a general impact identification framework to assist project implementers to screen the projects and institute measures to address adverse environmental and social impacts.



Figure 2: Classification of environmental and social risks (GCF, 2015)

Specifically, the main purpose of this ESMF is to:

- Establish clear procedures and methodologies for the environmental and social assessment, review, approval and implementation of investments to be financed under the project under Component 2;
- Specify appropriate institutional arrangements for managing and monitoring environmental and social concerns related to project investments;
- Determine the training, capacity building and technical assistance needed to implement the provisions of the ESMF.

Thus, in summary, the ESMF will document all key potential environmental and social issues related to project implementation as per GCF requirements. Preparation of Environmental and Social Impact Assessment (ESIA) study report will be undertaken at a later stage prior to implementation of some activities.

The Project Implementation Unit (PIU) and the management consultants will use and refer to this ESMF during implementation of the Project. Environmental and Social Management Plans (ESMPs) will be prepared during project implementation following guidelines in the ESMF. It remains the responsibility of the relevant safeguard officers of the PIU and management consultant to ensure that the necessary mitigation plans are developed and adhered to by the beneficiaries.

## 1.4 ESMF METHODOLOGY

### 1.4.1 *The Approach*

This ESMF has been prepared in line with the relevant GCF safeguard policies on environmental and social management and the Government of Kenya regulations. It describes the planning process concerning environmental and social issues, including screening, preparation, implementation, and monitoring of all project components and sub-components to ensure full compliance with the agreed guidelines.

In preparing the ESMF, the following approach was taken covering five phases:

- Phase 1:** Initial consultation with the PIU and the preparation of the inception report;
- Phase 2:** Conducting a stakeholder assessment and engagement, which provided guidance in the type, relevance and level of consultations to be undertaken with the different stakeholders;
- Phase 3:** Describing and developing a baseline of the biophysical characteristics and the socio-economic conditions within the catchment. This helped to provide an overview of the natural resources (including water), as well as the linkages to livelihoods within the Upper ACA;
- Phase 4:** Review of the different options and scenarios and the external factors that may affect their performance thus informing decision-making; and
- Phase 5:** Developing the ESMF and Terms of Reference (ToR) following consultations with and disclosure to various stakeholders and its finalisation.

The five phases described above entailed the following activities: detailed desk study literature review, coupled with consultation and engagement of appropriate stakeholders, environmental screening and scoping, analysis of potential impacts and mitigation measures, preparation of an ESMP, review of feedback from stakeholders including validation workshops, and the preparation and submission of reports.

### 1.4.2 *Screening and Scoping*

A comprehensive desk review was undertaken by combing through available documents, such as policies, projects or reports relating to the ESMF within and around the ACA with a view to ensuring that all the existing information regarding past or existing social and environmental issues within the catchment are captured and inventoried.

Documents such as the Constitution of Kenya (2010), Water Act, 2016, Environmental Management and Coordination (Amendment) Act, 2015, County Government Act, 2012 and the National Water Master Plan (2030) not only helped to get an in-depth understanding of the national policies relating to water resources management, but also to learn about earlier interventions in the catchment. The assessment also referred to World Bank and GCF's Environmental and Social Safeguards (ESS) Policies. These Policies include; ESS1: Environmental and Social Assessment; ESS2: Labour and working conditions; ESS3: Resource efficiency and pollution prevention; ESS4: Community health, safety and security; ESS5: Land acquisition and involuntary resettlement; ESS6: Biodiversity conservation and sustainable management of living natural resources; ESS7: Indigenous peoples and ESS8: Cultural Heritage.

In addition, this ESMF is based on recommendations from the technical feasibility studies conducted on the project. These include the technical and economic analysis; evaluation of the impact of climate change; and the capacity building and institutional strengthening measures.



## Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL

### 1.4.3 Consultative Review

Consultation is a key component of the ESMF. A stakeholder assessment following the project inception phase was done in order to identify the key stakeholders for the project. In a scoping mission conducted by the ESMF team in July 2018 covering all four counties of interest (Nairobi, Nyandarua, Machakos and Kiambu), a first inventory was undertaken by the participants. This first mapping was used as input for the stakeholder analysis.

Several consultative forums were held targeting the identified stakeholders. These consultative forums were convened in order to jointly develop a methodology to identify the water structures that will undergo rehabilitation under the proposed project. They were held on 6 August, 10 September and 17 September 2018 in Nyandarua, Kiambu and Machakos County respectively, bringing together stakeholders from county government, regional agencies and water companies.

The research included the use of participatory and interactive tools to allow in-depth generation of information. The tools used include interviews, FGDs and a semi-structured and flexible “interview guide” to capture diverse perspectives of stakeholders, but also draw out views around certain structured questions based on the key evaluation questions. Comprehensive literature relating policies, legal and regulatory frameworks and other relevant documents were reviewed to support the triangulation with the primary information collected from the respondents. The details of how each tool was utilised and the kind of information collected are highlighted below.

At national level data collection was aimed at understanding the intentions behind IWRM assessing the strengths and gaps, identifying government initiatives to fill legal and regulatory gaps, determining the role of present and future institutions and their relevance in relation to various aspects of sustainable catchment management, including potential impacts of water storage infrastructure. Among the stakeholders interviewed are officials from the Water Resources Authority, National Environment Management Authority and Water Resource User Associations. The list of stakeholders interviewed was generated mainly from the project Inception Report (KRC, 2018) which included an initial identification of relevant stakeholders. From the initial interview with WRA in Nairobi and subsequent interviews with county officials, other organisations and stakeholders relevant to the assignment were identified and approached. Most of these stakeholders were engaged for purposes of enriching information for the study.

At county level, an open-ended questionnaire was used to hold face-to-face interviews with the stakeholders. County government officials (Water and Environment department) in Nyahururu, Kiambu and Machakos and meteorological department were interviewed.

Data from Civil Society Organisations (CSOs) was collected by the use of semi-structured questionnaires. The data captured focused on their characteristics in terms of interests, impact, power dynamics, expectations and roles in the catchments and key social and economic issues. The open-ended questionnaire approach was used especially for organisations that were easily accessible. The consultants made follow up phone calls in a bid to fill identified information gaps.

At community level, the WRUAs were engaged through FGDs. Three FGDs were conducted in Nyandarua, Machakos and Kiambu Counties. Nine to thirteen members were mobilised for each FGD totalling to 18 women and 34 men, including youths. Discussions in the FGDs helped to understand the existing community efforts and perceptions towards the proposed project related to social and economic issues.



*Figure 3: WRUA representatives from Kiambu with consulting team after an FGD*

In some of the areas visited, the consultants held unstructured group discussions, also referred to as spontaneous gatherings. These gave useful information on issues affecting the stakeholders engaged. The four target counties within the Upper ACA (Nyandarua, Kiambu, Nairobi and Machakos) were sampled for the stakeholder assessment. Nairobi being the capital city and centre of national operations, most of the stakeholders engaged addressed national level issues. See Annex E for a full list of officials engaged in the counties.

To map the stakeholders and their relationship to the ESMF and the proposed project interventions including catchment management, the following tools have been used:

- Stakeholder identification matrix:** this matrix is used to indicate the stakeholders' categories, sectors of intervention and interests as well as to map stakeholders' influence and interests based on their strengths and weaknesses. The tool facilitated the identification of stakeholders of relevance to the proposed GCF project, the power relations, and to advise NEMA and the stakeholder engagement plan.
- Power dynamics matrix:** In this matrix, the power relations have been mapped. This map has guided the ESMF in its engagement strategy.
- Operational stakeholder engagement plan:** this tool presents the recommended engagement strategy per stakeholder groups

Furthermore, a detailed description is made for most of the identified stakeholders (groups). This involves a detailed description of the stakeholder characteristics based on their interventions, geographical scope and expertise. The information generated aided in determining their level of influence and interests within the Upper ACA.

#### **1.4.4 Environmental Social Scanning and Field Surveys**

As part of the ESMF, it was necessary to analyse the environment including the biophysical and social characteristics of the project area that may influence the project either negatively or positively.

The focus of the environmental scan included an overview of the different options for the proposed project that would maximise the project benefits. These include climate or economic conditions, projections or forecasts of the future such as population and urbanisation growth rates, and water use

or demand rates, acceptability by neighbouring land users, and the government policy affecting either selection or performance of the option.

This helped to answer the following questions that are important for the ESMF process:

- What are the external factors that may influence project performance?
- What are the projections that are important to take into consideration when designing and implementing the project?
- What are the potential social issues that may affect either selection or performance of the project?
- What potential policy and legal issues may affect either selection or performance of the project?
- Will the proposed water structures have a positive or negative impact on the identified resource base?

#### **1.4.5 Public consultations and/or Workshops**

According to WRM rules (Republic of Kenya, 2007c), a stakeholder is a person or entity which has influence over or is affected by a certain activity on a resource.

Engaging stakeholders in the ESMF process helped to:

- Raise the awareness and create greater understanding for the proposed project, its potential and the limitations, as well as for the work at hand;
- Facilitate the buy-in or commitment of stakeholders to the plans under development and water resources management; and
- Create mechanisms and processes acceptable to water users and other stakeholders and further institutionalised within the catchment for purposes of conflict resolution, water regulation and enforcement and other water management measures.

Throughout the ESMF planning process, stakeholders were engaged in the process by:

- Providing information to assist them in understanding the problem, opportunities, threats, solutions and options [**inform**];
- Obtaining feedback on analysis, options and decisions as well as collecting input to the different steps [**consult**]; and
- Requesting for advice, suggestions and recommendations in identification of preferred options and in decision making including the validation workshops held in October 2018 [**collaborate**].

Discussions with user groups, specifically WRUAs were held in order to further understand stakeholder perspectives, aspirations and needs. Interviews with relevant technical officers from WRA, NEMA and respective county governments were also held.

#### **1.4.6 Reporting**

The reports described under Section 1.4.1 were developed at timeframes agreed during the inception phase in July 2018.

The reports share the findings from the stakeholder mapping and analysis conducted in the Upper ACA, and further the results of the different approaches used to conduct the assessment. In particular, this ESMF report paints a picture of the Upper ACA's current institutional set-up and identifies stakeholders involved in natural resources management, water supply and water resources management and potential environmental and social issues in order to understand the challenges and needs related to implementation of Component 2 of the proposed GCF project.

## CHAPTER 2: PROJECT DESCRIPTION

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### 2.1 PROJECT LOCATION

The Athi Catchment Area (ACA) (Figure 1) covers an area of 58,639 km<sup>2</sup> (approximately 10% of land surface in Kenya). It comprises the southern part of the country, east of the Rift Valley draining the southern slopes of the Aberdare Ranges and the flanks of the Rift Valley, to form the Athi River. It then flows along the catchment area boundary with the Tana Catchment Area, and pours into the Indian Ocean in the north of Malindi (WRA, 2017).

Administratively, the catchment area covers thirteen counties: Nairobi, Makeni, Taita Taveta, Kwale and Mombasa Counties, part of Kiambu, Machakos, Murang'a, Kajiado, Kilifi, Kitui, Tana and Nyandarua Counties. Athi River being the only major river traversing the catchment is approximately 591 km long with an average width of 44.76 m, mean depth of 0.29 m and average flow rate of 6.76 m<sup>3</sup>/sec.

The Upper ACA (Figure 4), which is the area of interest, is bounded by latitudes 1° to 4.5° South and Longitudes 37° to 40° East, and ranges in altitude from 2,600 m to 1,500 m mean above sea level. It extends from the Ngong Hills and parts of Aberdares in the North West. It abuts the Rift Valley to the west, the Yatta Plateau to the east and the Indian Ocean to the South East (Kanyi, 2015). The area is a high potential agricultural, residential, commercial and industrial area and hosts major urban centres including the capital city, Nairobi and the fast growing Kiambu, Machakos and Nyandarua Counties. It experiences average rainfall of 700 mm per annum. Its climate varies from sub-humid in the upper zones to semi-arid in the lower zones (WRMA, 2012).

Presently, the catchment area is experiencing enormous challenges including competition for, and conflict over water, weaknesses in water allocation and administrative procedures, particularly compounded by the devolved system of governance in Kenya, catchment degradation resulting from poor land use, uncoordinated water resources management and climate change impacts. These challenges have left communities, especially the poor and vulnerable, whose lives and livelihoods are increasingly under threat from disasters, the impacts of degraded ecosystems and climate change, pointing to the need to strengthen regional and county mechanisms to prevent, respond to and recover from these vulnerabilities.



*Figure 4: Upper Athi Catchment Area (KRC, 2018)*

## 2.2 THE PROPONENT AND KEY STAKEHOLDERS

As the GCF accredited entity, NEMA will be responsible for the implementation of the project and thus the key project proponent. The Authority will play a key role in project management (overall project planning, execution, coordination, monitoring and evaluation of the project), reporting (preparation and submission of reports to the GCF and the PIU), and budgeting and auditing (preparation and approval of work plans submitted by implementing entities).

Key stakeholders include:

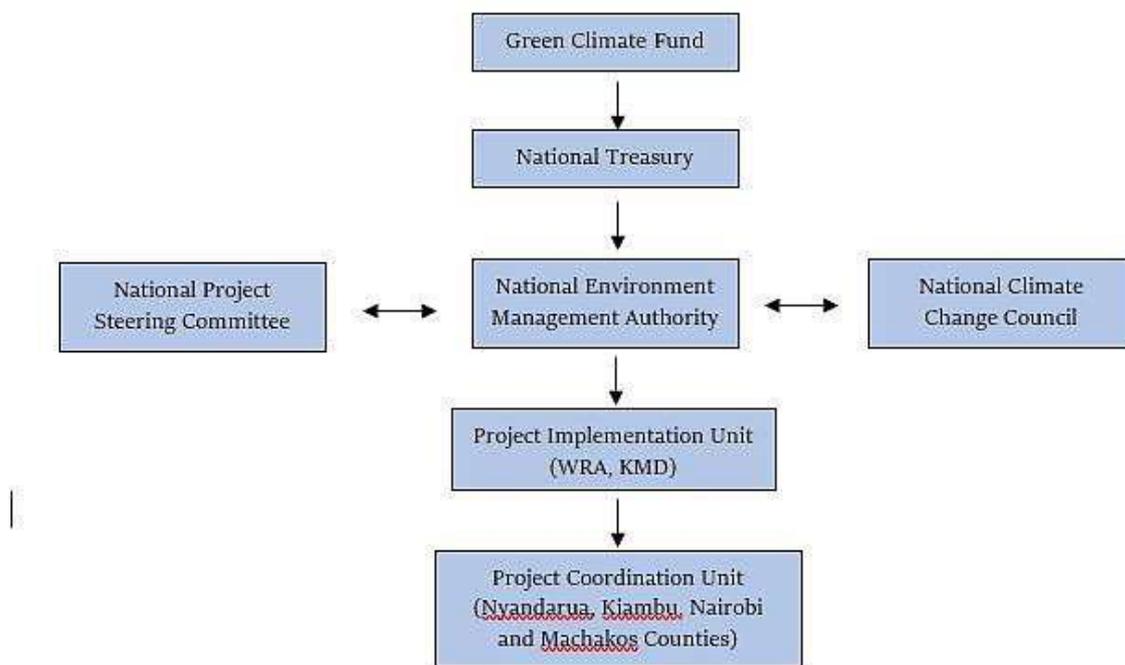
**The National Climate Change Council** – Will provide guidance in the implementation of the obligations and functions under the Climate Change Act, 2016 within the project.

**The Project Implementation Unit (PIU)** – Composed of WRA and Kenya Meteorological Department (KMD), the PIU will be responsible for the collection and analysis of hydro-meteorological and water flow information and data from local stations within the Upper ACA.

**The Project Coordination Unit (PCU)** – Composed of the WRA sub-regional manager, County Director of Water, Director of Meteorology and NEMA County Directors of Environment from the four counties within the Upper ACA (Nyandarua, Kiambu, Machakos and Nairobi).

**Affected communities** – These are the communities residing within the Upper ACA. Communities also includes institutions such as schools and hospitals who will benefit from the improved water supply.

The figure below illustrates the institutional arrangements that will deliver the project as key stakeholders described above.



*Figure 5: Project Implementation Arrangements*

## 2.3 PROJECT JUSTIFICATION

The development and management of water resources in Kenya is based on the view that water is a social good and a catalyst for economic development. The current access to potable water in the country is estimated at about 88 percent in urban areas and approximately 44 percent in the rural areas while the national average stands at about 57 percent. Additionally, the level of funding in the water sector is not sufficient to meet the growing water demands. The annual budget for the water sector is estimated at approximately 2.8 percent of the national budget, which covers around 44 percent of the required investment cost. Water resources conservation is also severely underfunded. This is despite the persistent water crisis that has been attributed to environmental destabilisation such as deforestation and watershed degradation. Since the effects of climate change are also predicted to increase the intensity and frequency of flood-drought cycle in Kenya, the low adaptability by the sector management due to insufficient funds is projected to decrease water quality and lower water resources availability in the country (KEITI, 2018).



## Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL

This project responds to this need. Investments in adaptation measures and mainstreaming climate change and risk management into water resource management will strengthen the climate resilience of communities in the catchment, economies, and ecosystems, improve effectiveness and enhance adaptive capacity of communities while also providing livelihoods and reducing poverty.

On direct benefits, the project expects to target 120,031 individuals through increased access to water sources i.e. water storage, rainwater harvesting and rehabilitation of degraded structure. This increased access to water for most of the year will reduce cases of waterborne diseases, household costs of treatment and time taken to fetch water in the short to medium term. Improved health will reduce the vulnerability of communities and over time increase their resilience. If the project is not realised, then the residents in the Upper ACA will be less capable of adapting to risks brought about by climate change. Besides this, the realisation of this project is important in closing the gap in the water demand ratio of 76 percent, which is much larger than ratios of other catchment areas in Kenya.

Further benefits of the project include improved capacity of institutional and regulatory systems for climate-responsive planning and development; increase in generation and use of climate information in decision-making; strengthened adaptive capacity and reduced exposure to climate risks particularly of the most vulnerable population groups; and improved awareness of climate threats and risk-reduction processes. Moreover, strengthening the capacity of community level institutions such as WRUAs will improve their capabilities to participate actively in decision-making processes regarding water resources management and catchment conservation.

### 2.4 PROJECT AREAS AND SITES

As indicated in Chapter 1 of this report, this Project focuses on the Upper ACA, with the counties of interest being Nyandarua, Kiambu, Nairobi and Machakos.

‘Traveling throughout the catchment (Figure 6) offered an opportunity to see the many ways in which natural resources are used, observe the factors that govern the natural resource use and hydrology of the catchment such as soils, land cover and land use, topography and the river network. Coordinates of the project sites are provided in Annex F.

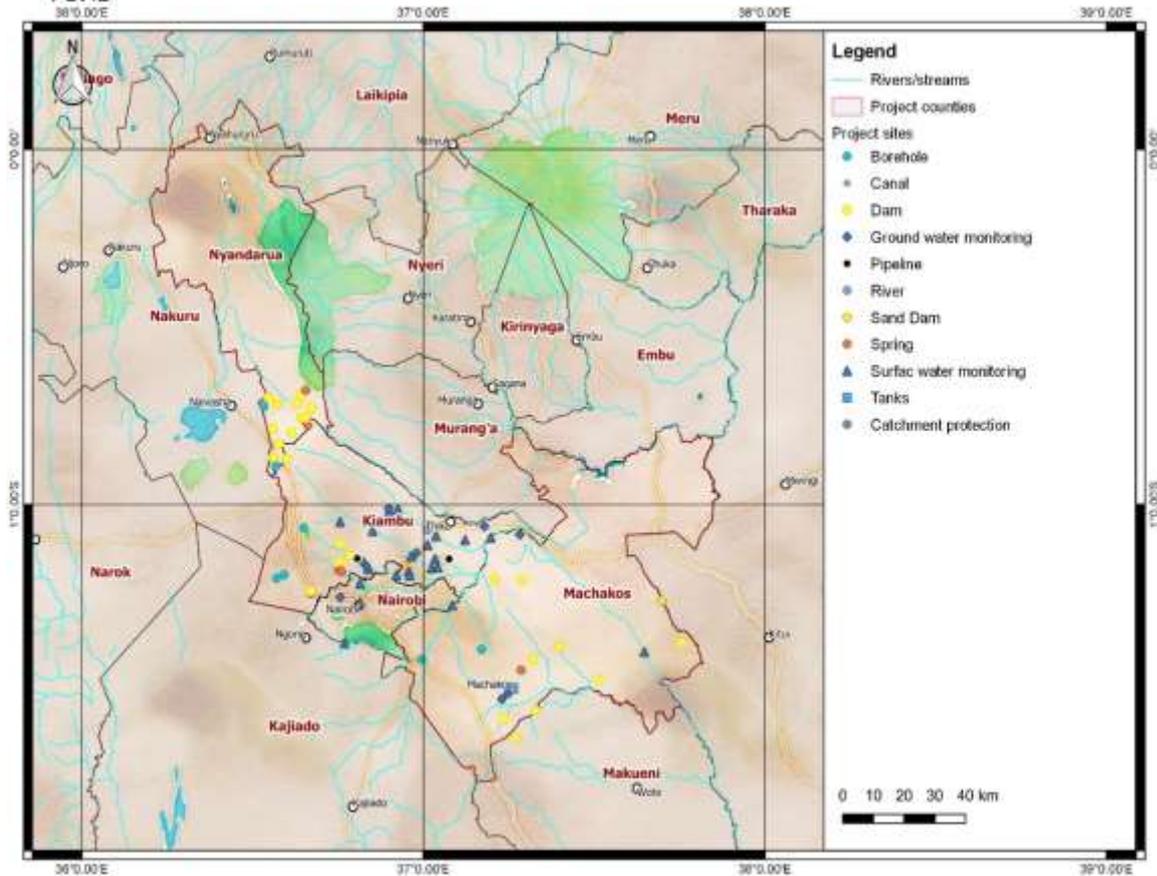


Figure 6: Sites sampled throughout the catchment area (KRC, 2018)

Therefore, based on the above, and in order to achieve the set objectives outlined under the project, for Component 2, forty-six (46) sites were identified for either rehabilitation or construction through a collaborative process led by NEMA and the county governments of Nyandarua, Kiambu and Machakos. The criteria used included potential coverage, equitable allocation of water and financial and environmental considerations. A summary of the identified interventions is provided in Figure 7 below.

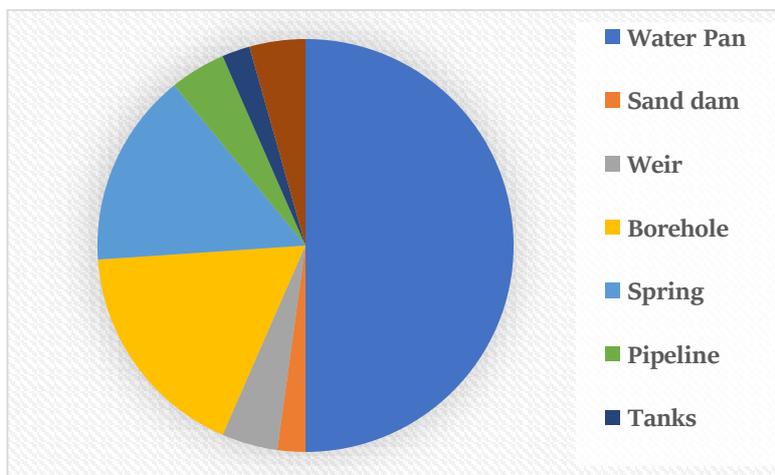


Figure 7: Distribution of the various types of structures assessed in Upper ACA (KRC, 2018)

## 2.5 ANALYSIS OF PROJECT ALTERNATIVES

As part of the ESMF, alternatives to the proposed project have been identified. These alternatives should serve as a baseline for further analysis by the ESIA consultant when assessing the potential environmental and social impacts of specific projects.

Only the best alternative should be selected based on analysis of the potential impact (less negative) and the effectiveness of the resources (cost-benefit analysis). The following alternatives were considered:

- No project alternative;
- Streaming vs Reservoirs vs Groundwater;
- Sitation of water infrastructure; and
- Design alternative.

### 2.5.1 *No Project Alternative*

A no project alternative is an important analysis as it provides the PIU with a scenario that enables them to measure the impacts from the project, against those that would have taken place without the project. It implies that the status quo is maintained and no action is taken to strengthen community and ecosystem resilience through development of the water infrastructure, protection of catchment area and its associated distribution network.

The Project's direct beneficiaries are 120,031 individuals, who will be reached through increased access to water sources. This increased access to water for most of the year will reduce cases of waterborne diseases, household costs of treatment and time taken to fetch water in the short to medium term. Improved health will reduce the vulnerability of communities and over time increase their resilience. If the project is not realised, then the residents in the Upper ACA will be less capable of adapting to risks brought about by climate change. Besides this, the realisation of this project is important in closing the gap in the water demand ratio of 76 percent, which is much larger than ratios of other catchment areas in Kenya.

Further benefits of the project include improved capacity of institutional and regulatory systems for climate-responsive planning and development; increase in generation and use of climate information in decision-making; strengthened adaptive capacity and reduced exposure to climate risks particularly of

Accepting the no project option will mean that the targeted populations will continue to suffer from inadequate and unreliable water supply. This also means that the local communities will potentially miss development opportunities that the project could bring including access to water and economic opportunities through project construction and operation including employment and small business opportunities.

Because of the above, the no project option has been discounted because it is unfavourable from both a local and a global environmental perspective. It will negate the potential benefits to the affected communities and the country as a whole.

### 2.5.2 *Streaming vs Reservoirs vs Groundwater*

The baseline ecosystems and environment conducted as part of this study identified several options to meet the water demand in the four counties. These include run of the river system or streaming; reservoirs or impoundment; groundwater and rainwater harvesting.

Within the catchment, there are several surface water resources, most of which are seasonal. These rivers and streams do not contain enough flows to support run-of-the-river supply to meet the projected water demand. This means that this option is not viable.

However, reservoirs in the form of water pans, sand dams and weirs that can retain vast quantities of water allowing them to act as effective and steady sources of water for domestic and industrial use and irrigation with minimal seasonal fluctuations are seen as a viable option.

Groundwater sources are also an additional option. The average drilling depth of boreholes in the catchment is between 40 and 120 m. Boreholes are considered functional when providing a minimum of 0.5 cubic metres/h. Yields and abstraction depths of deep groundwater are very different per location as water is abstracted from fractures, i.e. small groundwater pockets with differing hydrogeological characteristics. Data indicates that yields are slightly higher and boreholes less deep in Kiambu County. However, groundwater assessments should be conducted to ascertain viability.

The sites identified for either rehabilitation or construction is provided in Figure 7. The criteria used included potential coverage, equitable allocation of water and financial and environmental considerations.

### 2.5.3 *Sitation of Water Infrastructure*

Alternative site location is one of the options considered for this project. In this case, the interventions include rehabilitation and sinking of new boreholes, rehabilitation of water pans and earth dams, protection of springs, catchment protection, and installation of water tanks in public utilities such as schools and hospitals. Since the focus is largely on rehabilitation of existing structures, issues of sitation and review of options are considered from the viewpoint of suitability, efficiency and effectiveness. These interventions are subsequently discussed per type.

#### **a) *Water pans***

These are small reservoirs created by excavating open ground, to collect and store surface runoff from uncultivated grounds, from hillsides, roads, rocky areas and open rangelands. Pans rely wholly on surface runoff and do not receive groundwater contribution.

Some of the questions considered in determining the viability of this option include:

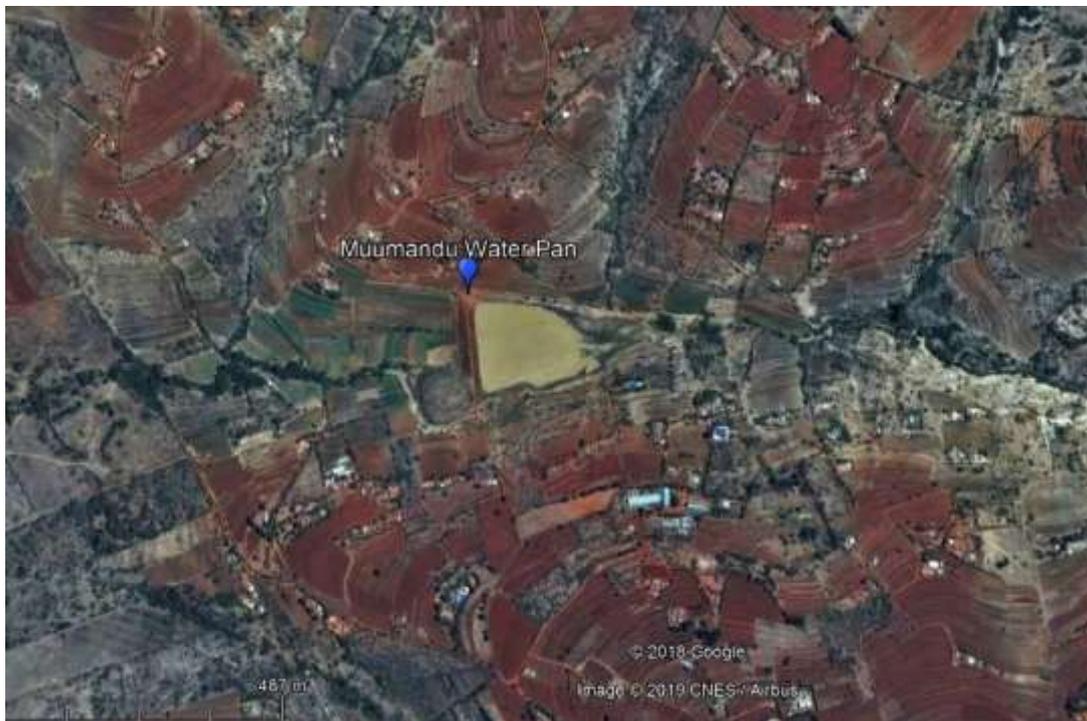
- Water quality:** Will the water be clean enough? If not, how can the quality be improved?
- Catchment topography:** How much time will rain take to reach the reservoir?
- Water quantity:** How much water will the water source provide? What is the soil type and catchment that would influence the amount of water to reach the reservoir?
- Project cost:** What are the project costs and is it affordable?
- Social and Environmental impact:** Will the project have any major impact on the environment? Are there any laws, cultural or ownership issues associated with the project that need to be addressed?

The bunds of the selected water pans are located where maximum storage volume is obtained for minimum volume of earth fill. Additionally, the streambed is composed of consolidated and nearly impervious formation. Generally, the major costs for a water pan are met at the time of construction or rehabilitation, but the benefits can be calculated over the life of the reservoir of at least 10 years or more, assuming that it will eventually fill with silt.

Economic benefits include the value of labour and time saved fetching water for domestic use, and watering livestock. Benefits may also result from improvements in the condition of livestock and small stock, cash from sale of irrigated farm produce and value of food grown.

Given the foregoing, twenty - three water pans have been identified for rehabilitation within the Upper ACA. Due consideration was made to the above. Figure 8-12 below presents imagery of some of the water pans and weirs that will be rehabilitated.

**i) Muumandu Water Pan**



*Figure 8: Muumandu Water Pan in Machakos County (KRC, 2018)*

ii) Kahora Water Pan



Figure 9: Kahora Water Pan in Nyandarua County (KRC, 2018)

iii) Rungiri Water Pan



Figure 10: Rungiri Water Pan in Kiambu County (KRC, 2018)

The images of the three water pans above are representative of the other nineteen to be rehabilitated as part of the project. Most of them are located in areas of clusters of family homesteads, which are widely scattered and confined within the elevated zones away from the flood plains. According to the water rules and the wetlands regulations, the allowed buffer zone for this type of a water body is 30

metres, which in this case will be fenced off to restrict encroachment by the residents. It is important to note that all the water pans are located on public utility land.

**b) Weirs**

A weir (sometimes called an overflow dam), is a small dam created across a valley or river channel and often used to create an impoundment reservoir. The term weir is also sometimes used to describe the crest of an overflow spillway on a large dam. In most cases, weirs take the form of a barrier across the river that causes water to pool behind the structure (just like a dam), but allows water to flow over the top. Weirs are commonly used to alter the flow regime of the river, prevent flooding, and measure discharge. They are normally constructed using concrete, stone masonry or gabions. Most weirs are used to create a pool of water for abstraction purposes but they are also used for flow measurement. They are also used for drinking water supplies or to control flooding and to help render a river navigable (Bancy, 2016).

For this project, two weirs (Figure 11 and 12) will be rehabilitated, both in Kiambu County. The proposed rehabilitation measures include desilting and catchment protection. This will enhance their functions, including recharge of riparian lands and thus revegetation. This may also attract animals due to improved habitat, e.g. wildlife, birds, fish and other aquatic animals.



**i) Kamiti River Weir**

*Figure 11: Kamiti River Weir in Kiambu County (KRC, 2018)*

ii) **Riara River Weir**



Figure 12: Riara River Weir in Kiambu County (KRC, 2018)

c) **Sand dams**

A sand dam is a reinforced stone-masonry wall (or similarly robust and impermeable weir) built across a seasonal, sandy riverbed and is one of the world's lowest-cost rainwater harvesting solutions. Sand dams are a simple, robust, low maintenance, rainwater-harvesting technology that provides a clean, year-round, local water supply for domestic and productive uses and are widely suited to dry land regions. They act as a catalyst for wider development. Sand dams provide water for livestock, small-irrigated horticulture and, for fishponds, tree nurseries and fruit orchards. They recharge the aquifer and rejuvenate the riverine ecology enabling fodder crops to be grown along the banks (Maddrell and Neal, 2013).

Sand dams are particularly well suited to a model where a community group builds, owns and operates the dam. This is the case with Ikombe sand dam in Machakos County, which is one of the water infrastructures that will be rehabilitated under this project.

The study team reviewed the following conditions at the Ikombe sand dam for purposes of assessing viability:

- Situation on a river with clearly defined riverbanks;
- A sufficiently impermeable riverbed, which can retain water;
- Sufficient sandy sediment; and
- An accessible bedrock of no more than 3 metres below the existing riverbed surface



**a) Springs**

Springs occur where groundwater emerges at the surface because a layer of hard rock prevents seepage downwards or because the water table is high enough to intersect a depression in the local topography. Protected springs are equipped with a masonry wall and a pipe that is set at sufficient height to allow a bucket or container to be placed below. Many of the springs within the Upper ACA are insufficiently protected. For safe water supply, it is essential to protect the spring catchment and springhead from pollution. A sample design of a protected spring is provided in Figure 14. Further below (Figure 16 and 17), the imagery shows location of two of the springs of interest for the project.

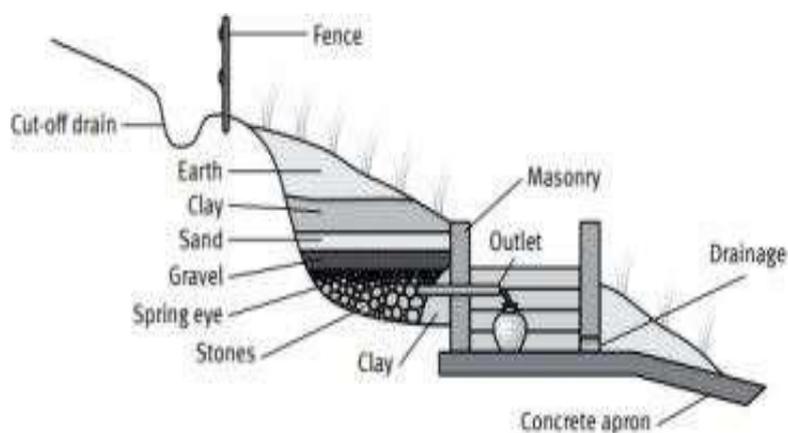


Figure 14: Sample design of a protected spring (WaterAid, 2013)

i) **Kikuyu Springs**



Figure 15: Kikuyu Springs in Kiambu County (KRC, 2018)

ii) **Kahungura Springs**



Figure 16: Kahungura Springs in Nyandarua County (KRC, 2018)

**b) Boreholes**

Seven out of 9 boreholes are proposed to be rehabilitated and the remaining newly constructed. These structures are expected to serve about 16,850 households with clean water supply. Currently, most of the communities in the catchment area rely on rainwater harvesting or unsafe water sources. Development of these structures will provide potable water for domestic use as well as serve as source of water for livestock. In Kiambu and Machakos, the water will also support small-scale irrigation currently been practised around the structures. Additionally, the computed catchment area of nine borehole project sites range 233 to 666 ha.

Some of the things to consider when siting these borehole sites include sufficient yield for the intended purpose, appropriate water quality for the intended purpose, avoidance of potential sources of contamination, proximity to the point of use, accessibility for construction and avoiding other groundwater sources.

The locations of the catchment areas of some borehole sites are shown in Figure 17-19.

**i) Koinange Borehole Site**



Figure 17: Koinange Borehole site in Nyandarua County (KRC, 2018)

**ii) Loromo I and II Borehole Site**

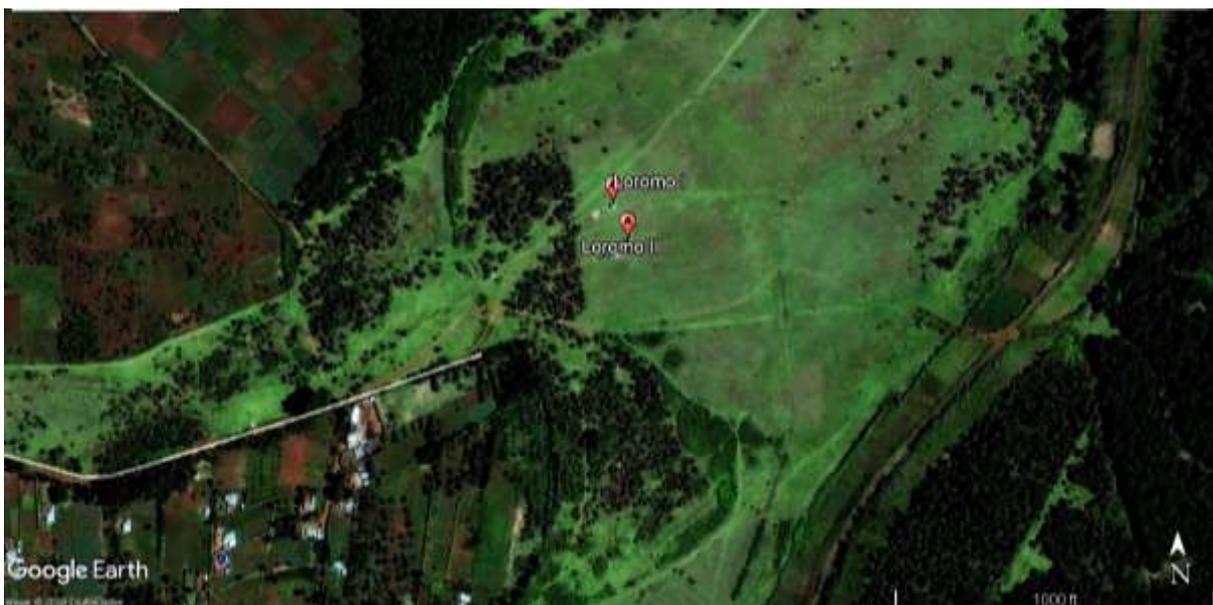


Figure 18: Loromo I and II boreholes in Kiambu County (KRC, 2018)

iii) **Nguirubi Borehole Site**

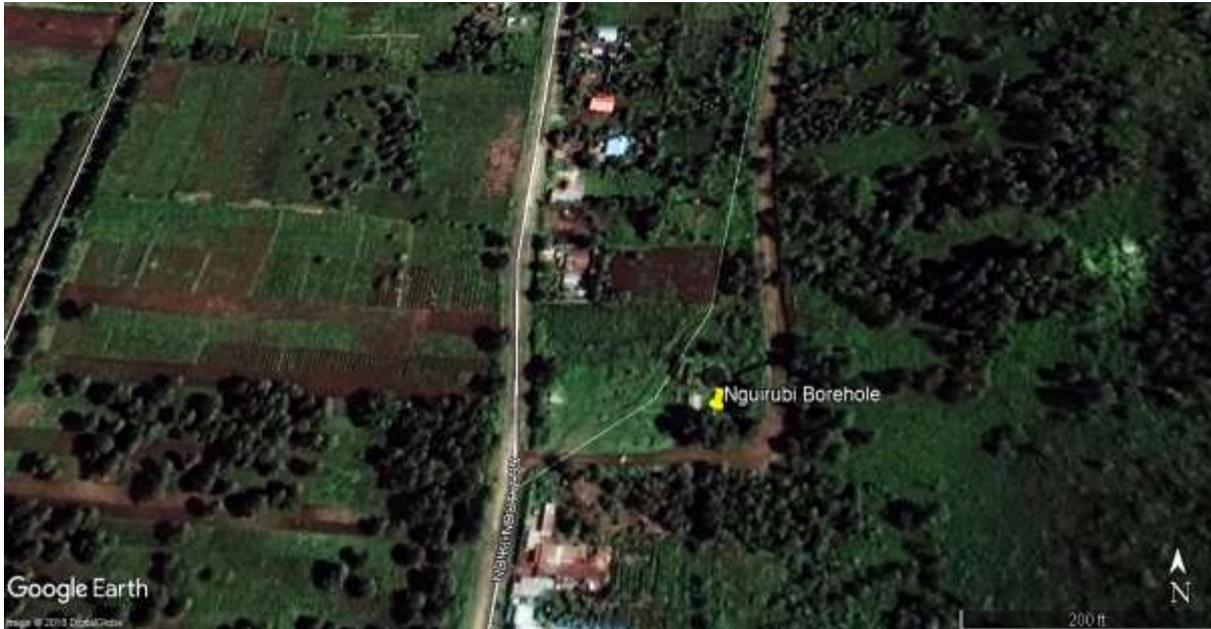


Figure 19: Nguirubi Borehole site in Ndeiya, Kiambu County (KRC, 2018)

**c) Catchment Protection**

Catchment protection is also required to reduce soil erosion and siltation of water reservoirs. The protection can consist of digging trenches, making terraces and planting of grasses or trees in rows along the contours. It also includes the building of check dams and silt traps in gullies. All land-users in a catchment area should be encouraged to participate in all the soil conservation activities, including the maintenance of structures and vegetation cover.

It is important to implement catchment protection, also called soil conservation, on the land from where rainwater runs off into the dam reservoirs. This is a function of County governments in line with the Water Act, 2016.

For reservoirs situated on sandy soils, a thin layer of siltation is beneficial because the silt seals the floor of a reservoir against seepage.

**2.5.4 Design options**

According to a feasibility study on the project conducted by ASAL (2018), the basic principle of designing the water infrastructure in section 2.4 was to produce satisfactory, functional structures at a minimum total cost.

Due consideration was given to maintenance requirements so that savings achieved in the initial cost of construction do not result in excessive maintenance costs. Maintenance costs vary with the provisions of upstream and downstream slope protection, drainage features, and the type of appurtenant structures and mechanical equipment. To achieve minimum cost, the listed water infrastructure has been designed with the idea of making the most economical materials available, including materials excavated for its foundations and for appurtenant structures.

Consequently, design is closely linked to the FIETS<sup>1</sup> sustainability principles of water supply infrastructure. Other than issues to do with economics described above, the most preferred option is the use of technologically sound materials that will conserve energy and ensure social inclusion components are taken into consideration. This means that modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements should be used. Equipment that saves energy and water should be prioritised without compromising on cost or availability factors.

The use of locally sourced stones, cement, sand (washed and clean), metal bars, pipes and fittings that meet the Kenya Bureau of Standards requirements is recommended. Moreover, heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise.

Lastly, safety and stability are also key components for consideration in the design, construction, commission and operation phases of the project. Issues such as loading conditions brought about in constructing the embankments, controlling seepage flows and stability of the rims to prevent large waves that overtop the water pans should be taken seriously.

## 2.6 PROJECT COMPONENTS AND ACTIVITIES

### 2.6.1 Project Components

The Project comprises three components. Component 1 addresses the issue of institutional arrangements, while increasing water availability and provision of an enabling environment for community resilience are addressed under Component 2 and 3 respectively. These three components and their sub-components are detailed below.

#### **Component 1: Enhanced institutional governance and Integrated Water Resources Management**

- 1.1 Support the establishment of a National Information Centre for Integrated Water Resource Management
- 1.2 Establish modernised hydro-meteorological observation, monitoring, and testing systems and related networks
- 1.3 Support training and capacity building programmes

#### **Component 2: Increased access to potable water for domestic and commercial use**

- 2.1 Develop and upgrade water sources and infrastructure for domestic and commercial use
- 2.2 Support conservation of water catchment areas

#### **Component 3: Strengthened adaptation planning, institutional and regulatory framework**

- 3.1 Enhance compliance of water regulations within the project area and improve adaptation planning
- 3.2 Support development of County Environmental Action Plans (CEAPs) for water catchment conservation as an adaptive action
- 3.3 Facilitate development, review and implementation of Sub-Catchment Management Plans (SCMP)

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<sup>1</sup> See [https://akvopedia.org/wiki/FIETS\\_sustainability\\_principles](https://akvopedia.org/wiki/FIETS_sustainability_principles) for the **FIETS** (Financial, Institutional, Environmental Technical and Social) sustainability principles as developed by WASH Alliance

### 2.6.2 Project Activities

One of the requirements from GCF as part of its project implementation strategy includes a process of feasibility studies on the proposed project's sustainability (including justification showing effective and efficient use of resources in order to achieve set outcomes).

#### a) Feasibility Studies

Planning efforts have been conducted by the PIU and led by NEMA. This includes overseeing the following three feasibility studies, which have been conducted alongside the ESMF.

- Technical and Economic feasibility:** KRC and ASAL Envirotech Consult Ltd. conducted this feasibility study. It involved an analysis of water demand, water resources, and the various technologies for harnessing the water resources. Technical designs and cost estimates of the identified water infrastructure were also prepared taking into consideration the accessibility (quantity) and quality of the proposed water sources.
- Capacity building and institutional strengthening measures:** This feasibility study was conducted by KRC. Key areas for capacity strengthening for the different stakeholders involved in project implementation were identified and cost. This was done in a collaborative manner involving identification of issues and remedies by the stakeholders themselves.
- Gender mainstreaming:** This study included a review of the gender components in the Upper ACA and the impact of unsafe and unsustainable water supply for both men and women and was conducted by TUNAY Africa. A gender action plan has been developed. This is in line with GCF's Gender Policy and Action Plan, which provides for mainstreaming of equality considerations into the entire project cycle to enhance the efficacy of climate change mitigation and adaptation interventions.

#### b) Rehabilitation Phase

The rehabilitation phase will be implemented based on the recommendations from the feasibility studies. The scope of works for this phase includes the following works but not limited to:

- Clearing of the site
- Excavation of pan reservoirs
- Forming and compaction of embankments
- Excavation of spillways
- Excavation of cut off drains
- Fencing of the reservoirs
- Construction of watering troughs and community water points
- Erection of draw off intakes
- Restoration activities

#### c) Commissioning Phase

This phase involves handing over of the project to the proponents. All the necessary precautions such as evaluation for completeness, functionality and other environmental and safety concerns need to be taken into consideration by the PIU before the formal handover. There is also need for clarity on ownership, which is important in determining the next phase on operations and maintenance.

**d) Operations and Maintenance**

The proper operation of the water supply facilities will result in their optimum use, contributing to a reduction in breakdowns and maintenance needs. The PIU should ensure that the relevant authorities that will manage the water facilities after handover as provided for in the Water Act, 2016 have appropriate/adequate capacity and cost recovery measures to ensure availability of funds for operations and maintenance (O&M).

Moreover, there is a need to create and promote a sense of awareness of surrounding communities of the ownership and their responsibilities for O&M, and to further develop participatory management practices as well.

## 2.7 PROJECT ESTIMATED COST AND IMPLEMENTATION SCHEDULE

The rehabilitation works are expected to be completed within the four years of project implementation.

The cost estimate of implementing the activities under Component 2 is USD 6,826,421 (Six Million, Eight Hundred and Twenty-Six, and Four Hundred and Twenty-One).

The breakdown per county is provided in Table 1 below.

*Table 1: Project Cost Estimates*

County	Type of infrastructure	Status	Number	Provisional Cost (USD) <sup>2</sup>
<b>Kiambu</b>	Borehole	Rehabilitation	4	263,941
	Water pan	Rehabilitation	2	495,219
	Weir	Rehabilitation	2	303,902
	Spring	New	2	217,958
	Spring	Rehabilitation	2	416,862
	Pipeline	Rehabilitation	2	652,441
	Catchment protection <sup>*3</sup>	Rehabilitation	2	67,594
<b>Total</b>			<b>16</b>	<b>2,417,917</b>
<b>Nyandarua</b>	Water pan	Rehabilitation	12	1,838,021
	Spring	Rehabilitation	2	44,625
	Borehole	Rehabilitation	2	63,506
<b>Total</b>			<b>16</b>	<b>1,946,152</b>
<b>Machakos</b>	Borehole	New	2	225,450
	Water pan	Rehabilitation	9	1,542,143
	Spring	Rehabilitation	1	170,932
	Tanks (80)	New	1	428,274
	Sand dam	Rehabilitation	1	95,553
<b>Total</b>			<b>14</b>	<b>2,462,352</b>
<b>GRAND TOTAL</b>			<b>46</b>	<b>6,826,421</b>

<sup>2</sup> 1 USD = 103.3 KES

<sup>3</sup> Refer to section 2.5.3

## CHAPTER 3: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

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### 3.1 OVERVIEW

Kenya has approximately 77 statutes that guide environmental management and conservation. Most of these statutes are sector specific, covering issues such as soil and water conservation, protected areas conservation and management, endangered species, public participation, water rights, water quality, air quality, excessive noise control, vibration control, land use among other issues.

This section describes the relevant national policies, legislation and regulations pertinent to the ESMF and the proposed project. These frameworks are discussed concerning their relevance in supporting compliance in the design and implementation of the ESMF and indeed, the project. The section further highlights the GCF, World Bank and International Finance Corporation's Safeguard Operational Policies applicable to the project.

### 3.2 POLICY PROVISIONS

Since promulgation of the new Constitution of Kenya in 2010, policy and legislative developments have been directed at redefining the role of the state with separation of policy and regulation (state responsibility) from implementation (private sector and/or statutory bodies). At the same time, there has also been movement to redefine the role of the state vis-à-vis the individual and/or community groups. The new constitution and emerging policies have considerably strengthened community rights. This is important as developments such as the proposed project components can create environmental and social conflicts with the affected communities or individuals effectively delaying the project. This implies a need to engage the affected communities from the earliest stages of project planning.

#### 3.2.1 National Environment Policy, 2013

The National Environment Policy proposes a broad range of measures and actions responding to key environmental issues and challenges. It provides the framework for an integrated approach to planning and sustainable management of natural resources in the country. It also recognises the various vulnerable ecosystems and proposes various policy measures not only to mainstream sound environmental management practices in all sectors of society throughout the country but also recommends strong institutional and governance measures to support the achievement of the desired objectives and goal. Some of the issues addressed include environmental governance, biodiversity loss, climate change, energy and disaster management, environmental valuation and public participation, environmental education and awareness.

The implementation of the Environment Policy is guided by the following principles relevant to the project:

- a) **Environmental Right:** *Every person in Kenya has a right to a clean and healthy environment and a duty to safeguard and enhance the environment.*
- b) **Right to Development:** *The right to development will be exercised taking into consideration sustainability, resource efficiency and economic, social and environmental needs.*
- c) **Sustainable Resource Use:** *Environmental resources will be utilised in a manner that does not compromise the quality and value of the resource or decrease the carrying capacity of supporting ecosystems.*
- d) **Equity:** *The management of the environment and natural resources will ensure equitable access to resources for present and future generations.*

- e) **Public Participation:** *A coordinated and participatory approach to environmental protection and management will be enhanced to ensure that the relevant government agencies, county governments, private sector, civil society and communities are involved in planning, implementation and decision-making processes.*
- f) **Precautionary Principle:** *Where there are credible threats of serious or irreversible damage to key environmental resources, lack of full scientific certainty will not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*
- g) **Polluter Pays Principle:** *The polluter and users of environmental and natural resources shall bear the full environmental and social costs of their activities.*
- h) **Good Governance:** *Rule of law, effective institutions, transparency and accountability, respect for human rights and the meaningful participation of citizens will be integrated in environmental management.*
- i) **Benefit sharing:** *Where benefits will accrue from utilisation of biodiversity, these will be shared to promote conservation and sustainable use of biodiversity.*
- j) **Community Empowerment:** *Communities will be involved in decision-making and empowered in the implementation of such decisions.*

**Relevance:** As the principal guiding document on all environmental matters, the proposed project should be implemented especially in conformity with principles above.

### 3.2.2 Draft National Water Policy, 2018

The Fifth draft water policy will replace the 1999 National policy on water which gave rise to the Water Act 2002, triggering positive reforms in the water sector. It recognises that a number of gains have been made since 1999, especially in relation to institutional framework through establishment of relevant institutions, water resource management, water harvesting and storage, access to improved water and sanitation services as well as improvement in corporate governance and creating linkages within the sector and with other sectors. However, it also takes full cognisance of the fact that the sector has not attained its full potential manifested in failure to meet sector targets envisioned in the country's Vision and sector strategy documents. The policy espouses regional and international aspirations, especially as envisioned in the Sustainable Development Goals, African Agenda 2063 and East African Community Vision 2050 (MoWS, 2018).

The policy has identified eight (8) overall policy statements responding to eight (8) key areas of focus namely: water resource management; water harvesting and storage; water and sanitation services; education, training, research and innovation; emerging and cross cutting issues like climate change, affirmative action and dispute and conflict resolution; institutional framework; investment planning, resource mobilisation and financing; and implementation framework. The policy has also set a clear sector goal accompanied by seven (7) specific objectives and nine (9) guiding principles that the sector players need to familiarise with and observe.

**Relevance:** The goal of this policy is to guide the achievement of sustainable management, development and use of water resources in Kenya. It also provides a framework for sustainable management and financing of water resources; water harvesting and storage; and for equitable, efficient, and universal access to water supply and reasonable standards of sanitation, for domestic, economic use and ecosystem sustenance. This is directly aligned to the key outcomes of the proposed GCF project on strengthening resilience of communities and ecosystems in the Upper ACA.

### 3.2.3 National Land Policy, 2009

This Policy guides the country towards efficient, sustainable and equitable use of land for prosperity and posterity. One of the policy principles is that of conservation and management of land based natural resources, the principle of protection and management of fragile and critical ecosystems including wetlands and arid lands.

Chapter 4 of the policy advocates for environmental assessment and audit as a land management tool to ensure environmental impact assessments and audits are carried out on all land developments that may degrade the environment and take appropriate actions to correct the situation. Public participation has been indicated as key in the monitoring and protection of the environment. Chapter 4 further advocates for the implementation of the polluter pays principle that ensures polluters meet the cost of cleaning up their pollution and encourages the use of cleaner production technologies.

Chapter 6, Section 3.6 under land issues requiring special intervention, which asserts, “Land rights of minority communities shall be protected through a law to be passed specifically to secure their rights as individuals and groups and recognition of their resource management systems to ensure sustainability. There is recognition of the need to protect vulnerable groups such as subsistence farmers, pastoralists, hunters and gatherers, agricultural labourers, unskilled workers, unemployed youth, persons with disabilities, persons living with HIV and AIDS, orphans and the elderly.

**Relevance:** The ESMF includes an ESMP, which proposes measures to ensure the project interventions linked to Component 2 do not cause harm. In addition, health and safety measures will have to be maintained in proximity of the affected waterways.

### 3.2.4 National Forest Policy, 2005

The goal of this Policy is to enhance the contribution of the forest sector in the provision of economic, social and environmental goods and services. The specific objectives of this policy are to:

- Contribute to poverty reduction, employment creation and improvement of livelihoods
- through sustainable use, conservation and management of forests and trees;
- Contribute to sustainable land use through soil, water and biodiversity conservation, and tree planting through the sustainable management of forests and trees;
- Promote the participation of the private sector, communities and other stakeholders in forest management to conserve water catchment areas, create employment, reduce poverty and ensure the sustainability of the forest sector;
- Promote farm forestry to produce timber, wood fuel and other forest products. Promote dryland forestry to produce wood fuel and to supply wood and non-wood forest products;
- Promote forest extension to enable farmers and other forest stakeholders to benefit from forest management approaches and technologies; and
- Promote forest research, training and education to ensure a vibrant forest sector.

**Relevance:** The ESMP proposes measures to ensure the project interventions linked to Component 2 do not cause negative impacts to forested lands. In addition, attention is paid to the specific objectives of the policy, in line with the programme’s plan.

### 3.2.5 Kenya Vision 2030

The economic, social and political pillars of Kenya Vision 2030 are anchored on Macro-economic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the



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poor; infrastructure; energy; science, technology and innovation; land reform; human resources development; security as well as public sector reforms.

During the Medium-Term Plan III period (2018 – 2022), the Environment, Water and Sanitation Sector will focus on the following:

- Conservation and management of water catchments and wetlands through programmes such as the Rehabilitation of urban rivers and protection of water towers.
- Management of water resources and sanitation through the Water Resource Management Programme and Irrigation Water Management Programme
- Management of trans-boundary water resources through various programmes in a number of basins, establishment of hydro-metrological stations on trans-boundary waters; Negotiations for a joint management and development of shared water resources and Review of three international water treaties/conventions.
- Water harvesting and storage through increasing water storage capacity via dam construction and rainwater harvesting via construction water pans, small dams and water harvesting structures in ASALs.
- Increasing water access coverage through enhancing water supply programmes in both urban and rural areas and provision of water to poor unserved areas including informal settlements.

**Relevance:** The proposed GCF project will lead to improved water supply and water resource management, which is in line with the aspirations of the country's development blueprint.

### 3.3 LEGAL FRAMEWORK

#### 3.3.1 Constitution of Kenya, 2010

Kenya's new supreme law – the Constitution – that was promulgated on 27 August 2010 takes supremacy over all aspects of life and activity in the Country. 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, utilisation, management and conservation of the environment and natural resources, and ensure the **equitable sharing** of the accruing benefits;*
- b) *Protect and enhance intellectual property in, and **indigenous knowledge** of, biodiversity and the genetic resources of the communities;*
- c) ***Encourage public participation** in the management, protection and conservation of the environment;*
- d) *Protect genetic resources and biological diversity;*
- e) *Establish systems of **environmental impact assessment**, environmental audit and monitoring of the environment;*
- f) ***Eliminate processes and activities** that are likely to endanger the environment; and*
- g) *Utilise the environment and natural resources for the benefit of the people of Kenya.*

Section 70 provides for enforcement of environmental rights thus:

(1) If a person alleges that a right to a clean and healthy environment recognised 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.*

**Relevance:** Section 69 and 70 of the Constitution describes the rights and responsibilities of citizens and institutions as regards to environmental and social issues. In addition, Chapter 5 on land and environment emphasises that the law shall protect rivers, forests and water bodies. The above should be taken into consideration to ensure that rights of people within the select project areas are infringed.

### **3.3.2 The Environmental Management and Coordination (Amendment) Act, 2015**

Environmental Management and Co-ordination (Amendment) Act 2015, provides a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment. Institutions formed under EMCA include the National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is NEMA. EMCA comprises of the parts covering all aspects of the environment.

Relevant to the proposed GCF project is Section 42 of the Act, which specifically deals with the protection of rivers, lakes, seas and wetlands. The Act forbids interference with water bodies without the express permission from NEMA. Permission can be granted subject to the findings of an Environmental Impact Assessment. The Act also empowers the Cabinet Secretary by a gazette notice to declare a lakeshore, wetland, coastal zone or riverbank as protected area and impose such restrictions, as he considers necessary to protect the lakeshore, wetland, coastal zone and riverbank from environmental degradation.

**Relevance:** The Second Schedule to the Act specifies the projects for which an EIA and EA must be carried out. The water infrastructures earmarked for rehabilitation under Component 2 of the proposed project falls under Item 1 and 2 i.e. Minimum and Medium Risk projects (3) water resources and transportation infrastructure (b) water abstraction works; and (c) water supply and distribution infrastructures. According to Section 68 of the Act, all projects listed in the Second Schedule of the Act must undertake an environmental audit, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require.

### **3.3.3 Land Act, 2012**

This is an Act of Parliament intended to give effect to Article 68 of the Constitution, to revise, consolidate and rationalise land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes. Parts 1 and 2 of section 4 of the Act outline the main guiding principles in land management and administration, binding to all land actors including state officers. These principles are to be applied when enacting, applying or interpreting any provisions of this Act; and when making or implementing public policy decisions. The act vests management of land on National Land Commission.

In discharging their functions and exercising their powers under this Act, the Commission is guided by values and principles that address issues of equitable access, security of land rights and conservation and protection of ecologically sensitive areas. The commission also encourages communities to settle land disputes through recognised local community initiatives; inclusiveness, participation, accountability and democratic decision-making within communities, the public and the Government; and non-discrimination and protection of the marginalised.

**Relevance:** Should there be any disputes regarding land ownership, local dispute resolution mechanisms should be sought first. In addition, the proposed project should seek the Commission to identify ecologically sensitive areas that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation.

### **3.3.4** *Water Act, 2016*

This Act provides for the regulation, management and development of water resources and water and sewerage services in line with the CoK, 2010. Authorities shall, in administering or applying this Act, be guided by the principles and values set out in Articles 10, 43, 60 and 232 of the Constitution.

Section 63 of the Act accords every person in Kenya right to clean and safe water in adequate quantities and to reasonable standards of sanitation as stipulated in Article 43 of the constitution.

Section 91 states that a water service provider shall be responsible for the effective and economical provision of water services to fulfil the rights to water and any other conditions specified in the license.

On the other hand, Section 143 states that a person shall not, without authority conferred under this act, interfere with, divert or obstruct water from any water resource. They shall also not cause pollution to the water resource in any way.

In section 145 (d) no person shall without lawful authority, willfully let off or discharge water from the works of any permit holder so that the permit holder loses the use of that water.

**Relevance:** The proposed project is concerned with the management and development of water resources for improved community and ecosystem resilience. Therefore, the Water Act, 2016 is right at the centre in guiding interventions involving provision of water.

### **3.3.5** *County Governments Act, 2012*

This Act provides for the election, functioning, control of, tasks and powers, etc. of county governments as provided for under Article 176 of the Constitution. It also provides for a wide variety of matters relating to public administration at local level such as civic participation, access to information, public communication and the protection of minorities.

**Relevance:** This is the primary law governing the development of counties and thereby will be key during implementation of the project in the four Counties of the Upper ACA. All organs established under this law should be consulted and approvals sought from the relevant authorities in relation to the County Government of Nyandarua, Kiambu, Nairobi and Machakos where the project falls.

## 3.4 REGULATORY FRAMEWORKS

### 3.4.1 *The Environmental (Impact Assessment and Audit) Regulations, 2003*

These Regulations provide the basis for procedures for carrying out EIAs and EAs. According to Regulations 3, “The Regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act. Part II of the Regulations indicates the procedures to be taken during preparation, submission and approval of the full study report.

**Relevance:** The ESMF study has been conducted in compliance with the above Regulations.

### 3.4.2 *The Environmental Management and Coordination (Water Quality) Regulations, 2006*

As described in Legal Notice No. 120 of the Kenya Gazette Supplement No. 68 of September 2006, these Regulations apply to domestic water use e.g. drinking, water used for agricultural and industrial purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes.

These standards play an important role in licensing effluent and abstraction activities. NEMA must license surface water use, abstraction and effluent discharge after review of any proposed activities. The regulations also mandate NEMA to monitor sources of water at least twice every year.

These Regulations outline:

- Quality standards for sources of domestic water;
- Quality monitoring for sources of domestic water;
- Standards for effluent discharge into the environment;
- Monitoring guide for discharge into the environment;
- Standards for effluent discharge into public sewers; and
- Monitoring for discharge of treated effluent into the environment.

**Relevance:** Regulation 8 and 9 clearly spell out issues of compliance for water monitoring and water quality standards that should be maintained. This will be of importance to ensure that water provided will meet the required standards for healthy people and maintaining vibrant ecosystems.

### 3.4.3 *The Environmental Management and Coordination (Waste Management) Regulations, 2006*

As described in Legal Notice No. 121 of the Kenya Gazette Supplement No. 69 of September 2006, these Regulations provide standards for the transportation and disposal of industrial waste, toxic waste, pesticides, biomedical waste, and radioactive waste. <sup>4</sup>The regulations make it a crime to dispose of waste in any other place but an appropriate waste receptacle. In order to transport any type of waste, NEMA must license the vehicle, and it is the responsibility of the waste transporter to ensure that waste is not spilled during transportation. Some of the stakeholders that are regulated include waste generators, transporters, recyclers, composters, incinerator operators and landfill/dumpsite operators.

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<sup>4</sup> The 2006 Waste Regulations do not have siltation standards, a major gap in regulation when considering the possible damage to a waterway when too much sediment is deposited in it (Barczewski, 2013)



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These Regulations outline issues of:

- Waste generation
- Waste transportation
- Waste disposal; and
- Waste recycling.

**Relevance:** Waste generated from the project during the water infrastructure rehabilitation activities such as sediments from desilting of dams should be transported, disposed or recycled in a manner as outlined in the Regulations.

### 3.4.4 *The Environmental Management and Coordination (Noise and Excessive Vibration Pollution (Control) Regulations, 2009*

As described in legal Notice no. 61 as a subsidiary legislation to EMCA, the Regulations provide for excessive noise and vibrations beyond defined thresholds.

Regulation 4(1) states that “Except as otherwise provided in these regulations, no person shall:

- a) *make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or*
- b) *cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source”.*

Regulation 5 of these regulations further makes it an offence for any person to make or continue to cause any noise as set out in the applicable column in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.

**Relevance:** The excessive noise and vibrations during construction are likely to be made during the dam and waterway desilting process and any construction that may involve motor vehicles that produce loud sounds. The proposed project should ensure that any contractor is compliant with the above regulations in order to promote a healthy and safe working environment throughout the rehabilitation phase. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary hooting by vehicle.

## 3.5 NEMA COMPLIANCE

NEMA was established as the supreme regulatory and advisory body on environmental management in Kenya, under EMCA, 1999. It is mandated to coordinate and supervise the various environmental management activities undertaken by other statutory organs in the country. In addition, NEMA is responsible for Environmental and Social Impact Assessment (ESIA) approvals and for monitoring and assessing activities in order to ensure that the environment is not degraded by such project activities.

## 3.6 THE GCF ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

The Environmental and Social Management System (ESMS) is a broad operational framework that allows GCF to incorporate environmental and social considerations into its decision-making and operations. The ESMS is underpinned by an overarching environmental and social policy that describes how GCF will implement the ESMS and achieve improvements in environmental and social outcomes while addressing any adverse impacts from GCF - financed activities.



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In March 2018, the GCF adopted its Environmental and Social Policy (ESP) and Indigenous Peoples' Policy. Both policies underwent multiple rounds of consultation with civil society and other stakeholders prior to their adoption at the meeting. It should be noted that at the time of conducting this assessment, its proposed Gender Equality and Social Inclusion Policy, which would more effectively address gender equality, intersectionality and, more broadly, social inclusion to achieve more equitable and sustainable climate change results is yet to be approved.

### 3.6.1 GCF Environmental and Social Policy

An essential element of the ESMS is the environmental and social policy, which elaborates the commitment of GCF to integrate environmental and social issues into its decision-making and outcomes, and establishes the principles, requirements, and responsibilities to deliver on these commitments. The policy reflects the broad consensus on GCF commitments to achieve environmental and social benefits and avoid harm in all the activities undertaken and supported and the importance to clearly convey these to stakeholders and communities.

Through this policy, GCF will require that all GCF-supported activities will commit to:

- Avoid, and where avoidance is impossible, mitigate adverse impacts to people and the environment;
- Enhance equitable access to development benefits; and
- Give due consideration to vulnerable populations, groups, and individuals (including women, children, and people with disabilities, and people marginalised by virtue of their sexual orientation or gender identity), local communities, indigenous peoples, and other marginalised groups of people and individuals that are affected or potentially affected by GCF-financed activities.

GCF requires that accredited entities will take all the necessary measures to ensure that all GCF-financed activities meet applicable laws related to managing environmental and social risks and impacts, including national laws, regulations, and standards, and/or obligations of the country or countries directly applicable to the activities under relevant international treaties and agreements. The compliance with applicable laws and relevant international obligations and standards will be reflected in the screening and assessment process indicating these national and international requirements and how these will be met through the management programmes and plans.

NEMA is required by GCF to assign the appropriate environmental and social risk categories to activities in a manner consistent with the accreditation framework of GCF. The categories are as follows:

- Category A:** Proposed activities with potential significant adverse environmental and/or social risks and impacts that, individually or cumulatively, are diverse, irreversible, or unprecedented;
- Category B:** Proposed activities with potential limited adverse environmental and/or social risks and impacts that individually or cumulatively, are few, generally site-specific, largely reversible, and readily addressed through mitigation measures; and
- Category C:** Proposed activities with minimal or no adverse environmental and/or social risks and/or impacts.

**Relevance:** GCF requires that appropriate risk categories be assigned to all activities proposed for GCF financing paying attention to specific environmental and social risks, as specified in the ESS standards. The environmental and social risk category will determine the nature and depth of environmental and social assessment, appropriate stakeholder engagement, and the type of information to be disclosed. For Component 2 of this project, risks and impacts will be assessed at the pre-mitigation stage, and NEMA shall consider the most serious potential impacts of all activities including associated facilities.

### 3.6.2 GCF Indigenous People's Policy

The GCF Indigenous Peoples Policy recognises that indigenous peoples often have identities and aspirations that are distinct from mainstream groups in national societies and are disadvantaged by traditional models of mitigation, adaptation and development. In many instances, they are among the most economically marginalised and vulnerable segments of the population. The economic, social and legal status of indigenous peoples frequently limit their capacity to defend their rights to, and interests in, land, territories and natural and cultural resources, and may restrict their ability to participate in and benefit from development initiatives and climate change actions. In many cases, they do not receive equitable access to project benefits, or benefits are not devised or delivered in a form that is culturally appropriate, and they are not always adequately consulted about the design or implementation of activities that would profoundly affect their lives or communities.

This Policy assists GCF in incorporating considerations related to indigenous peoples into its decision-making while working towards the goals of climate change mitigation and adaptation. The Policy allows GCF to anticipate and avoid any adverse impacts its activities may have on indigenous peoples' rights, interests and well-being, and when avoidance is not possible to minimise, mitigate and/or compensate appropriately and equitably for such impacts, in a consistent way and to improve outcomes over time.

**Relevance:** These elements of the Policy have been integrated in conducting the ESMF for this project. More focus has been given to the principle on respecting and recognising traditional knowledge and livelihood systems. Indigenous people's cultural heritage as well as traditional knowledge and ways of ownership and knowledge transmission where they exist have been taken into consideration.

## 3.7 THE WORLD BANK ENVIRONMENTAL SAFEGUARDS

The World Bank classifies its projects into four Environmental Assessment categories according to the likely impacts on the environment they will have. This classification is as follows:

- Category A:** A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts.
- Category B:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases, mitigation measures can be designed more readily than for Category A projects.
- Category C:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
- Category FI:** A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts; this case, in any way, is not applicable to the GCF project.

### 3.7.1 Environmental Assessment (OP 4.01)

Environmental Assessment is used by World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. The proposed projects from Component 2 may have minimal impacts to the environment, and where they may occur, they will be



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site specific and can be mitigated. In addition, it does not traverse in any international water way or indigenous persons regions.

### 3.7.2 *Natural Habitats (OP 4.04)*

This policy seeks to ensure that the Bank's-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the environmental services and products that natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, including those legally protected.

### 3.7.3 *Physical Cultural Resources (OP 4.11)*

This policy defines the cultural property as having archaeological, palaeontological, historical, religious and unique natural values. There are no known physical cultural resources within the proposed site thus this policy may be not be triggered.

### 3.7.4 *Involuntary Resettlement (OP 4.12)*

The Bank's OP 4.12 is triggered in situations involving involuntary taking of land and involuntary restrictions of access to legally designated parks and protected areas. The policy aims to avoid involuntary resettlement to the extent feasible, or to minimise and mitigate its adverse social and economic impacts. It promotes participation of displaced people in resettlement planning and implementation, and its key economic objective is to assist displaced persons in their efforts to improve or at least restore their incomes and standards of living after displacement. The policy prescribes compensation and other resettlement measures to achieve its objectives and requires that borrowers prepare adequate resettlement planning instruments prior to Bank appraisal of proposed projects.

## 3.8 IFC PERFORMANCE STANDARDS ON SOCIAL AND ENVIRONMENTAL SUSTAINABILITY

The International Finance Corporation's (IFC) Standards are among the strongest environmental and social standards globally. They are an international benchmark for identifying and managing environmental and social risk and has been adopted by many organisations as a key component of their environmental and risk management. They include requirements relating to integrated social and environmental assessments, core labour standards, greenhouse gas emissions, and community health and safety standards. They emphasise private sector considerations while ensuring compatibility with IFC's policies. They require greater transparency.

The IFC Performance Standards are described below.

- Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts – underscores the importance of managing environmental and social performance throughout the life of a project.
- Performance Standard 2:** Labour and Working Conditions – recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of worker's fundamental rights.



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- Performance Standard 3:** Resource Efficiency and Pollution Prevention – outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices.
- Performance Standard 4:** Community, Health, Safety and Security – it is applied during the environmental and social risks and impacts identification process. The requirements laid down under this standard have been used in analysing the potential impacts of the proposed project as detailed in Chapter 7.
- Performance Standard 5:** Land Acquisition and Involuntary Resettlement – recognises that project-related land acquisitions and restrictions on land use can have adverse impacts on communities that use the land.
- Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Resources – implementation actions necessary to meet this performance standard are managed through the ESMS.
- Performance Standard 7:** Indigenous Peoples – recognises indigenous peoples as social groups with distinct identities. Their participation and consent in project activities and decision-making processes is encouraged.
- Performance Standard 8:** Cultural Heritage – recognises the importance of protecting cultural heritage for future generations.

## CHAPTER 4: ENVIRONMENTAL BASELINE CONDITIONS

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### 4.1 OVERVIEW

As part of project implementation, it is paramount to identify, describe and develop a baseline of the biophysical characteristics and the socio-economic conditions within the Athi Catchment. The geographical scope of this assessment is limited to the Upper ACA. The focus is on several broad themes: physical geography, water resources, ecosystem services and socio-economic conditions. Within each theme, several topics and sub-topics are reviewed in detail, with consideration of the availability of data.

### 4.2 ALTITUDE

The Athi Catchment's altitude ranges from 2,400 m to 1,500 m above mean sea level in the upper zone (Figure 5). The Athi River flows in a north-easterly direction from Athi River Town and the Athi plains south of Nairobi until it reaches the hill of Ol Donyo Sabuk, where it turns south-eastwards. The left bank tributaries of the Aberdare drainage system run in a south-easterly direction, joining ten streams crossing the Nairobi-Thika road, and later into Nairobi and Ndarugu Rivers, which join the Athi River. The streams northeast of Gatamayu rise in the escarpment forest. Many of the streams have their sources from springs and swamps associated with the faulting of the eastern edge of the Rift Valley (Kanyi, 2014)

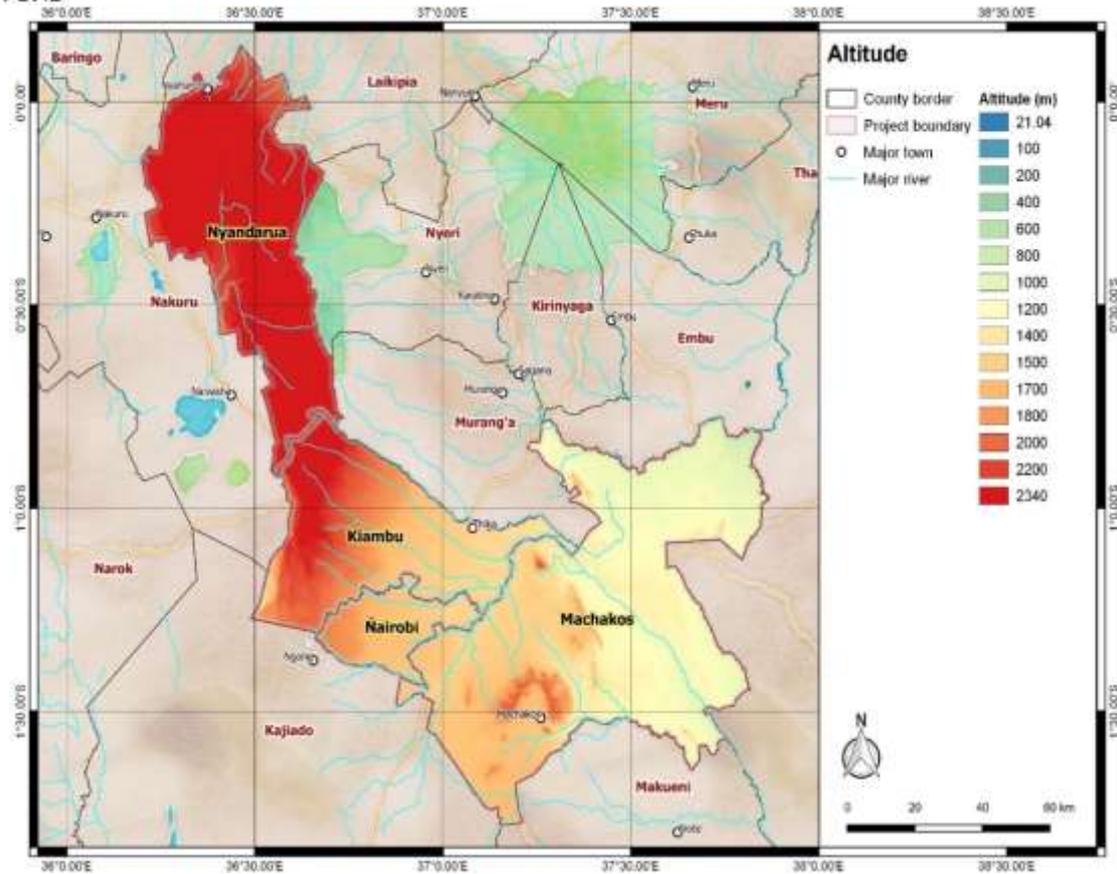


Figure 20: Upper ACA Altitude Map (KRC, 2018)

The Upper Athi region’s key catchment assets include the major water tower of the Aberdares, Ngong Hills and the Nairobi National park.

The river and its tributaries drain the southeast slopes of the southern end of the Aberdare Range, and part of the eastern slopes of the Ngong Hills. The areas drained by sub-catchments are given in the Table 2 below.

Table 2: Upper ACA Sub-drainage areas

Sub-Drainage Area	Principal River	Area Km <sup>2</sup>
3.AA	Mbagathi	459
3.AC	Athi	529
3.BA	Nairobi	505
3.BB	Kamiti	164
3.BC	Ruiru	330
3.BD	Thiririka	219
3.CB	Ndarugu	229
<b>TOTAL</b>		<b>2,435</b>

### 4.3 TOPOGRAPHY AND PHYSIOGRAPHY



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The Upper ACA is strongly defined by the Athi River and its tributaries, which has a length of 390 kms and is the second longest river in Kenya. The topography of the catchment varies from the highland in the Aberdare Range of around 2,600 m above mean sea level (amsl) to the coastal area at the sea level (Figure 22).

Dams are present throughout the catchment. Some have been constructed in small streams, but there are also major reservoirs, such as Ndakaini and Sasamua dams (Figure 23). Sasamua Dam has a capacity of 15.9 million cubic metres and contributes approximately 12 percent of Nairobi's water supply, whereas Ndakaini Dam has a storage capacity of 70 million cubic metres at full storage level of 2,041 meters above sea level and a depth average of 65 m. The dam produces 430,000 cubic metres/day of water that is about 84 percent of total supply of water to Nairobi residents.

Upper ACA is divided into five zones: The Athi Plain; The Low Ridge; The Middle Reaches; The Headwater Zone; and the Rift Valley Fault System;

### **4.3.1 Athi Plain**

The Athi plain lies between the Nairobi-Thika road and the Athi River. It is an area of generally low relief sloping gently to the southeast, and intersected at intervals by the main streams such as the Nairobi, Ruiru and Ndarugu. These rivers have curved out narrow steep-sided valleys 50 – 100 ft. deep. The land lying between the rivers consists mainly of thin murram or black cotton soils (Vertisols).

### **4.3.2 The Low Ridge**

This is an area of medium relief with long ridges of varying width lying between the stream valleys. Interspersed with the ridges are many low flat areas, usually elongated in the general direction of drainage, but with poor drainage and filled with dark or black clay soils. The higher ridges are composed of dark red friable clays commonly known as Kikuyu red loam, which supports the tea and coffee plantations in the area.

### **4.3.3 The Middle Reaches**

These areas have comparatively narrow ridges lying between valleys up to 300 ft. deep. The lower limit of this area roughly coincides with the upper boundary of the mostly settled area at about 5,250 ft. O.D. The upper limit is about 8,000 ft. and lies within the forest boundary.

### **4.3.4 The Rift Valley Fault System**

This area exhibits unique topographical characteristics. The east Rift valley fault system has truncated the headwater reaches of streams lying south-west of the Gatamayu and severe disruption of original drainage directions has taken place. This has resulted in swamps and strong springs, which now form the source of many of the streams.

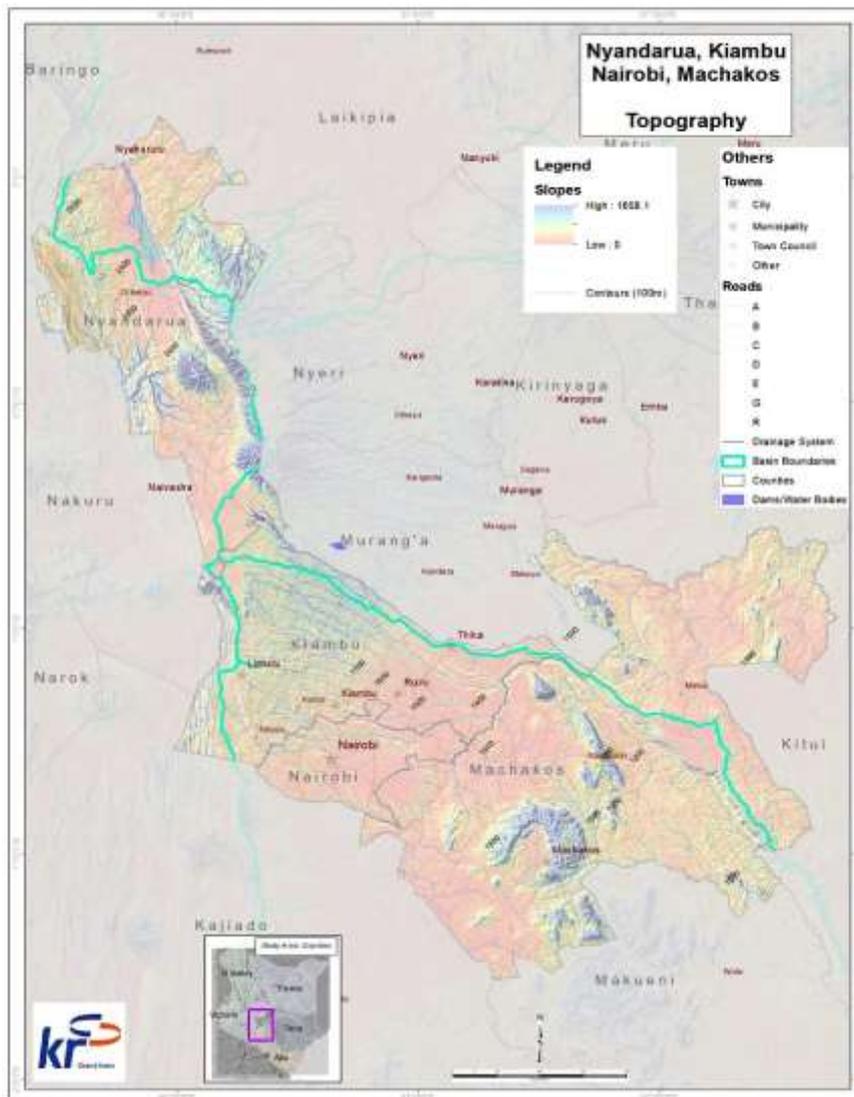


Figure 21: Topographic Map of the Upper ACA (KRC, 2018)

#### 4.4 GEOLOGY AND SOILS

The geology of any particular land surface determines the drainage patterns of the area in addition to influencing land use systems. Kenya has four major geological series: Precambrian, Paleozoic, Mesozoic and Cenozoic (Figure 23). The principal geological formation of the Upper ACA consists mainly of Tertiary trachytic lava of Pleistocene age. The area lies between the Plio-Pleistocene trachytes of the Kikuyu escarpment and the Late Miocene phonolite of the Kapiti plains of different phases of volcanism. The trachytes of Longonot, Kiambu and Nairobi occupy the upper parts. The middle and lower Kirichwa valley tuffs lie close to the city of Nairobi. On the south-eastern side are the Nairobi phonolites and Athi tuffs. The underlying rocks are Tertiary and younger sediments, volcanic lavas, tuffs and the basement complex. The Tertiary trachytic lava that covers most of this area is derived from the ancient fissures on the eastern flank of the Rift Valley. On the other hand, downstream flows through metamorphic rocks such as quartzites and crystalline limestone. Generally, the hydrogeology of the ACA is controlled by the nature of the various volcanic lava flows and the configuration of the old land surface of the basement system (Kiithia, 2006).

Soils are a major component for sustainable economic development of a catchment. The characterisation of soils determines largely the susceptibility to erosion and the suitability of lands for different types of crop production. Soils also provide an important natural resource for other economic activities, such as mining and construction.

Generally, the soils of the Upper ACA are well-drained, shallow, dark reddish brown though in some places and imperfectly drained, deep, dark grey to black in some areas. Most of the soil types produce naturally low sediments except in cases when interfered by human activities. In the hilly areas of river basins, sediment yields are relatively high due to the increased agricultural activities in these areas coupled with the steep nature of the slopes. A detailed description of the soil types and characteristics is provided in Table 3 below.



*Figure 22: Ndakaini and Sasamua Dams respectively (AWSB, 2017)*

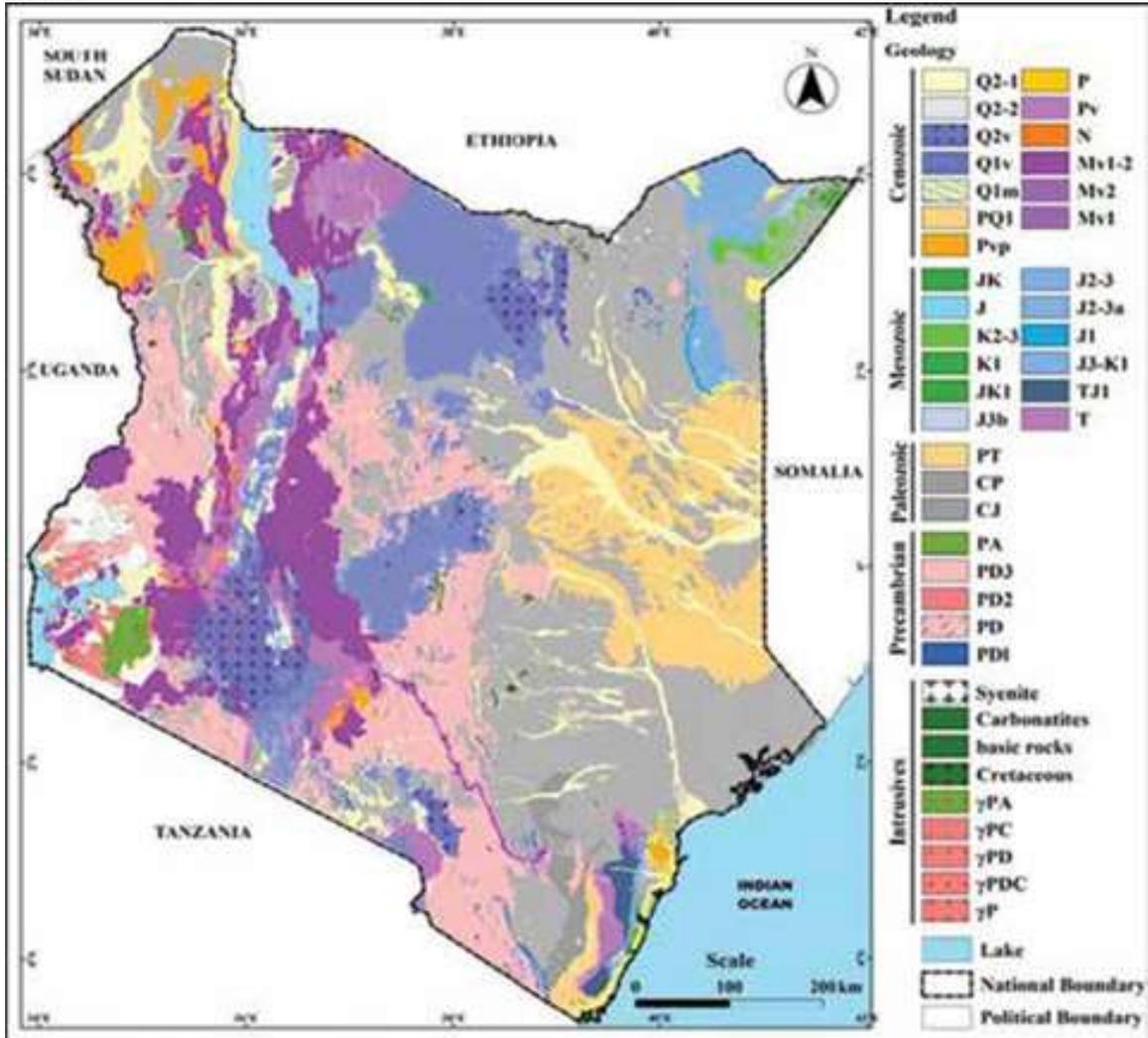


Figure 23: Geological Formations of Kenya (MEWNR, 2013)

Table 3: Main soil types and their characteristics (adapted from ISRIC)

Soil Type	Soil Characteristics	Description of location and uses
<b>Humic Nitisols</b>	Commonly referred to as Kikuyu red soils.  Well-drained, dark friable red soils that are formed on volcanic deposits and are strongly weathered with an acid humic top soil.	Found in parts of Nyandarua and Kiambu Counties and are not easily eroded.  Good for agriculture. Commonly cultivated with tea or coffee and food crops for subsistence use.
<b>Arenosols</b>	Commonly known as grey soils. They are sandy-textured and lack any significant soil profile development.  Exhibit only a partially formed surface horizon (uppermost layer) that is low in humus, and are bereft of sub-surface clay accumulation.	Found in parts of Nairobi and Machakos Counties.  Suitable for crop production, but often irrigation and fertilizer application are recommended.
<b>Plinthosols</b>	Defined by a sub-surface layer containing an iron-rich mixture of clay minerals (chiefly kaolinite) and silica that hardens on exposure into ironstone concretions known as plinthite.	Found in Machakos County.  Largely used for grazing or forestry.
<b>Vertisols</b>	Defined by a sub-surface layer containing an iron-rich mixture of clay minerals and silica that shrink and swell as they change water content then dry, forming large, deep cracks.  Poorly drained, deep to very deep, dark brown to very dark greyish brown, firm cracking clays in places with vertisols and greysols.	Found along major streams and rivers. Suitable for cropping but only if the right measures are taken.  Very susceptible to soil erosion and droughts.



Figure 24: Vertisols, Plinthosols and Arenosols respectively found in the Upper ACA (KRC, 2018)

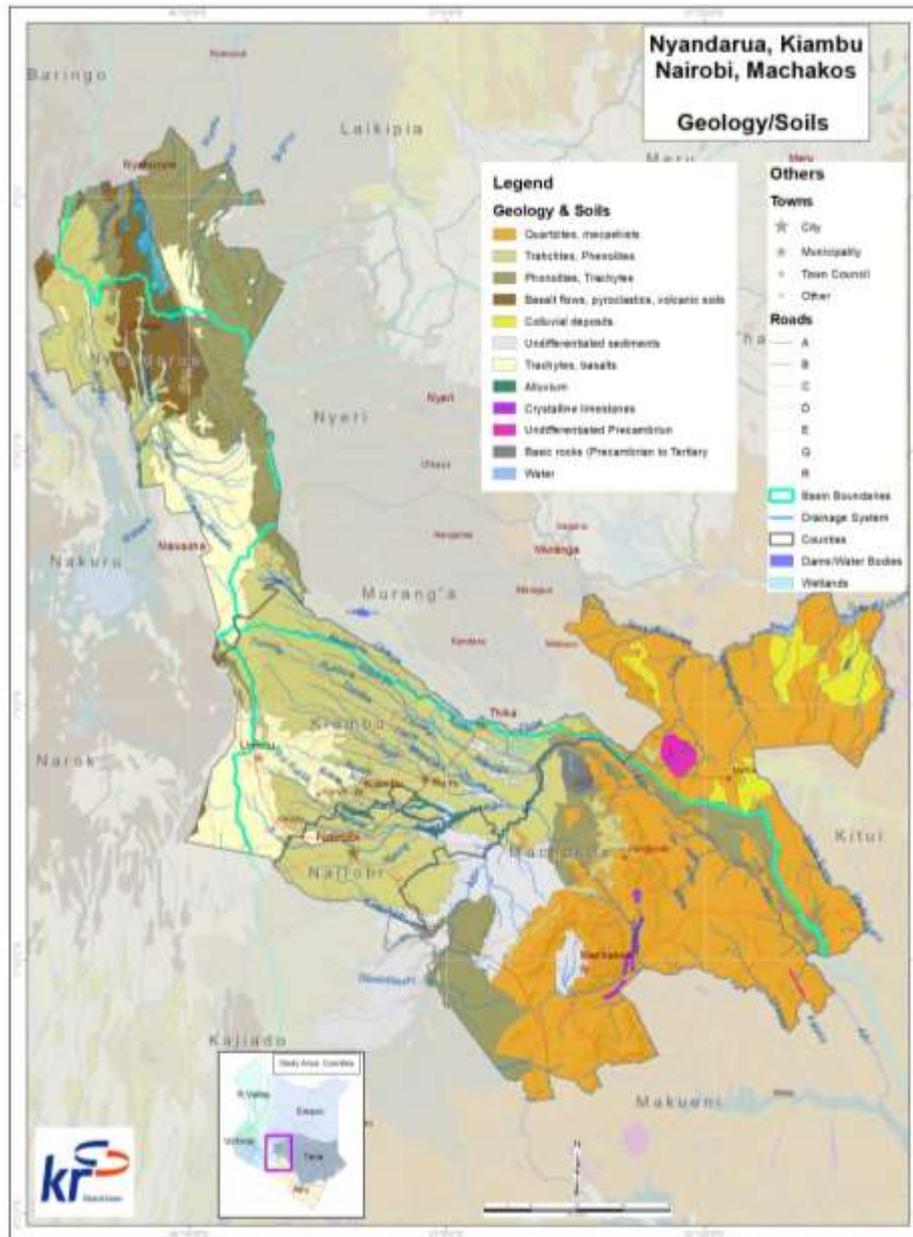


Figure 25: Parent materials map of the Upper ACA (KRC, 2018)

## 4.5 CLIMATIC CONDITIONS

### 4.5.1 Climate

Climate in Kenya varies both in time and space because of the equally variable topography that include large water bodies; high mountain ranges; and the Great Rift Valley among others. The small-scale circulation patterns generated by these features interact with the large-scale circulation systems mainly the Inter-Tropical Convergence Zone (ITCZ) to influence the weather/climate patterns. The climate is also influenced by global features such as El-Nino/Southern Oscillation (ENSO) events that are controlled by the sea surface temperature fields of the Pacific Ocean) as well as the south west Indian Ocean Tropical Cyclone activities.

These circulation systems result in a bimodal precipitation pattern (McSweeney et al. 2010a). The long rains are characterised by intense rainfall from March to May (about 70 percent of rainfalls) and short rains occur from mid-October to mid-December (about 20 percent of rainfalls). The mean annual rainfall over Kenya is estimated at 621 mm but the rain is not spread equally across the country (NEMA, 2013). It varies greatly due to the high variability in altitudes. These rainy seasons alternate with seasons of dry spells. Weather extremes in Kenya are a common feature of the country's climate (Schade, 2011).

In addition, the climate and geography of Kenya also has an impact on the availability of groundwater, which is unevenly distributed accordingly in terms of quality, quantity and depth of the groundwater table (NEMA, 2013). The central rift valley and the area around Lake Victoria have high groundwater storage capacities, as well as high groundwater quality. The coastal strip also has reasonable groundwater capacities, but the water is saline and of low quality. Similarly, the eastern and north-eastern parts of the country where the water table is much lower, groundwater is saline and below World Health Organisation (WHO) drinking water standards. Groundwater capacity is lowest in the north-western and central eastern parts of the country.

Geographical features foremost among them the Aberdare ridges determine the climatic conditions of the Upper ACA such as rainfall, temperature and humidity. The annual rainfall varies with altitude, with higher areas receiving as high as 2,700 mm and lower areas of Machakos receiving as low as 450 mm (Figure 26). The average rainfall of the Upper ACA is 1,200 mm. Dry spells are experienced from February to March and August to September annually.

Temperature affects the rates of evaporation and evapotranspiration. In terms of evapotranspiration, Upper ACA has moderate temperatures. The highest temperatures are recorded in the month of December, when the mean average is 29°C and the lowest temperatures are recorded in the month of July, with a mean average of 7°C. The area also experiences temperatures with adverse effects. The cold air that is generated during clear nights on the moorlands of the Nyandarua ranges flows down the Kinangop Plateau and Ol Kalou causing night frost. This tends to affect maize cultivation. The valleys west of the plateau occasionally provide outlets for the stream of cold air with temperatures ranging between 1.2°C to 10°C in the early mornings (IOM, 2016). Average relative humidity ranges from 54 percent in the dry months and 300 percent in the wet months of March up to August.

#### **4.5.2 Climate Change**

Kenya's economic development is driven by climate. The highly variable rainfall and humid conditions especially in the arid and semi-arid regions have far-reaching implications on socio-economic development of the country. Climate change poses great risks to the major sectors of the economy such as agriculture, livestock, water resources, energy resources and tourism. Adaptation to climate change is therefore critical to the country's resilience to the associated impacts in order to sustain development.

About ninety percent of all disasters that occur in the country are weather and climate related. The two events that mostly trigger disasters are droughts and heavy rains, which cause flooding. With the increased frequency of these extreme climate events, the risks of disasters in the country will increase. Our ability to effectively cope with the above climate situations will depend on our capacity to adapt to them in the short, medium and longer terms. This requires a well distributed network of climate observation stations that will enable us to study the changing patterns of both global and local drivers of the climate and consequently we are able to study the changing climate in both space and time and hence the related risks.

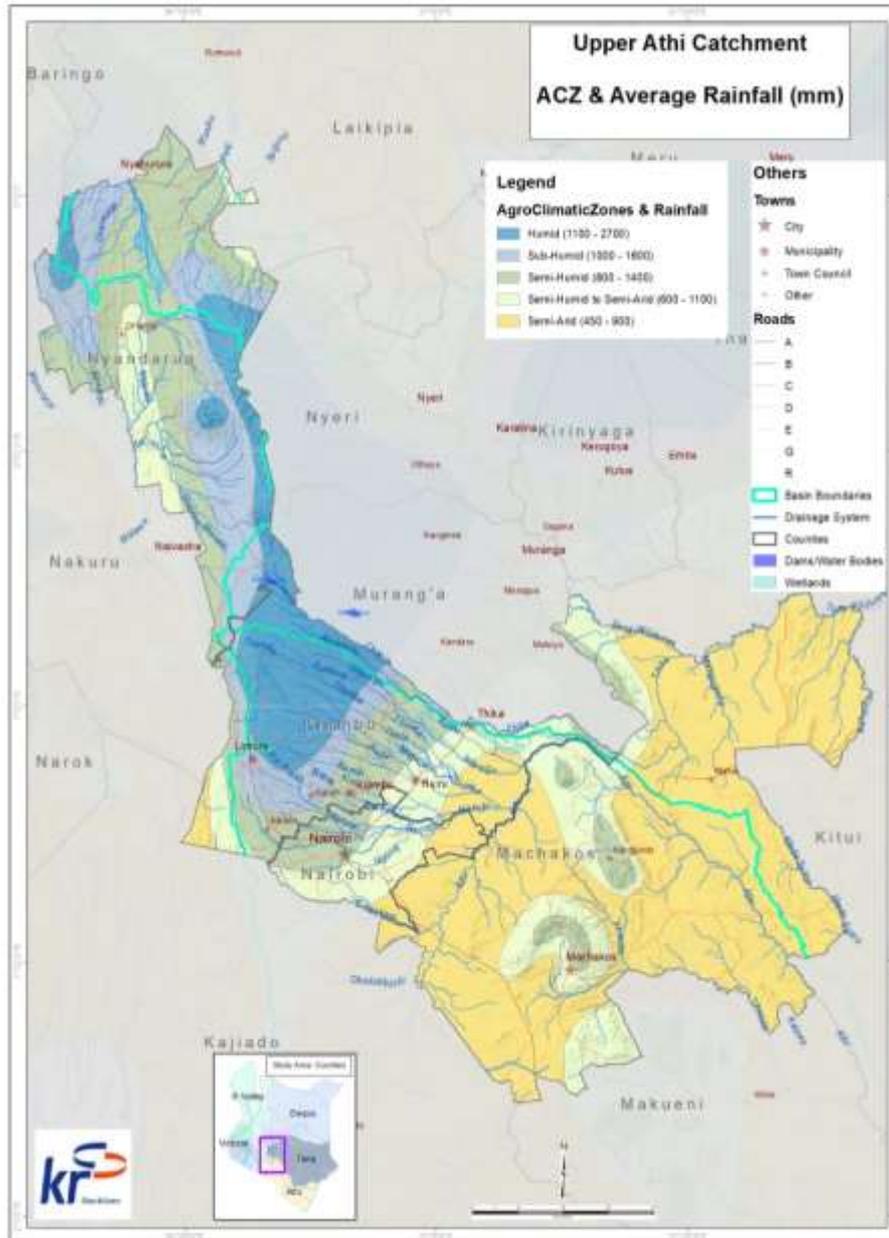


Figure 26: Upper ACA Precipitation Map (KRC, 2018)

The rainy seasons can be extremely wet, bringing floods and inundation. Even the arid and semi-arid areas that comprise 80 percent of total land area are prone to floods despite their low levels of rainfall (between 300 and 500 millimetres annually). Kenya also experiences major droughts every decade and minor ones every three to four years. The negative effects of these droughts are spreading among the increasingly dense population and fragile arid and semi-arid lands in the Upper ACA.

Within the Upper ACA, there is a need to plan on how to deal and adapt to the effects of climate change in different parts of the catchment area, especially where development levels are low and communities are highly dependent on natural resources where rainfall is erratic

## 4.6 HYDROLOGY/WATER RESOURCE BASE

### 4.6.1 *Surface water*

Surface water is found in networks of channels (streams and rivers), water bodies (lakes and reservoirs), and as runoff (water flowing on the surface outside defined channels, usually after a rainfall event). Streams flow from a source, such as a seep or a spring, down-slope to join other streams, eventually becoming a river. Excessive flow due to increased rainfall, snowmelt or dam releases (planned or otherwise) that cannot be absorbed by the vegetation or infiltrate into the soil, can lead to river exceeding its banks and flowing out on to the floodplain. This is known as flooding.

#### **a) *Rivers and streams***

The Athi Catchment Area is the second largest after the Tana Catchment Area. The Athi River traverses agro-ecological zones of diverse climatic characteristics and land use activities. Drawing most of its headwaters from the Kikuyu and Ondiri springs (Kenya Highlands), the river flows through some of the arid and semi-arid lands of Kenya, discharging into the Indian Ocean. The rainfall amounts in the headwater areas influence the river flow characteristics.

The peaks of both the rainfall and river flow characteristics signify the wet seasons whereas the lows represent the dry seasons. This consequently has some bearing on the seasonal water quality degradation. The implication of this is that during the wet seasons, water quality in the rivers is good chemically but poor physically because the water is highly loaded with sediments but chemically diluted. During the dry season water is chemically polluted with high concentration loads of metal ions (Kiithia, 2012)

The main streams in the Upper ACA are Malewa, Pesi, Chania, Ruiru and Ndarugu. Other minor tributaries but of great hydrological importance are Ngong, Nairobi, Mathare, Mbagathi, Kabuthi, Thiririka, Kamiti, Riara and Gitathuru. These streams drain areas of diverse land use systems ranging from agricultural, residential, urban and industrial. These land use systems have an impact on water quality and degradation. In addition, there are several springs within the catchment area such as Mzima, Kikuyu, Gathiri and Njoro Kubwa.

Land use activities within this catchment area have led to degradation of water quality and changes in the flow characteristics of the rivers. This is largely because two of the major urban and industrial centres in the Country (Nairobi and Thika) are found within the catchment.

#### **b) *Wetlands***

Apart from the Athi River itself, the wetlands in the Upper ACA are also associated with the Nairobi River, which originates from the Ondiri Swamp, the Mbagathi River, which originates from the Ngong Hills, the Kiboko River whose main catchment is Endoinyo Narok and the Tsavo River, which drains the northern slopes of Mount Kilimanjaro. These rivers supply water to the Athi River, which, like the Tana River, empties into the Indian Ocean (Gichuki et al. 2001). Manguo and Ondiri wetlands are two the most common and important wetlands in the Upper ACA. Their ecological characteristics and uses are described below.

Ondiri wetland is a swamp located in Kikuyu town with bog-like characteristics. This swamp is an important source of water for Nairobi River, which passes through the capital city (Ndiritu et al. 2006). Locally, the swamp provides water for domestic use, irrigation and livestock as well as fodder for

livestock particularly during the dry season (Macharia et al. 2007a). It also provides habitat for a significant number of resident and migratory bird species as well as aquatic plants. Common wetland and semi-wetlands plants include individual species of cattail (*Typha domingensis*), hippo grass (*Vossia cuspidate*), couch grass (*Cyperus brevifolius*), and grasses such as cutgrass (*Leersia hexandra*), love grass (*Eragrostis exasperate*) and Nees (*Eriochloa meyerana*). These plants are mainly found growing on the floating mat, an accumulated large amount of semi-decomposed organic matter that forms a thick layer of peat (approximately 0.5 m thick) on top of the water.

Manguo wetland is a tropical swamp, covering an area of approximately 50 ha. It is located in Limuru and serves as an important source of water for the town and the surrounding rural area mostly through two boreholes located in the northern low-flooded area of the swamp. Manguo swamp has three unique ecological units (i.e. open water, swamp and floodplain) that support substantial populations of bird species and wetlands plants (Macharia and Thenya 2007b). Over 30 species of resident bird and palearctic bird species have been recorded in the swamp, a feature that make it an important site for bird watchers and researchers. Common plants in the swamp consist of the sedges *Cyperus dives*, *C. dercilema*, *C. rigidifolius*, *C. exactatus*, *Typha domingensis* and *Potamogeton spp.* and the grass *Eragrostis esperata*. Exotic eucalyptus trees mainly cover the riparian and catchment areas, a phenomenon characteristic of much of the central Kenya highlands after the clearing of the original indigenous trees in the early part of the 20th century.

For this Project, it is imperative that the quality of surface water is monitored on a regular basis. This helps to provide an integrated evaluation of physical, chemical, and biological characteristics of aquatic system in relation to human health concerns, ecosystem, and designated uses.

There are six telemetry stations for monitoring surface water quality within the Upper ACA (Table 4). At present, only three monitoring stations are operational. This Project will seek to address this challenge by establishing modernised climate-hydrological observation and monitoring systems and related network systems.



*Figure 27: Manguo Wetland and Ondiri Swamp in Kiambu County*

Table 4: Surface water monitoring telemetry stations in the Upper ACA (WRA, 2017)

No.	Station	Station ID	County	Location	
				Latitude	Longitude
1.	Ruiru River	3BC08	Kiambu	-1.145715	36.96437
2.	Ndarugu River	3CB05	Kiambu	-1.129973	37.161001
3.	Athi River at Wamunyu	3DB01	Machakos	-1.41431	37.646793
4.	Maruba	3EA02	Machakos	-1.52029	37.246809
5.	Kiu River in Githurai	3BB11	Kiambu	-1.19667	36.92013
6.	Thiririka	3BD05	Kiambu	-1.154558	37.040815

#### 4.6.2 Groundwater

Many parts of Kenya rely on groundwater, either directly from privately owned or communal boreholes, or via piped supplies from groundwater well fields. Groundwater from communal boreholes or hand-dug wells supplies most of the rural population (Mumma et al. 2011). Most irrigation in Kenya is supplied by surface water, but groundwater supplies a small proportion of irrigation water.

Although groundwater exploitation has considerable potential for boosting water supplies in Kenya, its use is limited by poor water quality, overexploitation, saline intrusion along the coastal areas, and inadequate knowledge of the occurrence of the resource (Mumma et al. 2011). Nevertheless, many areas of Kenya are reliant on groundwater sources for domestic, commercial and industrial needs, including the coastal zone (lower ACA) which is almost entirely dependent on groundwater.

The Nairobi area contains many more boreholes than any other comparable area of the country (WRA, 2017). The underlying geological layer along Ngong road and the Dagoretti forests is the Upper Athi Series, which is porous and permeable, allowing for percolation, making it favourable as a watershed for discharge into rivers and recharge of aquifers. The Upper Athi Series is the main aquifer in the region while the Lower Athi Series is more clayey and therefore forms an aquiclude. The Ngong river basin has clay soils making it swampy with good grass cover and light forests. In some place, it has deposits of shallow stony soils associated with rocky outcrops along its course.

For this ESMF, an evaluation of shallow and deep groundwater within the Upper ACA has been conducted. Its uses and potential are described below.

##### a) *Shallow ground water*

There is no formal definition of shallow groundwater. However, to reflect the importance of hydrogeological characterisation, hydrogeologists define shallow groundwater as 'relatively young water stored in local overburden aquifers.'

Shallow groundwater is usually present in sandy riverbeds, wetlands and floodplains as is shown by the existence of traditional scoop holes and dug wells in and next to rivers. Hand dug wells are, in general, 5 to 10 m deep. Drilled (sometimes manually) shallow wells are up to 30 m deep.

This water is used domestic and animal watering purposes. In dry riverbeds mostly in the Machakos area, scoop holes and dug wells exist mainly at points where the river encounters rocky outcrops, bridges and road drifts. Groundwater flow is blocked and stored behind rocks and infrastructure.

The quality of shallow groundwater and its susceptibility to droughts is highly dependent on the hydrogeological characteristics of the aquifer. When an impermeable, or less permeable layer is present

(thick layer of clay or loam), shallow groundwater wells can be developed as a safe source of water supply. If such protective layer is not present it is crucial to implement and enforce due measures to protect water quality (source, well and tap protection) and study the groundwater fluctuation characteristics prior to investments.

Shallow groundwater provides opportunities development. It is low-cost and can largely be facilitated, operated and maintained by communities, and in many instances, it can be found in the close vicinity of rural communities. To increase the shallow groundwater storage capacity of rivers, sand dams and sub-surface dams can be constructed. Implementation of these interventions is deemed feasible in areas with medium to coarse sands and shallow bedrock.

#### ***b) Deep ground water***

Groundwater potential is the ability of an area to supply an adequate quantity of potable groundwater. 'Adequate' quantity means yield exceeding 0.5 m<sup>3</sup>/hr while 'potable' means free from organisms and chemical substances that are hazardous and injurious to human health, complying with standard water quality requirements.

The Nairobi groundwater basin extends from the zone of north-south rift faulting west of Nairobi (with an elevation of about 2400 masl) towards the Athi river floodplain (with an elevation of 1500 masl) east of the city centre. Volcanic activity has controlled the geomorphologic evolution – the rocks of the Nairobi basin mainly comprising a succession of volcanic lavas and ashes (tuffs), whose thickness reaches some 400 m underneath the city itself and which eastward gradually merge into to the Tertiary deposits of the Athi floodplain (Foster, S and Tuinhof, A., 2005).

Recharge also takes place in Greater Nairobi through infiltration of wastewater, water mains leakage and excess rainfall. The total leakage from the water-distribution system is estimated to be 180 Ml/d, but it is difficult to say how much of this reaches groundwater. There is some evidence that part of the infiltration in Greater Nairobi (rainfall averaging 850 mm/a) is intercepted by localized perched aquifers and discharged locally to springs and streams.

Groundwater flow is principally directed east-south-east from the main recharge area towards the Athi floodplain, where most of the groundwater formerly discharged as springs or seepages into local streams and depressions. Today, the many water wells in the Capital City intercept most of this groundwater flow (Foster, S and Tuinhof, A., 2005).

In addition to bringing into question siting practices, borehole development, pump testing and monitoring should receive more attention. Knowing whether boreholes are functional, how yields and water levels develop over time, and registering unsuccessful (dry) drilling attempts is highly informative for experts to decide where in future the opportunities for successful drilling are highest, and which approach should be adopted (Visser et al. 2015).

Similarly, as with surface water, there are six telemetry stations for monitoring groundwater quality in the Upper ACA (Table 5). Only two of the four are currently operational. WRA staff monitor groundwater levels monthly. On the other hand, the quality is monitored and analysed on a quarterly basis.



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*Table 5: Groundwater water monitoring telemetry stations in the Upper ACA (WRA, 2017)*

No.	Station	County	Location	
			Latitude	Longitude
7.	Kiambu District Hospital	Kiambu	-1.168240	36.831400
8.	Vinya wa Kanyuuku	Machakos	unknown	unknown
9.	Maki Milan	Kiambu	unknown	unknown
10.	Limuru DO's Office	Kiambu	-1.109771	36.639548
11.	Eastern Flour Mills	Machakos	-1.502364	37.258573
12.	Bishop Kioko Hospital	Machakos	-1.516558	37.264969

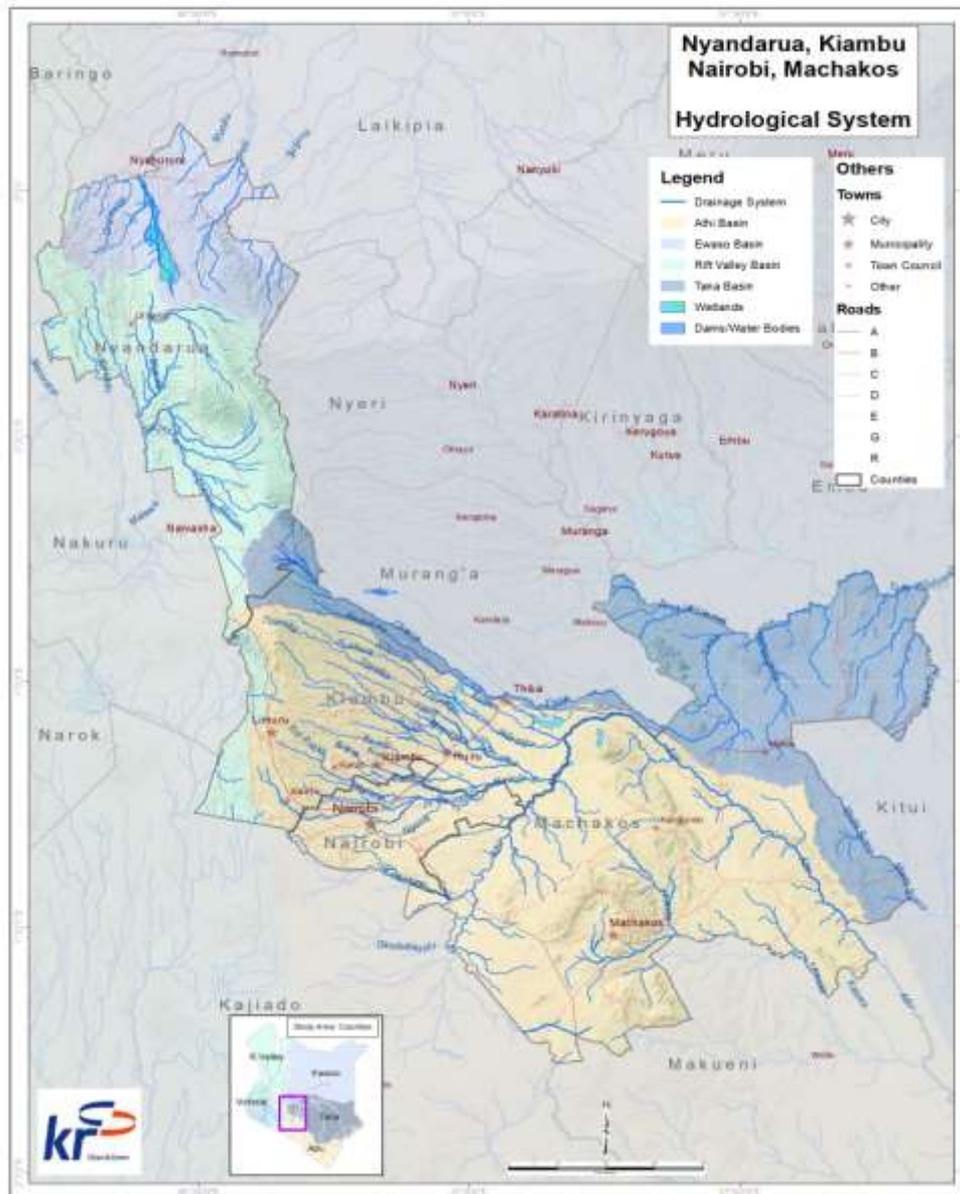


Figure 28: Hydrological System of the Upper ACA (KRC, 2018)



Figure 29: Shallow well works and a Borehole in use along a river in the Upper ACA (TWP, 2018)

## 4.7 ENVIRONMENTAL DEGRADATION

Research indicated that floods and droughts have been increasing in severity in the past four decades, not just in Kenya, but also in the entire Horn of Africa region. In addition, soil erosion and sedimentation, which damages aquatic and recreational resources, has also been on the rise. This has been associated with environmental degradation that has intensified due to urbanisation, development, extension of agricultural land into forests and logging of trees to burn and sell charcoal for economic gains. The causes and impacts of these disasters in the upper ACA are detailed below.

### 4.7.1 Flood and Drought

Floods and droughts are events of extreme climate; with drought signifying periods of extraordinary water shortage (when rainfall is less than normal) and floods occurring when river water expands to a level that is significantly above the banks. Floods and droughts cause climatic disasters resulting into impacts such as disruption of water supply and access, destruction of water resources infrastructure, fatal incidences on humans and livestock, destruction of private and public assets, food shortage, and an increase of waterborne diseases, among others (WRA, 2015).

Major flood areas in the ACA are in downstream Athi, Lower Lumi River, Athi River Town and in parts of Nairobi and Mombasa (WRA, 2009). According to the Kenya National Disaster Response Plan (2009), other than some hotspots, the extent of disasters from floods in this catchment area is still relatively low. However, the severity has been increasing in the recent past because of increased development, urban activities and impacts of climate change. In the upper ACA, flooding occurs in Nairobi and along the Athi River especially in the Kilimambogo and Athi River areas. These floods are not river-induced but rather due to inadequate and ineffective urban storm drainage system (NDMA, 2018).

Overflowing of infrastructure renders some places inaccessible and cuts them off from transportation routes (Figure 30). Infrastructures for numerous activities in urban areas have been built along riverbanks and wetlands, and sometimes within protected areas. Many facilities were devastated by the floods early 2018. In response, NEMA together with the recently created Nairobi regeneration team is taking drastic action, where 4,000 buildings have been earmarked for demolition.

Climate change is expected to increase the frequency and intensity of floods. Models by the IPPC (2013) indicate more and more intense rainfall in the Greater Horn of Africa. In combination with increased soil

moisture deficits and formation of clayish crusts after prolonged dry periods, more rainfall results in higher runoff rates and thereby increasingly in flash floods.



*Figure 30: Flash Floods in Nairobi and a road cut off by floods in Nyandarua (Kenya Today)*

On the other hand, droughts have a major impact on the productivity of rain fed agriculture, ecosystem functioning, and livelihoods, which are highly dependent on natural resources.

Droughts manifest itself in different ways. These include:

- Meteorological droughts**, below average amount of rainfall during a certain period.
- Soil moisture droughts**, below average availability of soil moisture during a certain period.
- Hydrological droughts**, below average water availability from rivers, lakes and groundwater during a certain period.
- Agricultural droughts**, below average crop production because of water shortages during a certain period.
- Economic droughts**, below average economic productivity because of water shortages during a certain period.

Hydrological droughts are generally felt later than meteorological or soil moisture droughts, since river base flow and groundwater infiltration typically can continue well into the dry season. In the Upper ACA, hydrological droughts lead to water insecurity throughout the catchment as more shallow water sources and natural resources production (fishing, rice fields, pasture) is undermined in areas that normally have sufficient water, such as wetlands and floodplains.

The factors that contribute to the severity of drought in the Upper ACA include inadequate water storage capacity, increased destruction of forests due to charcoal burning, clearing forests for agriculture and logging without replacing trees, frequent forest fires. In addition, stakeholders mention poor management of catchments areas, which includes destruction of forests and plants that retain water in the soil without using appropriate soil conservation measures. Poor farming practices such as cultivation on stream banks and steep slopes causing erosion of the topsoil, which silts up dams and pans usually, used as dry weather water reservoirs, are also a key driver for droughts.



Figure 31: Residents fetching water from Tyaa seasonal river in Machakos (The Star, 2018)

#### 4.7.2 Erosion and Sedimentation

The upper Athi region is a high potential area, which is characterised by catchment destruction leading to low flows. High population density in these areas is a cause of over-abstraction, both of ground and surface water. The high number of agro-based industries and urbanisation contribute to substantial pollution to the water resource.

In addition, the unsustainable land management practices in small-scale upland farms have resulted in soil erosion. This in turn causes sedimentation and siltation of the water reservoirs in the catchment area. This has led to high water treatment costs incurred by the water companies. In the mid and lower catchment, sand harvesting has adversely affected the water-carrying capacity and bank stability of the rivers.

Gully erosion is reported on the Vertisols used for crop production in Muthetheni and Musaalani area of Machakos County. Normalised Difference Vegetation Index (NDVI) analyses show that the average vegetation cover in this area is low, with the soil left exposed to degradation processes during most of the year. Vertisols are erosion-prone; therefore, the lack of coverage leads to the formation of gullies and rills. In the areas lying bare, soil fertility and agricultural lands are lost, and infiltration and soil moisture are minimal. Soil erosion is also reported near some of the water pans such as Muumandu and Miwani primarily due to tree cutting for charcoal production and land clearing.

Stakeholders indicate that droughts and floods are increasing in frequency and intensity. This is in part, caused by human processes such as deforestation and overgrazing leading to severe degradation. This degradation results in higher overland runoff rates and thereby in more frequent and intense droughts and floods. This calls for implementation of inclusive and integrated measures to address the challenge effectively.

## CHAPTER 5: SOCIAL AND ECONOMIC SETTING

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### 5.1 BACKGROUND

Kenya is situated along the equator in the eastern part of the African continent, between the between latitudes 0° 10' 36.73" N and between longitudes 37° 54' 29.98" E. It borders with Ethiopia and South Sudan to the North, Uganda to the West, Tanzania to the South, Somalia to the Northeast, and the Indian Ocean to the Southeast.

The Republic of Kenya has an area of approximately 582,646 km<sup>2</sup> comprising of 7.8 percent land and 2.2 percent water surface. Only 20 percent of the land area can be classified as medium to high potential agricultural land and the rest of the land is mainly arid or semi-arid. Forests, woodlands, national reserves, and game parks account for 10 percent of the land area. Kenya's total land surface comprises of 13,396 km<sup>2</sup> of water surface.

The Upper ACA is administratively located in the four counties of Nyandarua, Kiambu, Nairobi and Machakos. This chapter provides description of the catchment in terms of location, land tenure and land use, demographics and livelihoods, education, infrastructure and energy. Crosscutting issues such as gender are also discussed.

### 5.2 ADMINISTRATIVE LOCATION

#### 5.2.1 Nyandarua County

Located in the central part of Kenya, Nyandarua county covers a total area of 3,304 km<sup>2</sup>. It borders Laikipia to the North, Nyeri to the east, Kiambu and Muranga to the South and Nakuru to the West (Nyandarua County CIDP, 2018). The county lies between latitudes 0°8' to the North and 0°50' to South and between 35°13' East and 36°42' West. It is divided to five sub-counties and twenty-five wards.

#### 5.2.2 Kiambu County

The county is located in the central region and covers a total area of 2,543.5 km<sup>2</sup>. Kiambu County borders Nairobi and Kajiado Counties to the South, Machakos to the East, Murang'a to the North and North East, Nyandarua to the North West, and Nakuru to the West. The county lies between latitudes 0°25' and 1°20' South of the Equator and Longitude 36°31' and 37°15' East (Kiambu County CIDP, 2018). Currently, the county is divided into twelve sub-counties.

#### 5.2.3 Nairobi County

Nairobi County has an area of 696.1 km<sup>2</sup> lying between 36°45' East and latitudes 1° 18' South. It borders Kiambu County to the North and West, Kajiado to the South and Machakos to the East. Among the three neighbouring counties, Kiambu County shares the longest boundary with Nairobi County. It is divided to seventeen sub-counties or constituencies and eighty-five wards (Nairobi County CIDP, 2018).

#### 5.2.4 Machakos County

Machakos County borders seven counties. To the North it is bordered by Embu, Muranga and Kiambu Counties, to the West, Nairobi and Kajiado counties, to the South Makueni County and to the East Kitui County. It lies between latitudes 0°45' South and 1°31' South and longitudes 36°45' East and 37°45' East. The County covers an area of 6208.2 km<sup>2</sup> and is divided into eight sub-counties and (Machakos County CIDP, 2018).

### 5.3 LAND TENURE AND SETTLEMENTS PATTERNS

Approximately 75 percent of the country's population lives within the medium to high potential (20 percent of land area) and the rest in the vast Arid and Semi-Arid Lands (ASALs). One consequence of this is that size and distribution of land varies quite widely as population density does, which ranges from as low as 2 persons per km<sup>2</sup> in the ASALs to a high of over 2,000 in high potential areas.

Most of the land in the catchment area has been sub-divided, allocated and settled. Most of the land held by farmers is in small scale with few large farms that are spread throughout the county. The mean holding size per household is 3.5 ha. With the increasing population and emergence of urban centres, the holding sizes are expected to reduce as sub division and sale of land continues.

In Nairobi, shortage of land is a major issue. Available land is overstretched and scarce. There are cases of illegal allocation of land, which is a hindrance to development, because the projects planned for the same land cannot be implemented. The main cause of illegal allocation of land results from unresolved land disputes, inefficient land information management system and lack of secure land tenure especially for the vulnerable groups.

There have been rapid changes in terms of land use patterns where preference is on development of residential areas and commercial centres. The average holding size of land is approximately 0.36 Ha on small scale and 69.5 Ha on large scale.

In the Upper ACA, as indeed throughout the country, land use is linked to the natural environment, in a way in which people influence and are influenced by land cover. The major land use and land cover types include forests, rangelands, croplands, wetlands, springs, groundwater recharge areas, urban and built-up areas, rural settlements, national parks and reserves.

#### 5.3.1 Land Cover

Within the Upper ACA, land cover has changed over time. Socio-economic, environmental and political factors have changed livelihood conditions and opportunities and impacted land cover.

The changes have resulted in shrublands, woodlands and grasslands surrounding settlements and close to agricultural areas, becoming of poor quality, with bare soils, while dense shrub lands and forests are transforming into open shrublands (Figure 32).

##### **a) Wetlands and riparian areas**

Wetlands are landscape areas that are either permanently or seasonally flooded by water. They are considered one of the most biologically diverse spaces on landscapes, performing valuable functions such as attenuating floods, filtration, sediment capture, sustaining dry seasonal flows and providing an important habitat for flora and fauna.



## **Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL**

Major wetlands in the Upper ACA include Ondiri, Manguo, Riu, Gikambura, Karai, Lari, Theta and Loromo. These wetlands are under pressure from human encroachment for settlement, expansion of crop production, urbanization and infrastructural development. In order to retain the functional capacities of these wetlands, there is a need to protect and restore these wetlands riparian zones.

### ***b) Forest areas***

Forests serve a critical role on landscapes. During rainfall events, they attenuate raindrop impact, reduce potential erosion, and in many instances, increase soil infiltration, thereby potentially enhancing groundwater recharge and allowing for a slower release of rainfall over time into the system. Forest removal followed by poor land management practices can cause severe reductions in groundwater recharge (Bonell et al. 2013).

This role is pronounced in the Upper ACA, where forest reserves such as Aberdares, Kikuyu Escarpment, Muguga, Dagoretti, Ngong Hills, Ololua, Karura, Kinale, Kiambu, Nyamweru, Kieni, and Kitondo serve as the major water towers and groundwater recharge areas for the catchment.

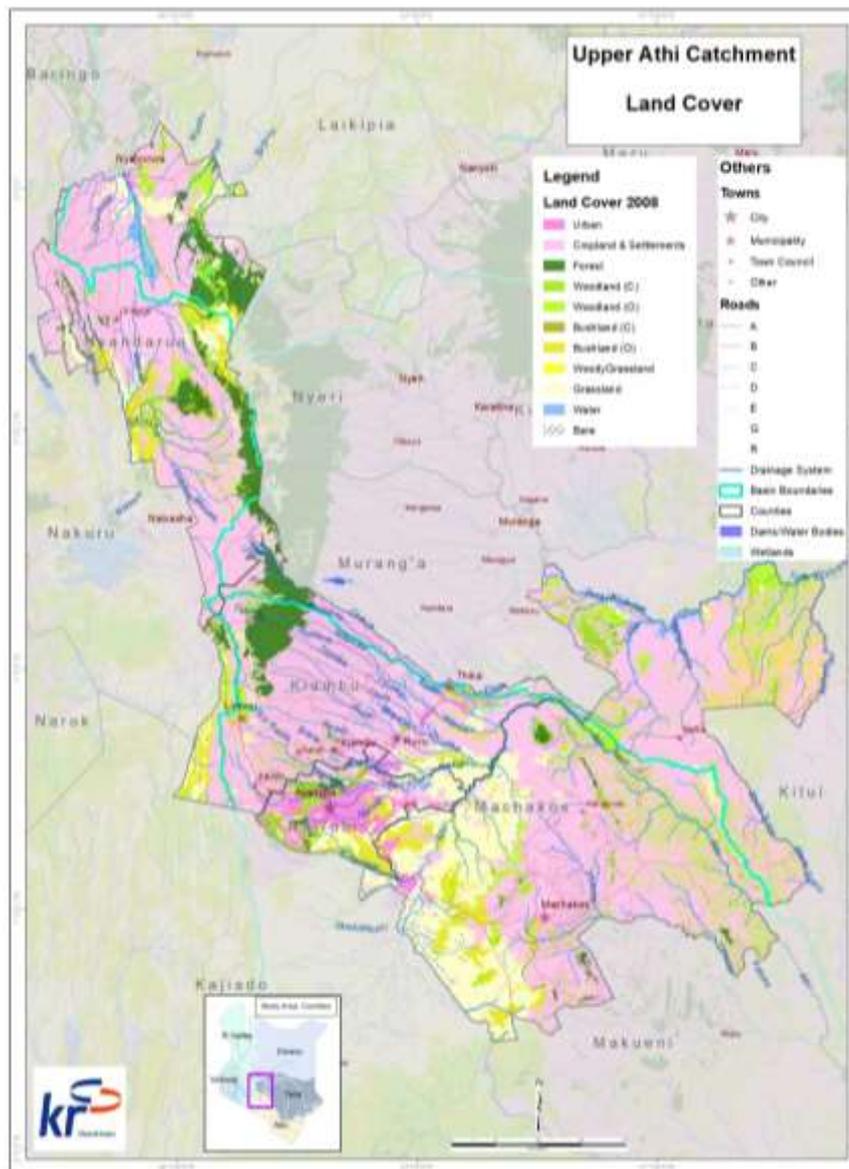


Figure 32: Upper ACA Land Cover Map (KRC, 2018)

Trees are used mainly for shade, boundary demarcation, fencing, and production of fruits, timber, fuel and wood for ornamental purposes. Common trees in the upper ACA include Eucalyptus or blue gum (*Eucalyptus globulus*), Siala (*Markhamia lutea*), Cedar (*Cupressus lusitanica*), Bishop tree (*Bischofia javonica*), Croton (*Croton megalocarpus*), Nandi flame, Jacaranda (*Jacaranda mimosifolia*) and *Pinup sp.* Common fruit trees are Avocado (*Persea Americana*), Plum (*Syzygium guminii*) and Medlar (*Eryobotria japonica*). Shrubs include Tickberry (*lantana camara*), Marigold (*Tithonia diversifolia*) and Thorn apple (*Solanum incanum*). These forest reserves are being for firewood, agriculture and settlement, posing a threat to water catchments in the area. This calls for collaborative strategies to restore, protect and monitor them from deforestation.

### 5.3.2 Land use

Land resource in Kenya is scarce, ethnically based and is usually related to conflict, and environmental degradation. This may be blamed on the colonial policy of large-scale land alienation for European settlement and the displacement of Africans into native reserves (Okoth-Ogendo, 1991), inequitable

distribution of land, fragmented land laws, inadequate land titling and registration and ineffective dispute resolution mechanisms.

**a) Urban and built up areas**

Land use forms a major divide in the Upper ACA. Urban areas such as major towns in the catchment (for example, Nairobi, Thika, Kiambu and Machakos), and associated built-up infrastructure (such as roads, airports and playgrounds) constitute a significant proportion of the catchment (~0.5 percent of the catchment area). These areas generate high runoff and consequent erosion of riverbanks, sewage spills during flash-floods, solid waste, encroachment into wetlands and riparian areas, encourage unsustainable sand harvesting by providing ready market, and are also home to many cement industries and their consequent badlands and pollution. A huge number of unfriendly-water-use plants such as Eucalyptus are also found in these areas and their surroundings. Besides being the most populated areas and with challenges in urban planning, they also pose serious challenges for implementation of proper land use plans for catchment protection and conservation.

**b) Croplands and rangelands**

Croplands and rangelands constitute the largest land use areas in the catchment. The grass- and bushland consisting of acacia shrubs and thickets in open grassland is used for grazing, whereas the areas covered by wood and bushlands are known well known for wood logging and charcoal production. If good and sustainable farming practices are carried out in the cropland areas, there could be a huge potential to reduce on-farm soil erosion, sources of fertilizer pollution, and improve livelihoods. Unsustainable farming practices have been widely reported for many areas in the catchment; implying that most cropland areas are not properly managed.

**5.3.3 Protected areas**

There are several gazetted forests and wildlife reserves within the Upper ACA. These include the Nairobi National Park, which is the only National Park, found within a city, Lake Ol Bolossat, Kikuyu, Ngong, Karura and Aberdare Forests. These forests and wildlife reserves are under the auspices of the Kenya Forest Service and the Kenya Wildlife Service.

The protected areas are very important for biodiversity and conservation of ecosystems. They host lions (*Panthera leo*), cheetahs (*Acinonyx jubatus*), spotted hyenas (*Crocuta crocuta*), black-backed jackals (*Canis mesomelas*), serval cats (*Leptailurus serval*), warhogs (*Phacochoerus africanus*), leopards (*Panthera pardus*), monkeys (*Cercopithecidae*), Olive baboon (*Papio anubis*), African buffalo (*Syncerus caffer*) and various bird species like parrots (*Psittaciformes*), guinea fowls (*Numididae*) and ostriches (*Struthio camelus*). However, for communities living close to protected areas, conservation sometimes translates into problems, such as loss of access to resources, crop damage caused by wildlife and conflicts over resources. In the recent past, there have been several contentious issues related to the balance between conservation and development where the National's Standard Gauge Railway construction was said to potentially interfere with the wildlife migratory corridor. This created tension between local population, conservationists and authorities.

## **5.4 POPULATION TRENDS**

Population is a major driver of environmental change in the area and as such is a determinant of other parameters such as land-use patterns, settlement and water consumption. In the Upper ACA, Population distribution and settlement patterns are influenced by infrastructure network such as roads, water, electricity, availability and accessibility of areas of gainful employment, availability of cheap housing,

security and land tenure.

The most recent census conducted in 2009 showed the country’s population at 38.6 million. It is expected to rise to 55 million by 2050. In terms of demographic characteristics, the population remains relatively young with 60 percent being below the age of 18 years, and over 51 percent being female.

The population is an indication of the social and public amenities that are necessary in each county to provide sufficiently for the needs of the entire populations. This includes water supply. Considering the population growth projections, it is pertinent to note that the social and public amenities must increase concurrently with the population growth. The demographics in the four Counties in the Upper ACA are provided in the table below, with projections for 2018, 2020 and 2022.

*Table 6: Upper ACA Population Projections (Adapted from KNBS, 2017)*

<b>County</b>	<b>Year</b>	<b>Population</b>
Nairobi	2009	3,138,369
	2018	4,941,708
	2020	5,433,002
	2022	5,958,338
Nyandarua	2009	596,268
	2018	722,498
	2020	1,035,254
	2022	1,207, 942
Kiambu	2009	1,766,058
	2018	2,032,464
	2020	2,356,426
	2022	2,695,352
Machakos	2009	1,098,584
	2018	1,315,244
	2020	1,659,278
	2022	1,892,654

## **5.5 EDUCATION**

Literacy rates are generally higher than average within the catchment area. This is attributed to proximity to towns and general higher standards of living than the country average. The Upper ACA is well endowed with education institutions, which are well distributed. The introduction of the free primary education increased the enrolment of children into primary school. This led to a strain on the infrastructure of the primary schools particularly the classrooms, toilets and laboratories. Though primary and secondary education and universities has not been devolved to the County government, the Counties within the catchment area cooperate with the National government to ensure that the infrastructure mentioned above takes into account the growing enrolment rates.

To address the challenge of inadequate facilities, it is recommended that the education institutions collaborate with the private sector, NGOs and development partners to provide additional educational facilities.

## 5.6 WATER SUPPLY

The Water Act (2016) aligned national water management and water services provision with the requirements of the Constitution of Kenya 2010 particularly on the clauses devolving water and sanitation services to the county governments. Service provision is devolved to the counties who are the owners of Water Service Providers (WSPs). One of their functions is to develop, operate and maintain water infrastructure to increase the available water for use by various sectors and for various purposes. This also includes overseeing water coverage. Water coverage refers to the number of people served with drinking water expressed as a percentage of the total population within the service area of a utility. It is critical in tracking the progressive realisation of the right to water with regard to the accessibility component in the normative content of the right to water (WASREB, 2018).

Some of these water infrastructures are detailed below.

### 5.6.1 *Piped water supply systems*

According to the Impact report no. 10 (WASREB, 2018), there are twenty-four water utilities in the four counties within the Upper ACA. These are: Mavoko, Machakos, Mwala, Yatta, Matungulu, Kangundo and Kathiani (Machakos County); Nyandarua, Olkalou, Ndaragwa, Engineer, Kikanamku and Mawingo (Nyandarua County); Thika, Gatundu, Ruiru-Juja, Kikuyu, Kiambu, Limuru, Karuri and Githunguri (Kiambu) and Kiamumbi, Nairobi and Runda (Nairobi County).

In the four counties within Upper ACA, Nairobi has the highest water coverage at 81 percent, whereas Nyandarua has the lowest at 36 percent. This represents a very low percentage of population that has access to safe and adequate water at reasonable distances to their homesteads.

### 5.6.2 *Boreholes*

Majority of the water systems in the Upper ACA with limited surface water rely on boreholes as the main source of water supply. Some of the areas like Kiambu and its environs have ground water with high fluoride content. Due to inadequate ground water exploitation and high cost of operation and maintenance due to high electricity costs, the water coverage in the Eastern part is very low with areas like Ndeiya having very limited supply.

Where (functional) deep boreholes and piped systems are unavailable, lower quality water (often contaminated with micro bacteria) from rivers, dams and valley tanks, shallow wells, scoop holes and (protected) springs are used. Some buildings are equipped with rooftop water harvesting systems.

The average drilling depth of boreholes in the catchment is between 40 and 120 m. Boreholes are considered functional when providing a minimum of 0.5 m<sup>3</sup>/h. Yields and abstraction depths of deep groundwater are very different per location as water is abstracted from fractures, i.e. small groundwater pockets with differing hydrogeological characteristics. Data indicates that yields are slightly higher and boreholes less deep in Kiambu County.

Non-functionality rates of boreholes are high, at between 15 and 50 percent, mainly due to poor site selection, design, operation and maintenance. There is a need to replace existing distribution systems with new and bigger diameter pipes, and retest pumps to confirm their actual capacities and service them accordingly to enhance production (AWSB, 2016).

### 5.6.3 *Protected springs*

Springs occur where groundwater emerges at the surface because a layer of hard rock prevents seepage downwards or because the water table is high enough to intersect a depression in the local topography. Protected springs are equipped with a masonry wall and a pipe that is set at sufficient height to allow a bucket or container to be placed below. Many of the springs within the upper ACA are insufficiently protected. For safe water supply, it is essential to protect the spring catchment and springhead from pollution.



*Figure 33: Example of a protected spring (thewaterproject.org)*

#### **5.6.4 Roof water harvesting**

Roof water harvesting was seen throughout the catchment, where water is mostly harvested from roofs of institutional builds (schools, clinics, hospitals and stores). After collection, water is conveyed via gutters and pipes into storage tanks. A first flush device is installed to avoid pollution to run into the storage tank.

Health risks associated with rainwater harvesting are very small. However, there is a need to ensure contaminants are reduced.

Despite its large potential, the use of roof water harvesting is still limited. This calls for more awareness and sensitisation of the importance of rainwater harvesting as a potential source of water provision.

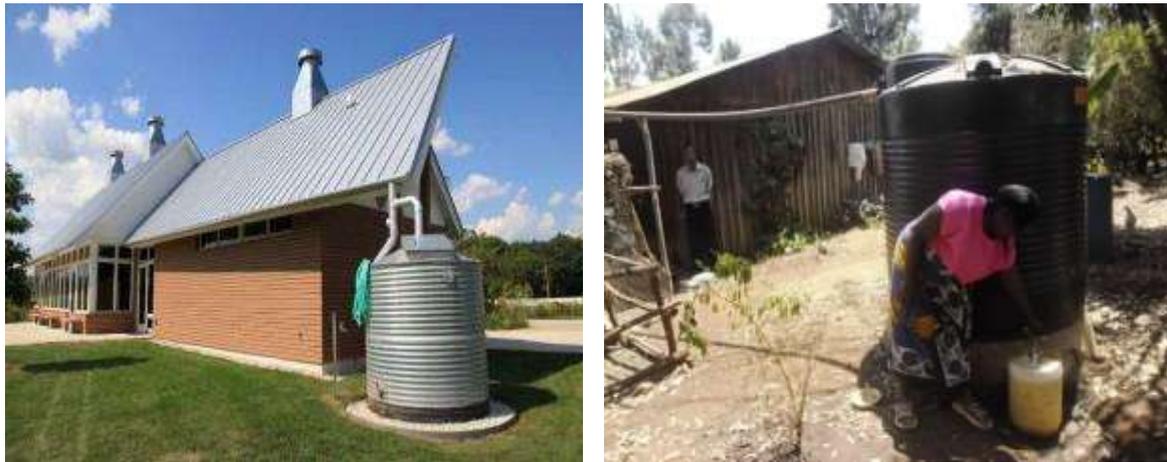


Figure 34: Examples of rainwater harvesting facilities

### 5.6.5 Shallow wells and scoop holes

Shallow wells abound in the catchment particularly along the river course, in the flood plains and in the wet areas. During the dry seasons, communities away from towns resort to scoop holes in sandy rivers and close to the larger open water storage reservoirs taking advantage of the locally raised water tables and the filtering properties of the soil (FAO 2009).

Shallow boreholes are wells drilled in the soft overlying rock – regolith – and usually have water strikes at the bottom of the hole. Drilling can be motorised or hand-driven. Water quality is good since a clayey layer generally protects the aquifer. Yields fluctuate depending on the type of aquifer. Dug wells (also known as shaft wells) are shallow wells of 1 m-diameter installed with concrete rings or lined with bricks and are mostly excavated with support from communities. Yields are often dependent on the season. Water quality could be reasonable to good, but is often polluted due to the inexistence of protective layers (Acacia Water, 2017).

### 5.6.6 Dams

In the past, there have been a large number of dams that have been built and rehabilitated, with even more being proposed for construction or rehabilitation. Sasamua, Thika, Ruiru and Ndakaini dams are some of the major dams supplying water to residents of the upper ACA.

However, there are many other dams, most constructed during the colonial period. Databases indicate that less than 20 percent of these facilities are fully functional, mostly due to siltation, which is strongly linked to poor design, construction, and water source protection.

Some of the planned or ongoing dam projects by Athi and Tanathi Water Service Boards include:

- Construction of **Mwania – Miwongoni Dam** - To serve over 200,000 people in Machakos
- Rehabilitation of **Maruba Dam** - To serve over 200,000 people with clean water and sewerage system in Machakos County.
- Construction of **Yatta Dam** - The project will serve Machakos County, supplying water to Matuu, Sofia, Katangi towns.
- Ongoing construction of **Ruiru II Earth Dam**. 55m high with storage capacity of 13Mm<sup>3</sup>.
- Ongoing construction of **Karimeno Earth Dam**. 40m high with storage capacity of 20Mm<sup>3</sup>

## 5.7 WATER BALANCE

Water balance refers to the comparison of the quantities of water supplied, drained and removed that affect the change in storage over a certain period of time and within a given area. According to the Athi Catchment Management Strategy, the per capita water availability for the entire ACA is low. It is estimated at 464 M<sup>3</sup> per year compared to the global recommended amount of 1,000M<sup>3</sup> per year. In 2010, the Athi catchment was the only catchment in Kenya having a water deficit according to the World Bank (2011).

The Kenya National Water Master Plan (2013) projects a 30 percent deficit between fresh surface water supply and demand for the ACA by year 2030. The pressure on water resources in the basin from domestic, industrial and other needs will therefore persist. The highest water stress within the Athi basin is experienced within the Nairobi metropolitan area, which is situated on the upper part of the basin. The deficit was estimated to be 334,942 M<sup>3</sup> per day (ibid, 2011). The water needs within Nairobi County alone are driven by domestic use (65 percent) with industrial and commercial uses accounting of the remainder (35 percent).

Some of the other key issues that have an impact on the water balance and subsequent demand management are:

- Unreliable rainfall (long periods of drought and water scarcity);
- Population increase;
- Increased growth (infrastructural development in the ACA e.g. Tatu City and the Konza Technopolis);
- Industrialisation;
- Demand for natural resources such as sand for the just completed Standard Gauge Railway;
- Inefficient water use; and
- Catchment degradation

This calls for optimisation of available resources, including rehabilitation of water infrastructure to full functionality and integrated water resources management. One such example is the use of recycled water (Table 7). Nairobi offers a perfect opportunity for the reuse, especially since it produces large volumes of greywater on a daily basis.

*Table 7: Treated wastewater effluent available for reuse in Nairobi (2010 - 2035)*

Year	2010	2015	2020	2025	2030	2035
<b>Net treated wastewater available (m<sup>3</sup>/day)</b>	59,128	83,311	118,683	163,154	218,649	293,899

## 5.8 WATER QUALITY

Water quality management in Athi Catchment is varied and complex due to the fact that two of the three major cities in the country, Nairobi and Mombasa are located in the region. As a result, there is population influx into the cities. The housing development is unable to keep pace with the population influx. This has given rise to informal settlements, which lack proper sanitation facilities (WRA, 2016)

The key drivers of water resources degradation in Upper ACA are mainly economic (e.g. increased industrial, commercial, residential and agricultural developments) and demographic (from increased

population). Water degradation studies across the Upper ACA reveal a close relationship between the types and concentration of potentially polluting substances and specific land use activities (Kiithia, 2012). Industrial land uses contribute heavy metals and chemical pollutants; agricultural activities produced pesticide sediments while the residential settlements were associated with human and domestic wastes. In Nairobi, slums are constructed along riparian lands, while in Kiambu and Machakos, streams, rivers and wetlands have been encroached for agricultural use.



*Figure 35: Women collecting water for domestic use (KRC, 2018)*

## 5.9 WATER DEMAND

The main objective for water development is to provide water to rural population within reasonable walking distance. In achieving this objective, there is a need to balance between human needs. Water demand is therefore the amount of water required to cover the needs of specific users or uses, including the environment.

The Athi Catchment Area has a mean annual rainfall of 810mm, which is obtained from a basin range of 600 to 1200mm/year. The 2010 available water resources amounted to 1,503M cubic metres, being 1,198M cubic metres surface water and 305M cubic metres/year groundwater. The demand in 2010 was 1,145 MCM/year, or 76 percent of the available water resources and there was a positive balance of 358 M cubic metres. By 2022, the domestic demand alone will rise by 286M cubic metres/year. The total demand is expected to rise to 2,085M cubic metres/year by 2030 largely due to planned irrigation projects. This will result to a basin deficit of 921M cubic metres/year.

According to the NWMP 2030, the annual water demands estimated for the year 2010 and projected for 2030 in the ACA for the various sub-sectors is provided below.

*Table 8: Water demands by sub-sector in the ACA (NWMP, 2030)*

Year	Water Demands (MCM/year)						
	Domestic	Industrial	Irrigation	Livestock	Wildlife	Fisheries	Total
2010	519	93	498	25	3	7	1,145
2030	941	153	3,418	59	3	12	4,586

### 5.9.1 Domestic water use

Access to water remains a major challenge in the upper ACA. The demand is highest for domestic, irrigation and industrial use. However, water demand varies per location and season. In 2010, the water demands for the ACA utilised for domestic purposes was 519M cubic metres/year. This accounts for 45 percent of all water use.

Throughout the catchment, there are areas where total water supply does not meet water demand.

Investments in water supply are needed throughout the catchment to keep up with the growing population. In addition, the water quality issues especially in Nyandarua County should be addressed.

*Table 9: Safe water coverage in the Upper ACA (Adapted from WASREB, 2018)*

County	Total Population	Safe Water Coverage %	Drinking Water Quality %
Nyandarua	773,115	36	21
Kiambu	1,987,092	75	81
Nairobi	4,328,225	81	93
Machakos	1,257,190	48	67

### 5.9.2 Livestock water use

Livestock keeping is one of the livelihoods practices within the Upper ACA, part of which are considered ASALs. Some of the livestock kept are cattle, goats, sheep and donkeys. Water demand for livestock is highest around Machakos area.

Current water demand for livestock in the ACA is 25MCM/year. In 2030, water demand for livestock is projected at 59MCM/year (Table 8). Livestock migration routes may change in the future depending on developments in terms of water for production infrastructure, changed land use and tenure, land cover and livestock numbers. Therefore, changing movements of pastoralists should be closely monitored and taken into consideration when selecting sites for dams and other water infrastructure.

In assessing the proposed water infrastructure under the proposed GCF project, it was agreed that the new water points should be developed in such a way that they can act as stepping-stones between grazing areas and in others, include water troughs for livestock watering. This will ensure that the grazing pressure on the water infrastructure is minimised, thus reducing soil erosion and hence improving the water regulating capacity of the catchments.



*Figure 36: Livestock around the Upper ACA*

### 5.9.3 Crop water demand

The Upper ACA consists of the areas of Kiambu and some parts of Nyandarua, where tea and coffee farming is predominant. Horticultural farming is also practised in these areas. Food crops like legumes, maize and fruits are also grown in the Upper ACA. Other crops are cotton in Machakos County.

In 2010, 498MCM/year was required for irrigation purposes. This accounted for 43 percent of the total water demand. Projections for 2030 show that this figure will go up to 3,418MCM/year, which will represent 74 percent of the total demand (Table 8). This will have a huge impact on water availability and may be a potential cause for conflicts if water is not allocated in an equitable manner.

Irrigation is a great way to enhance the productivity of agricultural land, but sustainable land use and management of soil and water resources should be ensured. Investment and soil carrying capacity, land management practices and infrastructure development provide major challenges, which have to be considered.



*Figure 37: Tea and coffee plantations in the Upper ACA*

### 5.9.4 Water for industrial use

The Upper ACA and its environs is a host to several industrial establishments. Mavoko, popularly known as Athi River, is a growing industrial town. In Nairobi, there are various kinds of industries such as agricultural equipment, brewing and beverages, cement, chemicals and pharmaceuticals, coffee processing, construction material, electricity appliances, food processing, etc. In the suburbs of Nairobi, there are shoes and meat processing in Limuru, while cement, brewing and beverages, meat processing, and textile along the Athi River, and food processing and light industry in Machakos. This industrial growth has not been matched with the development or expansion of infrastructure to deal with the increased water needs and waste volumes from the industries.

According to the NWMP, 2030, the water demand for industrial purposes will nearly double from 93 in 2010 to 153 in 2030 (Table 8). This growth should also be matched with availability of water supply, sewerage and sustainable waste management systems, including those that promote recycling.

## 5.10 OPPORTUNITIES FOR RECHARGE AND RETENTION OF WATER

In practice, recharge and retention means collecting and storing water during periods of water excess while making it available during periods of drought. In addition, recharge and retention interventions is

to extend the chain of uses, which use buffers like shallow aquifers, the soil profile and open water reservoirs to store water. The ultimate aim is to create secure water retention reservoirs, which can fulfil the water demand for different uses in the area. This translates into an increased resilience during droughts, higher productivity and increased access to drinking water. The recharge and retention approach can be used to make water available in areas with otherwise low water availability. The focus of the approach is on small low-cost interventions that contribute to the resilience of local livelihoods, with little to no negative impacts.

Recharge and retention include multiple techniques, such as conservation and reclamation of wetlands, soil and water conservation measures, sub-surface dams, sand dams, water harvesting from roads, ponds, but also controlled grazing, can be applied to increase freshwater availability. The most appropriate combination of measures is selected by means of integrated assessments. These assessments include in-depth biophysical analyses and discussions with stakeholders on the needs, operation and maintenance.

Examples of recharge and retention measures that could help to bridge the deficit between water availability and demand, and further improve water quality are: mulching, terracing, tree plantation, earth and sand dams and ponds (Figure 38).



*Figure 38: Examples of recharge and regeneration measures: Top left to bottom: Mulching, pond, sand dam, terracing, and tree planting*

## 5.11 ECONOMIC SETTING

Within the Upper ACA, people's livelihoods comprise a wide spectrum of activities, including agricultural production, livestock production and fishing, as well as pastoralism.

### 5.11.1 Agricultural Production

The Government of Kenya has identified flagship projects to be undertaken under the agricultural sector in Vision 2030. These include: exploiting the 9.2 million ha irrigation potential; developing water resources for livestock, domestic and irrigation use; constructing roads; managing natural resources; facilitating sustainable exploitation of renewable sources of energy to support agricultural development; exploring the possibility of providing a livestock insurance scheme for producers in arid and agricultural areas; and improving technical capacity of communities. About 40 percent of agricultural land in the Upper ACA is considered semi-arid and has suffered from perennial food shortages during the dry spells.

More than half of the arable land in the Upper ACA is cultivated. Most of the crop production is to a large extent small-scale, market oriented and subsistence farming where farmers have small portions of land. Horticulture farming takes lead in crop production in the county. The main vegetables grown include tomatoes, kales, spinach, cabbage, local vegetables, onions, capsicum and carrots. Fruits grown include passion fruits, mangoes, bananas and avocado. Several varieties of herbs and spices are also grown. Cut flowers are also grown.

The main food crops grown are maize, beans and Irish potatoes on small-scale basis especially in peri-urban areas. The crops are grown for both household consumption and for commercial purposes. Tea, coffee and cotton are also grown for export and are the main cash crops grown in the catchment area.

### 5.11.2 Livestock and Fishing

Livestock farming is a major activity in parts of the catchment and the main animals reared are indigenous and exotic species of cattle, goats, sheep, rabbits and poultry. Dairy farming is the dominant enterprise in the livestock subsector. Several farmers in the region are also practicing bee keeping. The main value addition activities on livestock products include milk processing, cooling of milk, processing and packaging of honey and leather tanning. Most of these activities are on small scale.

Livestock production and value addition is a component of urban Agriculture in Nairobi that addresses food and nutrition insecurity in addition to supplementing household incomes. Most of the livestock production systems are mainly small-scale, market oriented and subsistence farming. The limited space available for livestock farming requires innovative urban farming technologies to maximise production per unit area. These technologies include utilizing all available spaces such as vertical, roof tops for small animals and maximizing on feeds by-products; including feeds bulking from off-farm sources.

Nairobi is the major market for livestock and livestock products from other counties where large supplies originate. To take full advantage of the proximity of the urban market, value addition of livestock products is promoted through urban livestock extension methodologies. Livestock production section plays a key role in capacity building livestock farmers to realise maximum output per animal through fora such as

field days, individual farm visits, group trainings, shows, exchange visits, among others. The department also plans for programmes and projects to implement the extension activities, targeting the youth, women and the vulnerable.

Livestock products and by-products in the Upper ACA include milk, eggs, both red and white meat as the major animal-based source foods, hides, skins, honey and bees-wax. The county produces considerable livestock products though the quantities are insufficient to meet the consumption needs of the resident population, with deficits being offset by supplies from other

The main fisheries activities carried out in the catchment area include aquaculture development (Fish farming), fish quality assurance, fish value addition and marketing, promotion of recreational fisheries, implementation of fisheries management measures and compilation of fisheries statistics.

The department of fisheries offers extension services to fish farmers aimed at increasing the production of safe fish. The main approaches used in provision of extension services includes demand driven farm visits, farmer group trainings, exhibitions, on farm demonstrations as well as exhibiting at the Nairobi International Trade Fair. The department is also mandated to ensure fish safety and does so through inspection of fishery enterprises and sampling of fish, water and fish feeds for official checks.

The main fish species produced through fish farming are *Oreochromis niloticus* (Nile tilapia) and *Clarias gariepinus* (African catfish). The urban fish farming technologies in the include fishponds, fish tanks, aquaponics systems and aquariums for production of fish for food and ornamental fish. The fish industry in Nairobi employs an estimated 3,000 people working as fish traders, fish farmers, fish processors and provision of fisheries auxiliary services.

### 5.11.3 Other livelihoods

In Kenya sand harvesting has been reported along major river banks all over in the country. In the Upper ACA, sand harvesting is common in Machakos County. Although it has led to job creation among the youth living in the area, sand harvesting is causing environmental degradation thus affecting socio-economic development.

Unregulated sand harvesting was raised as a key challenge in water resources management during stakeholder interviews, including validation workshops. There is thus need for concerted efforts to address this challenge.



## 5.12 INFRASTRUCTURE AND COMMUNICATION

Figure 39: Sand harvesting within the Upper ACA (Change.org, 2018)



## Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK GREEN CLIMATE FUND FUNDING PROPOSAL

Infrastructure is the underlying foundation for an area's development. This section describes the various infrastructural facilities and their access in the Upper ACA. They include the road and rail network, airports, and airstrips. It also includes Information, Communication and Technology, which include post offices, mobile telephones, landlines, fibre optic cables, radio and television. Also included are energy access and housing types.

Public services in the area include *matatus* (vans), minibuses and taxis. Motorbikes (*boda bodas*) are also gaining popularity.

### 5.12.1 Road, Railway Network and Airports

The current road network in the Upper ACA is inadequate in terms of coverage to meet current and future demands as envisaged in the Vision 2030. There is heavy congestion on most of the city roads especially during the morning and evening peak hours.

Nairobi County hosts three (3) airports; Jomo Kenyatta International Airport, Wilson Airport and Eastleigh Airport. Jomo Kenyatta International Airport (JKIA) is the biggest Airport in East and Central Africa, and is the focal point for major aviation activity in the region. Its importance as an aviation Centre makes it the pacesetter for other airports in the region. There are also fifteen (15) functional railway stations.

Access to the project areas is not expected to be a problem as these are mostly along existing roads.

### 5.12.2 Information, Communication and Technology

Posts and telecommunication sub-sector has experienced mixed growth in the recent past. The growth of postal services has rather been declining due to increase in mobile telephony. Mobile telephony has the highest coverage in Nairobi compared to other parts of the Upper ACA, with over 95 per cent of the inhabitants having access to mobile communication. The players engaged in mobile telecommunication include Safaricom, Telkom and Airtel, while those in mailing services include Kenya Postal Corporation, Group 4 Securities, Direct Handling Limited, Wells Fargo among others.

## 5.13 SOURCES OF ENERGY

Lack of access to clean sources of energy is a major impediment to development through health-related complications such as increased respiratory infections and air pollution. The type of cooking fuel used by households is related to the socio-economic status of households/ individuals.

The main sources of energy in Nairobi County are electricity, solar, LPG, biogas paraffin, charcoal and firewood. In Nyandarua, the main source of cooking energy is firewood while electricity covers 10.5 percent of the county and is mainly found in urban centres of Mairo-inya, Ol'kalou, Njambini and Engineer and several trading centres located in different parts of the county.

## 5.14 CROSS CUTTING ISSUES

### 5.14.1 Gender

Owing to interplay of historical, socio-cultural, economic and environmental factors that are at work against the interests of women in general, gender relations are unfavourable to women in the catchment



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area. The household is the basic unit of economic activity where, productive and domestic activities are organised mainly based on gender and age. While leadership within the household and management of household economic and social activities is the responsibility of household heads (who are usually men), women and children play a vital role in economic and domestic activities.

Women and children are disproportionately burdened by displacement. Gender socialisation directly disempowers women, because typically women are much less able within the family to influence decisions related to how family income is to be spent.

Although the water community has made significant strides in designing programmes and policies that take into account the differing roles and responsibilities of women and men, most of the progress has been in the area of domestic water supply and sanitation. Much more needs to be done to address water resources management, development and productive use.

### *5.14.2 Cultural Issues*

In the urban parts of Nairobi, Kiambu and Machakos towns, the areas are largely cosmopolitan with the residents being bilingual (English and Swahili). However, there are still a large percentage of the population speaking their ethnic (tribal) languages. The dominant ones are Kikuyu, Luhya, Luo, Kamba, Kalenjin and Kisii. In Nyandarua and Kiambu Counties, the dominant tribe is the Kikuyu, while in Machakos it is the Kamba. There are also non-Africans of Asian, Arab or European origin.

The communities living within and around the Upper ACA share Socio-cultural assets such as churches, which form a large part of religion in the country.

### *5.14.3 Disadvantaged People*

In Kenya, the elderly and disabled persons are largely viewed as disadvantaged groups in society, and like any other area, these disadvantaged groups exist in the Upper ACA.

The GoK has committed to address the issues of social protection, which is entrenched in the Constitution of Kenya, 2010. In 2013, the GoK released a sector plan for gender, youth and vulnerable groups, recognising the need to protect human rights and preserving the dignity of individuals and communities in order to promote social justice and realise the potential of all human beings.

This project will contribute to these efforts by enhancing the availability of water and its supply in an equitable manner, in line with the human rights to water.

## CHAPTER 6: CONSULTATIONS AND PUBLIC PARTICIPATION

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### 6.1 STAKEHOLDER ANALYSIS

In a participatory process such as the ESMF, it is of essence to understand the local dynamics in order to balance the interests and views of various groups. In this analysis, the ESMF team identified the relevant stakeholders and collected as much as possible information in order to understand the specific issues and power-dynamics at hand within the Upper ACA.

The following steps were undertaken in the stakeholder mapping and analysis exercise:

- Identification and listing of all stakeholders (primary<sup>5</sup> and secondary<sup>6</sup>) operating in the Upper ACA.
- Identification of stakeholders implementing water related interventions.
- Description of main characteristics of key stakeholders in terms of their activities, interests, influence and participation, possible contributions, challenges and their possible roles in the proposed project; and
- Formulation of an engagement strategy for stakeholder participation.

#### 6.1.1 Stakeholder Identification

During the inception and scoping phase of the ESMF, an initial list of stakeholders was generated based on a stakeholder identification activity conducted on 2 July 2018. During data collection, as part of the full stakeholder assessment exercise, the list was further expanded with stakeholders identified by other actors like NEMA, WRA and County government officials. The list provided a basis for analysing the different stakeholders and relevance to the Upper ACA.

It should be noted that a stakeholder mapping is not a static process, but rather dynamic; actors will enter or leave the catchment, or will change objectives led by strategic planning cycles. We therefore advice NEMA and WRA to use this stakeholder identification as a database which will be regularly updated and to which new actors can be added while other might drop out.

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<sup>5</sup> Primary stakeholders are those ultimately affected by certain actions, either directly or indirectly.

<sup>6</sup> Secondary stakeholders: are the intermediaries in the service delivery process. They can be divided into funding, implementing, monitoring and advocacy organisations, or governmental, NGO and private sector organisations. They may also be informal groups of people who will act as intermediaries, e.g. politicians, local leaders, respected persons with social or religious influence.

Table 10: Stakeholder list - Primary and Secondary Stakeholders

National level	County Government
National Environment Management Authority	County government of Nyandarua
Water Resources Authority	County government of Kiambu
Ministry of Environment and Forestry	County government of Nairobi
Ministry of Water and Sanitation	County government of Machakos
Kenya Meteorological Department	
Athi Water Service Board	
Primary Users (local resource users)	County government departments
Farmers (subsistence and commercial)	County Meteorological Department
Miners (Sand harvesting and stone quarrying)	County Water Offices
Fisher folk	NEMA – County Offices
Bee keepers	County Environment and Water Offices
Livestock herders	Public Health Department
Water Resource User Associations	
Private Sector	Civil Society Organisations
Water Service Providers	Tree is Life Trust
Sand dam and water pan stakeholders	Lake Ol Bolossat Conservation Network
Regional Offices	Community Forest Associations
Water Resources Authority: Sub-regions	Upper Tana Water Fund – TNC
Kenya Agriculture and Livestock Research Organisation	World Vision
Department of Fisheries	Crane Conservation Volunteers
Kenya Wildlife Service	
Institutions	Academia
Schools	University of Nairobi
Hospitals	

### 6.1.2 Stakeholder Characterisation

In this section, stakeholders have been described and characterised based on the data collected through interviews, questionnaires and FGDs. Multiple actors with different motivations, agency and influence must engage with the proposed project, but may not do so if proposed actions do not align with their motivations or if they do not have agency to undertake specific actions. This stakeholder analysis provided a basis for determining stakeholder influence and relevance in the Upper ACA.

Table 11: Stakeholder Characterisation in the Upper ACA

Stakeholder	Influence	Interest
<b>Primary Users (local resource users): Have a good knowledge of the area. When they are heard and participate during the planning process, community acceptability is high</b>		
Farmers (subsistence and commercial)	Low	High
Miners (Sand harvesting and stone quarrying)	Low	High
Fisher folk	Low	High
Bee keepers	Low	High
Livestock herders	Low	High
Water Resource User Associations (Upper ACA)	Low	High
<b>National level stakeholders</b>		
National Environment Management Authority	High	High
Water Resources Authority	High	High
Ministry of Environment and Forestry	High	High
Ministry of Water and Sanitation	High	High
Kenya Meteorological Department	Low	High
Athi Water Service Board	High	High
<b>County governments</b>		
County government of Nyandarua	High	High
County government of Kiambu	High	High
County government of Nairobi	High	High
County government of Machakos	High	High
<b>County government departments</b>		
County Meteorological Department	Low	High
County Water Offices	High	High
NEMA – County Offices	Low	High
County Environment and Water Offices	High	High
Public Health Department	Low	High
<b>Private sector</b>		
Water Service Providers	High	High
Sand dam and water pan stakeholders	Low	High
<b>Regional offices</b>		
Water Resources Authority: Sub-regions	Low	High
Kenya Agriculture and Livestock Research Organisation (KALRO)	Low	Low
Department of Fisheries	Low	High
Kenya Wildlife Service	Low	Low

<b>Civil Society Organisations</b>		
Tree is Life Trust	Low	High
Lake Ol Bolossat Conservation Network	Low	High
Community Forest Associations	Low	High
Upper Tana Water Fund – TNC	High	High
World Vision	High	High
Crane Conservation Volunteers	Low	High
<b>Institutions</b>		
Schools	Low	High
Hospitals	Low	High
<b>Academia</b>		
University of Nairobi	Low	Low

The stakeholders positioned in the top right corner with high influence and high interest could be strong allies for the Project, whereas those with high influence and little interest have the potential to resist against the proposed interventions. It is therefore important to keep them well informed and lobby towards their support for improved water resources management.

The stakeholders with high interest but little influence could become stronger participants in project implementation. For purposes of this ESMF, this study focused on getting their views as regards potential positive or negative impacts of the project. It is important that representatives of primary beneficiaries participate in the project planning process.

## 6.2 INITIAL INTERVIEWS

Initial consultations with select stakeholders were held in July 2018. Two workshops were held in Nairobi at the NEMA office with the PIU. These meetings focused on planning of the ESMF development process and the second to present the inception report and solicit comments.

The PIU was consulted on an ongoing basis regarding planned initiatives for cooperation on environmental and social management.

## 6.3 PUBLIC CONSULTATION MEETINGS

Communication and consultation with the various stakeholders was essential to ensure that the ESMF was tailored to their needs and the overall Project objective. The consultation took the form of interviews with representatives from relevant government institutions and community members from the four counties.

Table 12 below provides a summary of the consultation and participation process during the ESMF development phase.

Table 12: Summary of Public Consultation Meetings Held as part of the ESMF

Date	Meeting description and objectives	Where	Participants summary
6 July 2018	<b>Scoping Mission</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	Nyandarua	County Government of Nyandarua; WRA; NEMA; WRUAs; Tree is Life
9 July 2018	<b>Scoping Mission</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	Kiambu	County Government of Kiambu; WRA; NEMA and WRUAs
11 July 2018	<b>Scoping Mission</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	WRA Office; Machakos	County Government of Machakos; WRA, NEMA, World Vision, WRUAs
6 August 2018	<b>Consultative Workshop</b> <b>Objective:</b> Consultation on the GCF proposal design; development of a methodology for the identification of water infrastructure for rehabilitation	Royal Gardens Hotel, Nyandarua	County Government of Nyandarua; WRA; NEMA; Tourism directorate; NEMA; WRA; WRUAs
10 September 2018	<b>Consultative Workshop</b> <b>Objective:</b> Consultation on the GCF proposal design; development of a methodology for the identification of water infrastructure for rehabilitation	Phoenecia Hotel, Kiambu	County Government of Kiambu; Kiambu Water – Limuru, Ruiru and Kiambu; NEMA; WRA; WRUAs
17 September 2018	<b>Consultative Workshop</b> <b>Objective:</b> Consultation on the GCF proposal design; development of a methodology for the identification of water infrastructure for rehabilitation	Kyaka Hotel, Machakos	County Government of Machakos; MAWASCO; Machakos WSP; NEMA; WRA
16 October 2018	<b>ESMF Stakeholder Validation Workshop</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Nairobi	Nairobi	PIU; KEITI; KRC ASAL Envirotech consult; TUNAY
25 October 2018	<b>ESMF Stakeholder Validation Workshop</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to	Nyandarua	NEMA; WRA; County Government of Nyandarua; Dam Committees; WRUAs

	strengthen the ESMF and project implementation in Nyandarua		
26 October 2018	<b>ESMF Stakeholder Validation Workshop</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Kiambu	Phoenicia Hotel, Kiambu	NEMA; WRA; County Government of Kiambu; Kiambu Water Company; Karuri Water Company; WRUAs
29 October 2018	<b>ESMF Stakeholder Validation Workshop</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Machakos	WRA Office, Machakos County	County Government of Machakos; WRA; NEMA; WRUAs; Water Companies and Local administration

Two hundred and thirty-one (231) people were engaged throughout this process with 82% being those that live within and around the proposed water infrastructure or are directly involved in water development and water resources management.



*Figure 40: Rapid Public Consultations*

## 6.4 EMERGING ISSUES

The following are some of the key benefits identified by the stakeholders during the consultative workshops.

### 6.4.1 *Perceived Benefits*

- Improved water supply (provision of reliable sources) for domestic and commercial use including irrigation, fishing and livestock;
- Improved access to water for residents (achievement of mandate by water companies);
- Enhanced opportunities for employment (especially during the construction phase) and for others, during the operation phase and monitors and security guards;
- Increase in land prices (hedonic value) – appreciation of the value of land following the availability of water;
- Improvement of amenities such as transport infrastructure (access to the water reservoirs);
- Improvement in catchment protection measures through growing of water friendly trees around the water infrastructure;
- Flood protection – Increased magnitude of flooding event captured by water reservoirs; and
- Improved recognition especially of WRUAs by County Governments on their role in water resources management at the sub-catchment level.

### 6.4.2 *Fears and Concerns*

Despite their being benefits, there were still some concerns especially over the water reservoirs and boreholes. Some of the key fears and concerns are highlighted below.

- Increase in reservoir-related epidemics – water reservoirs and their networks are seen as ideal breeding grounds for mosquitoes, snails and flies (disease carrying vectors);
- Lack of adequate involvement of the local communities by the county governments and water companies in operation and maintenance of the water infrastructure;
- Resistance from those currently benefiting from the water infrastructure (albeit through illegal water off-takes). An example is the large-scale carrot vendors washing carrots in preparation for sale at the Mutonyora C water pan in Nyandarua;
- With improved water supply, there is fear that there may be increased population to some of the project areas. This may have an impact on the land use (types of crops grown and commercialisation), diversity in the settlement patterns and in turn, security; and
- Shift in priorities and delays in completion of the project – an example was given on the plans for rehabilitation of Rugita Borehole in Kiambu County under the then Kabete Constituency Development Fund, where funds were reallocated to the construction of Kingeero police post.

### 6.4.3 *Key Suggestions and Opinions*

- There is a need to sensitise key stakeholders on the project in order to reduce potential for conflict. This was emphasised in areas where local communities have encroached into the land where the water infrastructure will be developed/rehabilitated;
- Removal of Eucalyptus tree stands around the water reservoirs should be done in phases in order to reduce biodiversity loss;
- There is a need to clearly demarcate the water reservoir area in order to avoid confusion on the boundaries;
- The PIU should form management committees composed of local communities to ensure regular monitoring of the water reservoirs/infrastructure; and



- The PIU should consider developing a Payment for Ecosystem Services mechanism. This will motivate upstream landowners to practice land uses that enhance catchment protection with the support of downstream communities.



Figure 41: Identification of key issues and recommendations at stakeholder meetings

## 6.5 STAKEHOLDER ENGAGEMENT PLAN

Based on the analysis, involvement and identification of key issues based on their perceptions, it is important to develop and implement a stakeholder engagement plan for the Project. This plan will:

- Offer opportunities for stakeholders to raise their concerns and submit their opinions;
- Create opportunities for information sharing and disclosure, including feedback
- Create an avenue for participatory project impacts monitoring
- Foster strong community relationships including promoting social acceptability of the Project
- Ensure meaningful consultation and the consideration of expectations and concerns into the implementation arrangements for the programme.



Table 13: Stakeholder Engagement Plan

Category	Institutions/ Stakeholders	Details to be disclosed	Communication channels	Frequency and timing	Responsibility
Project Implementation Unit	<ul style="list-style-type: none"> <li>WRA</li> <li>KMD</li> </ul>	<p><b>Information to be disclosed:</b> Project progress, policies and procedures</p> <p><b>Format:</b> Periodic reports, minutes of meetings and workshop proceedings</p> <p><b>Engagement strategy:</b> Consultations, Information disclosure Negotiation and partnerships Reporting Participation in project monitoring</p> <p><b>Methodologies:</b> Key informant interviews (email, phone, one on one), meetings, workshops and joint planning sessions</p>	Rules of Engagement for Project Implementation, Contracts and agreements	As per contractual obligations and rules of engagement throughout the Project	NEMA
Project Coordination Unit	WRA sub-regional manager; County Director of Water; Director of Meteorology and NEMA County Directors of Environment from the four counties within the Upper ACA (Nyandarua, Kiambu, Machakos and Nairobi)	<p><b>Information to be disclosed:</b> Project progress, policies and procedures</p> <p><b>Format:</b> Periodic reports, minutes of meetings and workshop proceedings</p> <p><b>Engagement strategy:</b> Consultations, information disclosure, negotiations, reporting and joint monitoring</p> <p><b>Methodologies:</b> Key informant interviews (email, phone, one on one), meetings, workshops and joint planning sessions</p>	Conditions of approval of reports, Legal requirements, Permits, EMCA regulations ESIA Certificates	Regularly throughout the project phases	PIU
Regional Authorities	WRA sub-regional offices; Kenya Wildlife Service; Department of Fisheries; KALRO	<p><b>Information to be disclosed:</b> Project progress, policies and procedures</p> <p><b>Format:</b> Periodic reports, minutes of meetings and workshop proceedings, Information brochures</p>	Meeting Minutes	Quarterly	NEMA

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		<p><b>Engagement strategy:</b> Consultations, information disclosure, negotiations, reporting and joint monitoring</p> <p><b>Methodology:</b> Key Informant interviews (email, phone, one on one), meetings and workshops and joint planning sessions</p>			
County governments	Four counties within the Upper ACA (Nyandarua, Kiambu, Machakos and Nairobi)	<p><b>Information to be disclosed:</b> Project progress and challenges, project principles and procedures in regards to civil works, grievance management all other ESMF related issues including mitigation measures</p> <p><b>Engagement strategy:</b> Consultations, information disclosure, negotiations, and joint monitoring</p> <p><b>Methodology:</b> Key informant interviews (email, phone, one on one), joint planning sessions, brain storming sessions, meetings and workshops</p>	MoUs and Meeting minutes	Quarterly	PIU
Private Sector	Water Service Providers; Dam and Water Pan Stakeholders	<p><b>Information to be disclosed:</b> Project progress</p> <p><b>Engagement strategy:</b> Consultations, information disclosure, negotiations, and joint monitoring</p> <p><b>Methodology:</b> Key informant interviews (email, phone, one on one), joint planning sessions, meetings and workshops</p>	Notices and meeting minutes	Regularly	PIU
Beneficiaries	Local resource users from the four counties within Upper ACA (Nyandarua, Nairobi, Kiambu and Machakos)	<p><b>Information to be disclosed:</b> Programme design and composition, project principles and procedures in regards to water infrastructure under Component 2 and linkages with other project components, grievance management, all ESMF identified issues.</p>	Minutes of Meetings, Consent agreements and Grievance logs	Monthly during planning and construction phase	PIU



**Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK  
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		<p><b>Format:</b> Oral and written (community meetings, information brochures, meetings with leaders, newspapers, posters, radio, non-technical summary documents, joint meetings and brain storming sessions in regards to matters that affect beneficiaries collectively)</p> <p><b>Engagement strategy:</b> Consultations, information disclosure, negotiations, reporting and joint monitoring</p> <p><b>Methodology:</b> Community meetings, meetings with leaders and locally influential persons, suggestion boxes in safe and accessible locations, focus group discussions, in depth discussions with the directly affected. Stakeholder maps including transect walks, Media, including local radio and tv stations and newsletters, Workshops, Billboards and road signs.</p>		<p>As and when necessary during operation phase</p>	
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## CHAPTER 7: ANTICIPATED IMPACTS AND MITIGATION MEASURES

### 7.1 OVERVIEW

The proposed project is not likely to result in significant adverse environmental or social impacts if carefully managed. As with any project that involves disruption of environmental, social and economic systems, projects such as this one is likely to have both negative and positive environmental and social impacts particularly at site-level if not carefully designed and implemented.

Although impacts are likely to be site-specific, they may also be felt upstream and downstream. For example, impoundment of large volumes of water may shift ecosystem boundaries such as flood regimes, bringing about implications upstream. Siltation and loss or introduction of alien and/or invasive species may happen on-site, while deprivation of sediment loads and land use changes may occur downstream.

For the forty-six sub-activities identified under this project, including rehabilitation of water pans, boreholes and springs, the following are the key potential impacts and mitigation measures. These were gleaned from public consultations, observations and review of similar projects in similar environments.

This ESMF provides a guide which the PIU and contractors should refer to when working towards mitigating the impacts and enhancing the positive impacts. A comprehensive ESMP is provided in this chapter and should be integrated into project implementation.

### 7.2 PREDICTED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

An environmental impact is any change to the existing condition of the environment caused by human activity or an external influence. In the case of the Project, potential impacts (both positive and negative) would arise during the construction and operation phases of the water infrastructure. The potential impacts associated with the proposed development have been assessed as presented in the table below. Precautionary principle was used to establish the significance of impacts and their management and mitigation.

*Table 14: Rating and scoring criteria of environmental impacts*

Severity of impact	Rating	Scoring
Insignificant / non-harmful/less beneficial	-1/+1	None
Small/ Potentially harmful / Potentially beneficial	-2/+2	Negligible
Significant / slightly harmful / significantly beneficial	-3/+3	Medium
Great/ harmful / beneficial	-4/+4	Significant
Disastrous/ extremely harmful / extremely beneficial	-5/+5	Very Significant
Spatial Scope of the Impact	Rating	Scoring
Activity specific	-1/+1	None
Right of way specific	-2/+2	Negligible
Within project area 5km radius	-3/+3	Medium

Regional	-4/+4	Significant
National	-5/+5	Very Significant
<b>Duration of impact</b>	<b>Rating</b>	<b>Scoring</b>
One day to one month	-1/+1	None
One month to one year	-2/+2	Negligible
Within project construction period	-3/+3	Medium
Within the project life	-4/+4	Significant
At decommissioning	-5/+5	Very Significant

The Project construction phase shall involve the following activities:

- Delivery of construction equipment and materials to the project site including contractor's equipment, pipes and fittings, etc.
- Site clearance and excavation activities (e.g. desilting of the water pans);
- Temporary stockpiling of soils, sub-soils and rock along the trenches;
- Construction works including pipe laying, pipe testing, etc
- Ground reinstatement.

The following are the potential environmental impacts identified during the assessment.

### 7.2.1 General Positive Impacts and Enhancement Measures

Table 15: Project potential positive environmental impacts and enhancement measures

Positive Impacts	Proposed Enhancement Measures
<p><b>Improved water security</b> Developing and upgrading of water storage infrastructure for domestic and commercial use will enhance water access and supply in the Upper ACA. This will in turn increase the capacity of vulnerable communities to withstand shock arising from the changing climate.</p>	<p>The PIU should ensure that the identified water infrastructure are developed in a manner that will ensure provision of accessible, reliable and timely water supply.</p>
<p><b>Improved catchment protection</b> The plans to ensure that water friendly and indigenous tree species such as bamboo are planted within and around the project site and the catchment area will have wide-reaching and long-term impacts on the environment.</p>	<p>The Project should ensure that local communities and the Kenya Forest Service are involved in the identification of tree species suitable for the specific sites. Measures to ensure the trees grow and thrive should also be put in place.</p>

### 7.2.2 Hydrological Impacts

This impact largely depends on the design of the water infrastructure. For example, for the boreholes, there is a need to ensure that the aquifers are not overdrawn, negatively impacting downstream communities.

According to the AWSB, Loromo 1, Loromo 2 and Kiriri boreholes have been installed with a master meter and an Airline/Piezometer to monitor ground water abstractions and to facilitate regular measurements of the static water level in the borehole, respectively. The pre-construction plans indicate that 'the water company shall ensure that there is no over pumping and they will stick to the permit class issued by the Water Resources Authority. In addition, auto-shut water taps to reduce water wastage will also be installed'.

There is a proposal to drill two new boreholes in Machakos County i.e Gimu and Mitathini community boreholes. Before borehole drilling, a hydrogeological survey should be conducted on the proposed site. Generally, groundwater is unequally distributed, this survey is therefore necessary to ascertain the suitable sites for exploration of significant quantities of groundwater. In addition, an Environmental Impact Assessment of the proposed project should be conducted as directed in various legislations such as EMCA, EIA and Water Act 2016.

### **Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-3
Duration of impact	-4
<b>Overall score</b>	<b>-3</b>
<b>Interpretation</b>	<b>Medium</b>

### **Mitigation measures**

For the existing boreholes, in order to limit groundwater contamination including over extraction of the aquifer, the following measures should be put in place by the contractor:

- Ensure that all potential sources of pollution are eliminated;
- The contractor should adhere to the regulations set by WRA on the amounts to be extracted from a borehole and the number of pumping hours. This will ensure that wastage and misuse of water is minimized as well as ensuring equity in ground water abstractions
- Avoid improper land use activities within the proximity of the borehole wellhead.
- Undertake an audit on the integrity of the borehole abstraction piping and associated casings.
- Educate and create awareness to the community on the value of water and water resources for enhanced conservation.
- Ensure optimum maintenance of the water supply system components including pipelines, valves and consumer taps.

### ***7.2.3 Vegetation Clearing, Soil Erosion and Sedimentation Impacts***

#### **Impacts**

Construction activities have the potential to clear vegetation and, loosen soils which can then be washed downstream. This may have the following impacts:

- Clearing of vegetation in and around the water infrastructure, especially during the rehabilitation of water pans and provision of access roads will contribute to siltation of downstream water sources.
- In Nyandarua and Kiambu counties where intensive crop farming is practiced, during the rainy seasons, the heavy rains are likely to wash down silt into downstream areas. This silt may

contain organic matter and chemical residues which may affect the quality of water reaching the downstream users.

- Soil quality degradation is also likely to occur during construction as a result of disposal of construction materials on the adjacent lands especially near the base of the valleys and ultimately into the rivers.

### **Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-3
Duration of impact	-3
Overall score	-3
<b>Interpretation</b>	<b>Medium</b>

### **Mitigation measures**

The following are proposed to mitigate soil erosion and its effects, and to enhance vegetation cover:

- Ensure proper demarcation and delineation of the project area to be affected by construction works.
- Re-plant the indigenous vegetation as much as practical once work is completed as part of landscaping initiatives. This will encourage recolonization on denuded areas.
- Construction activities should be done during the dry season to minimise erosion.
- Limit vegetation clearance unless where unavoidable circumstances appear.
- Re-vegetation of exposed areas around the site should be carried out rapidly in order to mitigate erosion of soil through surface water runoff and wind erosion.
- Contain excavated soils so that they will not find their way into nearby water sources. This can be done by establishing a silt trap to hold excessive soil.
- Cement mixing should be done in a designated area away at a safe distance from storm water drains.
- Spilled cement or concrete should be collected and disposed away from natural water ways or storm water drainage.
- Sensitise workers and enable them to properly handle concrete spillages or waste cement.
- An erosion and sediment monitoring and control plan should be prepared and implemented throughout the life of the Project.

#### ***7.2.4 Air Quality Impacts***

### **Impacts**

The main sources of air pollution especially during the construction phase will be dust and emissions from construction equipment (carbon, hydrocarbons, particulate matter,) earth movers and excavators, vehicles, concrete and cement batching plants and trucks, Emission of dust from trucks and vehicles accessing the construction areas as well as material piling (sand and aggregate).

Changes in air quality will have an impact on residences, institutions and vegetation cover. This impact will be temporary and small scale in nature and is rated negligible.

**Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-1
Duration of impact	-2
<b>Overall score</b>	<b>-2</b>
<b>Interpretation</b>	<b>Negligible</b>

**Mitigation measures**

- Maintain construction equipment at high operational conditions such as to control emissions into the air.
- Practice dust control measures. Earth moving should be done under damp conditions as much as possible to prevent emission of dust into the air.
- Piled materials (sand and aggregate) should be maintained damp or covered to prevent dust emissions.
- Provision of appropriate personnel protective equipment such as dust masks to site workers.
- Proper planning in transportation of spoil to ensure that the number of trips done or the number of vehicles used is as minimum as possible.
- Notify the surrounding communities on the potential impacts of the project.

**7.2.5 Excessive Vibration and Noise Impacts**

Construction Phase for the proposed Project will most likely result in noise emissions as a result of the machines that will be used (excavation equipment among others) and construction vehicles delivering materials to site. Noise and excessive vibration can be a nuisance to the local community if construction works begin too early in the day and continues into the night. In 31/40 existing project sites, there is no settlement within a 3 km radius. This impact is therefore rated negligible.

**Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-1
Duration of impact	-2
<b>Overall score</b>	<b>-2</b>
<b>Interpretation</b>	<b>Negligible</b>

**Mitigation measures**

To control noise pollution:

- The contractor should avoid night-time construction when noise is loudest.
- Conduct periodic noise measuring and monitoring to determine levels and extent of harmful noise, the required decibel levels is 60 decibels.
- Provide hearing protection to persons operating within or visiting the areas identified to have high noise.
- In order to meet noise level requirements, the equipment should be fitted with standard noise

attenuation features.

- Machines that exceed acceptable noise limits should be equipped with silencers or lagging materials or specially designed acoustic enclosures.
- Inform local residents when construction activities are likely to generate excessive noise in order to minimise disruption to local residents.
- Sensitise truck drivers to avoid hooting especially when passing through sensitive areas such as schools, churches, residential areas and hospitals.

### **7.2.6 Solid Waste Impacts**

Solid waste generated during construction may include papers used for packing materials, plastics, cuttings and trimmings off materials among others. Dumping around the site will interfere with the aesthetic status on the surrounding environment. This impact is rated negligible, especially since plastics and plastic bags have been banned.

#### **Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-1
Duration of impact	-2
<b>Overall score</b>	<b>-2</b>
<b>Interpretation</b>	<b>Negligible</b>

#### **Mitigation measures**

- The contractor should prepare a site waste management plan prior to commencement of construction works. This should include designation of appropriate waste storage areas, collection and removal schedule and identification of approved disposal site.
- Proper solid waste receptacles and storage containers should be provided, particularly for the disposal of eating materials so as to prevent littering of the site.
- Arrangements should be made for the regular collection of litter and for its disposal with the respective County Governments.
- Ensure that the solid waste collection, segregation, and disposal system is functioning properly at all times during the construction phase.
- Recycle and re-use wastes where possible such as scrap metal.

## 7.3 SOCIAL IMPACTS AND MITIGATION MEASURES

### 7.3.1 General Positive Impacts and Enhancement Measures

There are several potential beneficial impacts as a result of implementing Component 2 of this Project. These are highlighted below.

Table 16: Project Potential Positive Social Impacts and Enhancement Measures

Positive Impacts	Proposed Enhancement Measures
<p><b>Improved public health</b></p> <p>This increased access to water for most of the year will reduce cases of waterborne diseases and household costs of treatment. Improved health will reduce the vulnerability of communities and over time increase their resilience.</p>	<p>To reduce incidences of water borne diseases, the Project should ensure that potable water is made available through the different infrastructure and enhanced used of monitoring systems to check on water quality.</p>
<p><b>Employment creation</b></p> <p>There will be an increase in temporary and permanent jobs during construction and post-construction phases, including operation and maintenance of the water infrastructure.</p>	<p>Adjacent communities should be given priority in the employment of both skilled and semi-skilled labour.</p>
<p><b>Capacity building</b></p> <p>Those involved in the project, including casual workers, will benefit from on-the-job skills training.</p>	<p>Capacity building and training will enhance skills-sets for future deployment.</p>
<p><b>Increased gender friendly and responsive learning environments</b></p> <p>Increased access to water will reduce the time that women and girls would ordinarily use to look for clean water. This has an effect on efforts to address poverty.</p>	<p>The gender action plan that is developed as part of the feasibility studies for this Project should include such components for implementation.</p>

It is important to note that usually, for similar projects, if the community are not involved in the siting of the water structures, it might lead to; lack of ownership of the project and/or lack of social license to operate. For this project, the targeted infrastructure for rehabilitation are mostly in existence, and these issues have not featured strongly during our consultations. That notwithstanding, the need for sensitisation and participation is recognised as important from onset throughout the life of the project.

### 7.3.2 Project Induced Labour Influx

This project will involve construction of civil works during the rehabilitation works for which the required labour force and associated goods and services cannot be supplied locally, either due to inadequacy of technical skills and capacity. In this case, the total or partial labour force may need to be brought in from outside the project area.

In many cases, this influx is compounded by arrival of other people who follow the incoming workforce with the aim of selling them goods and services, or in pursuit of job or business opportunities. This can

have adverse social and environmental impacts on local communities, especially if they are small or rural such as is the case in some of the project sites under Component 2.

Some of the potential impacts related to labour influx include:

- Pressure or increased demand and competition on available public infrastructure, utilities, housing and social and health goods and services, which can lead to price hikes.
- Social conflicts within and between communities
- Increased risk of spread of communicable diseases
- Increased rates of illicit behaviour and crime

Such adverse impacts are usually amplified by low capacity to manage and absorb the incoming labour force, and specifically when civil works are carried out in, or near, vulnerable communities and in other high-risk situations.

It is worth noting that many of these impacts may only become fully known once a contractor is appointed and decides on sourcing the required labour force. This means that not all specific risks and impacts can be fully assessed prior to project implementation, and others may emerge as the project progresses.

**Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-3
Duration of impact	-3
<b>Overall score</b>	<b>-3</b>
<b>Interpretation</b>	<b>Medium</b>

**Mitigation measures**

- Develop and implement labour influx management measures while undertaking an ESIA
- Prepare and disseminate Grievance Redress Mechanisms (GRM) that take into consideration labour engagement
- Implement an effective GRM and act on grievances received
- Ensure applicable commitments made in the social and environmental documents are reflected in the civil works bid documents including ToRs and contracts and penalties clearly indicated
- The contractors should as far as possible engage the local skilled and unskilled labour within the project area during construction stages
- Ensure that the local communities are given priority in relation to employment -all unskilled labour should be contracted or obtained from the local community if possible.
- Ensure that all workers have contracts with terms and conditions that are consistent with Government of Kenya labour laws and polices
- Every worker should also sign a code of conduct as an annex to the employment contract – covering issues such as zero tolerance of unacceptable conduct in the community, Gender Based Violence, sexual harassment, sexual exploitation and abuse of children

The PIU should therefore develop site-specific measures before the contractor starts work. Monitoring and adaptive management will play a key role in addressing potential impacts from labour influx and mitigating risks.

### 7.3.3 Occupational Health and Safety Impacts

Heavy machinery will be used during the construction phase. There is therefore need to ensure health and safety concerns are taken into consideration.

Some of the possible impacts related to health and safety include:

- Risks of drowning of livestock and people (especially minors and the elderly) into open water reservoirs.
- Breaking of water pan embankments.
- Injuries to workers.
- Increased incidences of waterborne diseases such as malaria in the post-construction phase

#### **Impact scoring**

Severity of impact	-2
Spatial scope of the impact	-1
Duration of impact	-2
<b>Overall score</b>	<b>-2</b>
<b>Interpretation</b>	<b>Negligible</b>

#### **Mitigation measures**

- Construction of a perimeter fence around the project sites.
- Sensitisation of communities on ongoing works. This can be done through strategically placed signage.
- Undertaking an audit of the water infrastructure designs before implementation
- Prepare an emergency preparedness plan
- Workers accidents to be mitigated by enforcing adherence to safety procedures and preparing contingency plans for accident response
- The Contractor to have qualified first aid personnel among the workers and maintain fully stocked first aid kits at the sites
- Develop and enforce a strict code of conduct for workers to regulate behaviour in the local communities.

## 7.4 ECONOMIC IMPACTS AND MITIGATION MEASURES

### 7.4.1 General Positive Impacts and Enhancement Measures

One of the knock-on impacts of this Project is improved economic situation. Some of these impacts are described below.

Table 17: Project Potential Positive Economic Impacts and Enhancement Measures

Positive Impacts	Proposed Enhancement Measures
<p><b>Simulation of local economies</b></p> <p>This will be promoted during the construction phase through the procurement of construction materials and employment of local communities.</p>	<p>Adjacent communities should be given priority in the local supply of construction inputs and provision of services.</p>

## 7.5 REVIEW OF GCF ENVIRONMENTAL AND SOCIAL SAFEGUARDS

Exclusion Criteria	Yes	No
<p><b>Will the activities involve associated facilities or generate cumulative impacts that would require further detailed due diligence and management planning?</b></p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<p>There will be no associated facilities generated from the project. All planned interventions under Component 2 will be funded as part of the project. In terms of cumulative impacts, there are some that may have incremental impacts such as reduction of water flows. These include the two new boreholes in Machakos County (Gimu and Mitathini community boreholes) and rehabilitation of some water pans that require impoundment of water.</p> <p><b>Recommendation:</b> Before borehole drilling, a hydrogeological survey should be conducted on the proposed site to ascertain the suitable sites for exploration of significant quantities of groundwater. An Environmental Impact Assessment should also be conducted in line with EMCA.</p>		
<p><b>Will the activities involve transboundary impacts including those that would require further due diligence and notification to affected states?</b></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>All the activities will be undertaken within the specified boundaries of the Upper ACA described in Chapter 2. Therefore, no due diligence related to transboundary impacts will need to be considered as none is triggered.</p>		
<p><b>Will the activities adversely affect working conditions, health, and safety of workers or potentially employ vulnerable categories of workers including women and children?</b></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>One of the positive impacts envisaged from this project is the creation of employment and income generation, where recommendations are made to the PIU and contractor to ensure that local communities are considered as skilled and unskilled labourers, especially in implementation of Component 2. These labourers include women.</p> <p>An analysis of the potential impacts does not indicate likelihood of generating any adverse risks. Moreover, this ESMF recommends that all the requisite plans to manage working conditions are taken into account as and when necessary.</p> <p>In addition, worker's fundamental rights should be protected in line with Kenya's Labour laws such as Kenya's Employment Act (2007), Labour Relations Act (2007) and Work Injury Benefits Act (2007).</p>		
<p><b>Will the activities potentially generate hazardous waste and pollutants including pesticides and contaminate lands that would require further studies on management, minimisation and control and compliance to the country and applicable international environmental quality standards?</b></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>The analysis undertaken under this ESMF on the forty-six components do not provide any indication that hazardous waste and effluents will be generated in quantities that would adversely impair the quality of the immediate and surrounding environment and adversely affect the health and well-being of the affected communities.</p> <p>In the event where there are potential cases of air and water pollution (site-specific and in negligible quantities), several mitigation measures such as maintaining construction equipment at high operational conditions such as to control emissions into the air and</p>		

practicing dust control measures have been proposed.		
<b>Will the activities involve the construction, maintenance, and rehabilitation of critical infrastructure (like dams, water impoundments, coastal and river bank infrastructure) that would require further technical assessment and safety studies?</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<p>In this project twenty-three (23) water pans have been identified for rehabilitation. In selection of the specific water infrastructure, the feasibility study for their suitability was conducted as part of the project.</p> <p>Overall, safety and stability are key components that were considered in the design and have to be carried through in the construction, commission and operation phases of the project. Issues such as loading conditions brought about in constructing the embankments, controlling seepage flows and stability of the rims to prevent large waves that overtop the water pans will be taken seriously.</p> <p><b>Recommendation:</b> Conduct structural integrity tests will also have to be conducted on a regular basis. Issues considered in the situation have been described in section 2.5.3 of this report, with implementation actions necessary to meet this performance standard will be managed through the ESMP.</p>		
<b>Will the proposed activities potentially involve resettlement and dispossession, land acquisition, and economic displacement of persons and communities?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>All the identified water infrastructure are located on public utility land and are managed either by the County Governments or water companies (also under the County governments in line with the Water Act, 2016).</p> <p>Therefore, this assessment has not identified any risk of displacement of individuals and/or communities (either in a temporary or permanent manner) from the areas, they are occupying.</p>		
<b>Will the activities be located in protected areas and areas of ecological significance including critical habitats, key biodiversity areas, and internationally recognized conservation sites?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>In conducting an assessment on situation of the water infrastructure and baseline environmental conditions, several considerations were made such as the vicinity and location of important areas for biodiversity conservation, natural and modified habitats, and critical habitats.</p> <p>There was no risk identified to biodiversity and natural resources that would require further assessment and risk management planning.</p>		
<b>Will the activities affect indigenous peoples that would require further due diligence, free, prior and informed consent (FPIC) and development of inclusion and development plans?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>This project recognises indigenous peoples as social groups with distinct identities. Their participation and consent in project activities and decision-making processes where they are found has been encouraged in line with the Constitution of Kenya (2010) and County Public Participation Guidelines.</p> <p>This assessment did not identify any potential negative impacts on indigenous people.</p>		



**Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK  
GREEN CLIMATE FUND FUNDING PROPOSAL**

<b>Will the activities be located in areas that are considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>This project recognises the importance of protecting cultural heritage for future generations.</p> <p>An assessment of the presence of tangible and intangible cultural resources that may be potentially affected by the activities was conducted. Results indicate that there are no potential risks, so no need for a more detailed assessment.</p>		



## 7.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

An Environmental and Social Management Plan (ESMP) has been developed to assist in prioritising the key findings of the ESMF, and to suggest necessary mitigation actions. From the ESMP, a schedule for the operations implementation could also be drawn that takes into consideration all issues that could develop into serious risks to environment, health and safety at all times. Management reviews and continuous improvement determines which of the activities require to be revisited and at what frequency.

### 7.6.1 Pre-implementation phase

Activity	Associated impacts	Impact levels	Management actions	Target areas and responsibility	Monitoring indicator	Budget (USD)
Community sensitisation and awareness	Project buy-in, ownership and sustainability	Significant	The PIU shall ensure that key stakeholders are made aware of project interventions before rehabilitation/construction commences	<ul style="list-style-type: none"> <li>Nyandarua, Kiambu and Machakos Counties</li> <li>PIU/NEMA</li> </ul>	<p>Awareness levels</p> <p>Independent Redress Mechanisms in place</p>	10,000
Seeking approvals from NEMA for ESIA	Delay in implementation of the Project due to objections and stop orders	Low	The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to	<ul style="list-style-type: none"> <li>Nyandarua, Kiambu and Machakos Counties</li> <li>Contractor</li> </ul>	Number of approvals and/or permits issued	Nil
Approval of plans from County Government and WRA	Delay in implementation of the Project due to objections and stop orders	Low	The Contractor shall ensure that all pertinent permits, certificates and licenses have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to	<ul style="list-style-type: none"> <li>Nyandarua, Kiambu and Machakos Counties</li> <li>Contractor</li> </ul>	Number of approvals and/or permits issued	5,000
Hydrogeological survey and ESIA	Useful in the assessment of impacts of water abstraction over the life of the water infrastructure	Significant	The PIU shall ensure that a hydrogeological survey for new boreholes is conducted	<ul style="list-style-type: none"> <li>Nyandarua, Kiambu and Machakos Counties</li> <li>PIU/NEMA</li> </ul>	<p>Hydrogeological survey report</p> <p>ESIA reports</p>	100,000



7.6.2 Implementation phase

Activity	Associated impacts	Impact levels	Management actions	Target areas & responsibility	Monitoring indicator	Budget (USD)
Environmental and Social Training and Awareness	Risks of Environmental and Social degradation and occupational health and safety related accidents	Significant	Contractor should provide for appropriate environmental and social awareness training	<ul style="list-style-type: none"> <li>All workers</li> <li>Contractor</li> </ul>	<ul style="list-style-type: none"> <li>No. of trainings held</li> <li>Participant attendance lists</li> </ul>	30,000
Local Labour / Employment	Delay in Project implementation due to opposition from aggrieved community members	Medium	<ul style="list-style-type: none"> <li>Wherever possible, the Contractor shall use local labour, and women must be encouraged to be involved in construction work.</li> <li>The contractor shall ensure compliance to the gender balance as required by the 2/3 gender rule</li> </ul>	Nyandarua, Kiambu and Machakos Counties	<ul style="list-style-type: none"> <li>No. of workforce employed from the local community</li> <li>No. of female employed</li> </ul>	No direct costs
Implementation of ESIA ESMP	Minimisation of negative environmental and social risks and maximisation of positive risks	Significant	The PIU should monitor and set aside funds for the implementation of the ESIA and ESMF ESMPs	PIU/NEMA	<ul style="list-style-type: none"> <li>Successful project implementation</li> <li>Monitoring reports</li> </ul>	50,000
Public consultation and redress	Project timeline delays and complaints	Significant	Ensure a process of meaningful consultation with is initiated, including setting up of appropriate independent redress mechanisms for stakeholders to seek remedy	PIU	<ul style="list-style-type: none"> <li>Stakeholder analysis and consultation plan</li> <li>No. of public consultation fora held</li> </ul>	No direct costs



7.6.3 *Post-implementation phase*

Activity	Associated impacts	Impact levels	Management actions	Target areas and responsibility	Monitoring indicator	Budget (USD)
Groundwater monitoring	Regular measurements of the static water level in the boreholes will ensure sustainable use of available water and reduce water resource use conflicts	Significant	The PIU should ensure contractor installs master meters and airlines to monitor groundwater abstractions.	Nyandarua, Kiambu and Machakos  PIU/NEMA/WRA and contractor	<ul style="list-style-type: none"> <li>• Compliance to WRA permit class</li> <li>• Sustainable use of ground water</li> </ul>	No direct costs (WRA reports)
Public consultation and redress	Project failure	Significant	Ensure a process of meaningful consultation with is initiated, including setting up of appropriate independent redress mechanisms for stakeholders to seek remedy	PIU	<ul style="list-style-type: none"> <li>• Stakeholder analysis and consultation plan</li> <li>• No. of public consultation for a held</li> </ul>	10,000

## CHAPTER 8: PROJECT SCREENING, REPORTING, CONSULTATION AND DISCLOSURE

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### 8.1 OVERVIEW

According to the EMCA, 1999, all projects need to be subjected to a review and screening process. This will determine whether an EIA is necessary. In the case of this Project, of the eight different types of interventions (Rehabilitation of water pans, a sand dam, weirs, springs and boreholes; laying of pipelines; installation of water tanks and implementation of catchment protection measures), six of them require to be reviewed independently for potential environmental and social impacts when undertaking the ESIA studies for the Project. These are water pan, sand dam, weir and borehole rehabilitation, spring protection and laying of pipelines.

### 8.2 ENVIRONMENTAL AND SOCIAL SAFEGUARD SCREENING AND REVIEW PROCEDURES

Prior to implementation of Component 2 of the project, the proponents will need to conduct a safeguard screening and review. This process follows the following steps:

- a) **Eligibility Screening** - For all the sub-projects that involve construction and rehabilitation works, the proponent should complete the screening form in Annex A. Should the screening process reveal no major negative impacts, then the project would be given a go-ahead.
- b) **Scoping and Evaluation of Alternatives:** If the screening process reveals that there will likely be moderate or significant adverse impacts during and after implementation, then the proponent would be required to prepare a Project Reports and submit it to NEMA for review.
- c) **Technical Screening and Categorisation of Sub-Projects:** All the forty-six sub projects (refer to Section 2.4) will be subjected to the screening process in order to determine the appropriate categorisation according to GCF guidelines. The screening form will determine which safeguard instrument will be applied according to the level of impact.
- d) **Determining the Safeguard Instrument:** NEMA may approve the project to commence at this stage or require the proponent to prepare Terms of Reference (ToR) and proceed to ESIA study.
- e) **Assessment and Consultation:** Consultants registered by NEMA would undertake preparation of Project Reports and ESIA study reports. Based on this study, a limited ESIA and ESMP will be required for all the rehabilitation and construction activities.
- f) **Implementation of Mitigation Measures:** Mitigation measures identified in the ESMP will be implemented by contractors under supervision of an entity mandated by the PIU. This will include monitoring of effectiveness and efficiency through performance indicators.
- g) **Monitoring and Reporting:** In order for the PIU to make informed decisions, there is a need to monitor the implementation of mitigation measures based on set environmental and social indicators. Regular reports for all active sub-projects will be provided as part of project implementation.

## CHAPTER 9: INDEPENDENT REDRESS MECHANISMS

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### 9.1 OVERVIEW

During the four years of project implementation, there is a possibility that affected persons, groups of persons or communities have misgivings with Project implementation. Under this Project, this may occur during construction, commissioning or operational phases. One of the avenues for these affected stakeholders to engage with the PIU is the Independent Redress Mechanism (IRM).

The IRM responds to complaints by people who feel they have been adversely affected by GCF projects or programmes failing to implement GCF operational policies and procedures. This includes allegations of a failure to follow adequate environmental and social safeguards.

Identifying and responding to these complaints supports the development of positive relationships between projects and affected groups/communities, and other stakeholders. Redress mechanisms should receive and facilitate resolution of the concerns and grievances.

This mechanism ensures that:

- The basic rights and interests of every affected person as a result of poor environmental performance or social management are protected; and
- Their concerns are addressed effectively and in a timely manner, at no cost and without retribution.

### 9.2 PRINCIPLES OF A GOOD IRM

In implementing the IRM, the PIU should embody the following core principles should there be any issue arising from this project.

- Fairness:** Complaints are treated confidentially, assessed impartially, and handled transparently.
- Objectiveness and independence:** PIU should operate the IRM independently of all interested parties. This will guarantee fair, objective, and impartial treatment to each case.
- Simplicity and accessibility:** PIU should ensure that procedures to file grievances and seek action are simple enough to be understood by project beneficiaries. Project beneficiaries have a range of contact options including, a telephone number, an e-mail address, and a postal address. It should also be accessible to all stakeholders, irrespective of the remoteness of the area they live in, the language they speak, and their level of education or income.
- Responsiveness and efficiency:** The IRM is designed to be responsive to the needs of all complainants. Accordingly, the PIU should ensure that officials handling complaints are trained to take effective action upon, and respond quickly to, complaints and suggestions.
- Speed and proportionality:** All complaints, simple or complex, shall be addressed and resolved as quickly as possible. The action taken on the complaint or suggestion is swift, decisive, and constructive.
- Participatory and social inclusion:** A wide range of project-affected people— community members, members of vulnerable groups, project implementers, civil society, and the media - shall be encouraged to bring grievances and comments to the attention of project authorities. Special attention is given to ensure that poor people and marginalised groups, including those with special needs, are able to access the IRM.

### 9.3 IRM HANDLING STRUCTURE

The IRM should be made public to the project stakeholders and affected communities in the early stages of the project. They must be made aware of:

- How to access the IRM
- Who to lodge a formal complaint to
- When to expect a response
- Confidentiality, responsiveness and transparency of the process
- Conflict of interest issues

For this Project, the following members are proposed as members of the Independent Redress Committee (IRC):

- Community member e.g. WRUA representative
- Area administrator e.g. Chief
- Local administrator e.g. Sub-County Commissioner
- NGO representative e.g. Local NGO
- PMU member e.g. County Water Officer
- PIU member e.g. KMD
- Safeguard specialist e.g. Engineer or Hydrologist
- Contractor representative
- Other

The PIU will nominate one of its members as the person in charge of redress.

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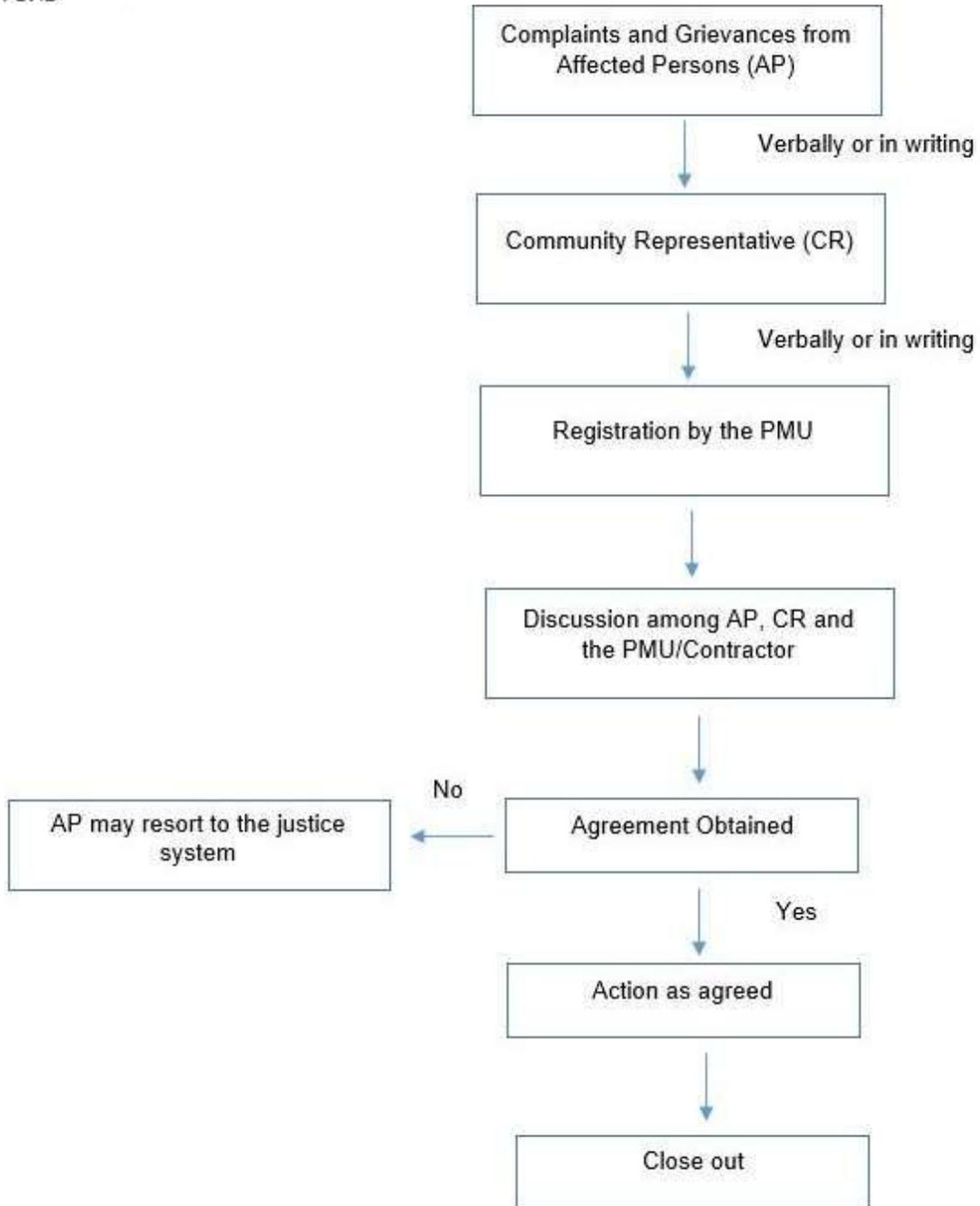


Figure 42: Sample IRM Process

## CHAPTER 10: CAPACITY BUILDING, TRAINING AND TECHNICAL ASSISTANCE

### 10.1 OVERVIEW

NEMA as the institution mandated to oversee implementation of environmental and social safeguards has adequate expertise on conducting ESIA's and implementing ESMFs. However, there is also need to bring other members of the PIU to the same level of understanding. This includes an understanding of environmental and social issues and indicators.

One of the gaps identified under the feasibility study on capacity building measures conducted as a pre-requisite for GCF funding was the weak enforcement of environmental issues. Inadequate resources (financial and human) to effectively address these issues compound this gap. It is recommended that part of the funds allocated to Component 1 of the project be used to support the capacity needs of the implementing agencies to apply the requirements under this ESMF.

### 10.2 TRAINING TOPICS AND PARTICIPANTS

In order to support capacity needs and institutional strengthening for this ESMF, the following trainings are recommended. These trainings may be conducted by a consultant with wide expertise in the proposed topics and familiar with the water and climate change sectors.

Table 18: Proposed trainings and participants

Training Methodology	Topic	Participants
Training course	Environmental and Social Impact Assessments (ESIAs and SSEAs)	Project executors: NEMA, WRA, UoN, KMD, County Environment and Water Officers
	Climate Change Adaptation (Including Ecosystem Based Adaptation)	
	Any other relevant course that will be instrumental in ensuring successful project implementation (including implementing the ESMP)	
Site visit exchanges	Development and implementation of sub-catchment management plans	WRA Community Development Officers, WRUAs; Sub-County Environment Officers
	Management of Rural Water Supply Systems	

Table 19: Proposed ESMF Training Programme

Day	Topic
Day 1	<b>Introduction:</b> Project Background
	<b>Objective of the ESMF:</b> Definition of terminologies; Key principles of the ESMF
	<b>Key stakeholders</b> in the ESMF and their roles in implementation of the ESMF and other related project components
	<b>Relevant policies, legislations and regulations</b> in the implementation of the ESMF including GCF safeguard policies
	<b>Screening of projects including application of ESMF tools, their review, implementation and enforcement</b>
Day 2	<b>Identification of impacts</b> (both positive and negative environmental, social and economic impacts)
	<b>Development of an ESMP</b> based on an analysis of the impacts, mitigation measures and stakeholders
	<b>Monitoring of mitigation</b> measures including follow-up against set responsibilities and timelines
	<b>Planning and reporting</b>
	<b>Independent Redress Mechanisms</b> and its relevant tools and application in different circumstances
	<b>Budgeting for implementation</b>

## CHAPTER 11: ESMF IMPLEMENTATION BUDGET

In order to ensure that project activities are aligned with the recommendations in this ESMF, it is necessary to develop a budget, which will be included in the overall project budget funds.

Table 20: ESMF Implementation Budget Estimates

Activity	Responsibility	Schedule	Estimated costs USD
<b>Development of environmental and social assessment reports, Implementation, Monitoring and Reporting for sub-projects under Component 2</b>			
i. Environmental and Social Screening	NEMA	Year 1	20,000
ii. Preparation of ESIAs through short-term consultancies	NEMA	Year 1	100,000
iii. Monitoring and Supervision of ESIAs and ESMPs including Annual audits	NEMA	Year 1 - 4	80,000
<b>Sub-total</b>			<b>200,000</b>
<b>Institutional Capacity Strengthening on Environmental and Social Safeguards</b>			
i. Training workshop PIU and other key stakeholders identified in section 10.2	NEMA	Year 1 - 2	30,000
ii. Site-visit exchanges	WRA	Year 2 - 3	50,000
<b>Sub-total</b>			<b>80,000</b>
<b>Grand total</b>			<b>280,000</b>

## CHAPTER 12: CONCLUSIONS AND RECOMMENDATIONS

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This ESMF is meant to ensure that the implementation of the project will be carried out in an environmentally and socially sustainable manner. It provides the PIU with an environmental and social screening process that will enable them to identify, assess and mitigate potential environmental and social impacts of the activities, including the preparation of site-specific responses.

This proposed project has the potential to bring considerable benefits to concerned communities and within the sub-project areas as well as adjoining settlements and indeed, the Athi landscape. Anticipated benefits include increased access to safe water supply, job creation, improvement in public health status, time and energy savings particularly for women and children, and ultimately, strengthened ecosystem and community resilience.

Based on the assessment of the environmental and social issues of the proposed project activities, this project is anticipated to generating localised, site-specific negative impacts, which are negligible to medium in scale.

Generally, project activities and its associated impacts can be managed with relatively standard mitigation measures, including known technology, good design, practices and management solutions, resulting in impact of minor significance. Therefore, despite having several sub-projects, the cumulative negative environmental and social impacts of the project, virtually are expected to be mitigated

To ensure maximisation of the positive benefits and minimisation of the negative ones, this ESMF recommends that ESIA's and ESMP's to should be finalised before any implementation can begin and further be in accordance with Kenyan legal framework, as well as GCF performance standards particularly Environmental Assessment.

Moreover, the ESMF recognises existing capacity gaps in some of the institutions with regard to effectively implementing the ESMF under this project. Therefore, strengthening the capacity of key implementing institutions will be critical to the success of the project. This will provide an enabling environment to address environmental and social issues by the PIU and PMU. Furthermore, appropriate roles and responsibilities, for managing and monitoring environmental and social concerns related to sub-projects should also be adhered to.

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## ANNEXES

### Annex A: Environmental and Social Screening Checklist

The Environmental and Social Screening Checklist is designed to avail information to the PIU, decision-makers and reviewers so that impacts and their mitigation measures, if any, can be identified and/or that requirements for further environmental analysis be determined. This Form will be filled for sub-projects under Component 2.

<b>PROJECT DETAILS</b>			
Name of sub-project			
Ward			
County			
Name of Executing Agency			
Name of the Approving Authority			
Contact person			
Job title			
Telephone number			
Email address			
<b>PART A: BRIEF DESCRIPTION OF THE PROJECT</b>			
Provide information about actions needed during the rehabilitation process and construction of support/ancillary structures and activities required to build it, e.g. need to quarry or excavate borrow materials, laying pipes/lines to connect to energy or water Describe how the sub-project will operate including support/activities and resources required to operate it e.g. roads, disposal site, water supply, energy requirement, human resource etc			
<b>PART B: BRIEF DESCRIPTION OF THE ENVIRONMENTAL AND SOCIAL SITUATION AND IDENTIFICATION OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS</b>			
Please provide information on the type and scale of the sub-project (area, coordinates)			
Describe the project location, project site; surroundings (include a (sketch) map)			
Describe the land formation, topography, vegetation in/adjacent to the project area			
Estimate and indicate where vegetation might be cleared			
<b>Questions</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
<b><i>Biophysical features/ considerations</i></b>			
Are there sensitive or threatened habitats? If yes, list			
Are there sensitive or threatened species? If yes, list			
Are there any streams, rivers or wetlands nearby? If yes, list			
Are there any protected areas nearby? If yes, list			
Are there current natural resource management requirements such as alien or invasive species?			



Are there any existing water pollution issues?			
Is there any current soil contamination?			
Explain the geology, topography and physiography of the project site			
Is there a possibility that the project will result in any contamination and pollution hazards?			
Is there a possibility that the project will adversely affect the aesthetics of the landscape?			
<i>Any other?</i>			
<b>Socio-economic</b>			
Are there any vulnerable groups in the area?			
Are there any indigenous people in the area?			
What are the current land use patterns in the area?			
Are there any historical, archaeological or cultural heritage sites in the project area?			
Will the project create local employment and skills development			
Will the project require any resettlement and/or land acquisition?			
How will noise and dust control be handled during the construction and operational phases?			
How will solid or liquid waste be handled?			
Is there a possibility that the project will adversely affect the aesthetic attractiveness of the local landscape?			
<i>Any other?</i>			
<b>Institutional</b>			
Are there key political, administrative or traditional structures and systems for consideration?			
<b>Consultation</b>			
Describe how public consultations will be undertaken during the screening phase			
<b>PART C: MITIGATION MEASURES</b>			
For all "Yes" responses, describe briefly the measures taken to this effect.			
Date:			
Name and Signature:			

## Annex B: Stakeholder Engagement Guidelines

No one type or format of a stakeholder engagement plan will accommodate all projects. Its content depends on various factors, including the nature, scale, location, and duration of project; the diverse interests of stakeholders; the scale of the project's potential positive and adverse impacts on people and the environment; and the likelihood of grievances.

For a project like this which has few potential adverse social and environmental impacts and initial stakeholder concerns, a 'simplified' stakeholder engagement plan would be needed, focusing primarily on initial consultations, information disclosure and periodic reporting.

In order to address basic minimum criteria. The following checklist will help ensure that the plan addresses key issues and components.

Stakeholder Engagement Plan Checklist	
Who	<ul style="list-style-type: none"> <li>Which stakeholder groups and individuals are to be engaged based on the stakeholder analysis?</li> <li>Have potentially marginalised groups and individuals been identified among stakeholders?</li> </ul>
Why	Why is each stakeholder group participating (e.g. key stakeholder objectives and interests)?
What	<ul style="list-style-type: none"> <li>What is the breadth and depth of stakeholder engagement at each stage of the project cycle?</li> <li>What decisions need to be made through stakeholder engagement?</li> </ul>
How	<ul style="list-style-type: none"> <li>How will stakeholders be engaged (strategy and methods, including communication)?</li> <li>What measures are in place to ensure inclusive participation of marginalised or disadvantaged groups?</li> </ul>
When	What is the timeline for engagement activities, and how will they be sequenced including information disclosure?
By Whom	How have roles and responsibilities for conducting stakeholder engagement been distributed among the project implementing arrangements?
Resources	What will the stakeholder engagement plan cost and under what budget?

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As project information changes – perhaps from subsequent risk assessments, the addition of project activities, stakeholder concerns – the stakeholder engagement plan should be reviewed and modified accordingly to ensure its effectiveness in securing meaningful and effect stakeholder participation.

The checklist above will determine how to engage the different stakeholders. A sample Inform-Consult – Engage – Collaborate and Empower matrix is provided below.

<b>INFORM</b>	<b>CONSULT</b>	<b>ENGAGE</b>	<b>COLLABORATE</b>	<b>EMPOWER</b>
<b>Goal:</b> Promote stakeholder understanding of issues, problems alternatives, opportunities and solutions through balanced and objective information	<b>Goal:</b> Obtain feedback on analysis, alternatives, and decisions.	<b>Goal:</b> Work directly with stakeholders to ensure that their concerns and aspirations are understood and considered.	<b>Goal:</b> Stakeholders become partners in each aspect of the decision, including development of alternatives and identification of preferred solution.	<b>Goal:</b> Final decision-making in the hands of stakeholders
<b>Commitment:</b> Will keep you informed	<b>Commitment:</b> As keep you informed, Will listen and acknowledge your concerns and aspirations	<b>Commitment:</b> Will work with you to ensure that your concerns /aspirations are directly reflected in the developed alternatives and Will provide feedback on how your input influenced the decision	<b>Commitment:</b> Will look to you for direct advice and innovation in devising solutions and incorporate your advice and recommendations to the maximum extent.	<b>Commitment:</b> Will implement what you decide
<b>Approach</b>	<b>Approach</b>	<b>Approach</b>	<b>Approach</b>	<b>Approach</b>
<ul style="list-style-type: none"> <li>• Fact Sheets</li> <li>• Websites</li> <li>• Newsletters</li> <li>• Briefings</li> </ul>	<ul style="list-style-type: none"> <li>• Public comments</li> <li>• FGDs</li> <li>• Surveys</li> <li>• Public meetings</li> </ul>	<ul style="list-style-type: none"> <li>• Workshops</li> <li>• Face-to-face meetings</li> </ul>	<ul style="list-style-type: none"> <li>• Committees</li> <li>• Consensus-building</li> <li>• Participatory decision-making</li> </ul>	<ul style="list-style-type: none"> <li>• Ballots</li> <li>• Delegated decisions</li> </ul>

## Annex C: Sample ESIA Guidelines

### Introduction

An ESIA focuses on the significant environmental issues of a subproject. The report's scope and level of detail should be commensurate with the project's potential impacts. The report submitted to GCF is prepared in English. An executive summary can be provided in local language for disclosure.

### Document Format

The ESIA report should include the following items:

- a. *Executive summary.* Concisely discusses significant findings and recommended actions.
- b. *Policy, legal, and administrative framework.* Discusses the policy, legal, and administrative framework within which the ESIA is carried out and GCF policies. Identifies relevant international environmental agreements to which the country is a party.
- c. *Project description.* Concisely describes the proposed subproject and its geographic, ecological, social, and temporal context. Indicates the need for any resettlement plan. Include a map showing the sub-project site and the sub-project's area of influence.
- d. *Baseline data.* Assesses the dimensions of the study area and describes relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences. Includes identification of indigenous people and their socio-cultural characteristics. Data should be relevant to decisions about project location, design, operation, or mitigation measures. The section indicates the accuracy, reliability, and sources of the data.
- e. *Environmental and social impacts.* Predicts and assesses the project's likely positive and negative impacts, in quantitative terms to the extent possible. Identifies mitigation measures and any residual negative impacts that cannot be mitigated. Explores opportunities for environmental enhancement. Identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions, and specifies topics that do not require further attention.
- f. *Social assessment.* Identification of the socio-cultural context and the potential impacts.
- g. *Analysis of alternatives.* Systematically compares feasible alternatives to the proposed project site, technology, design, and operation-in terms of their potential environmental impacts. States the basis for selecting the particular project design proposed and justifies mitigation measures.
- h. *Consultation.* Describes stakeholder engagement, consultation effort and outputs.
- i. *Environmental and social management plan (ESMP).* Covers mitigation measures, monitoring, and institutional strengthening.
- j. *Conclusion and Recommendations:* Succinctly describes conclusion drawn from the assessment and provides recommendations.



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### *k. Appendices*

- References--written materials both published and unpublished, used in study preparation.
- Record of interagency and consultation meetings, including consultations for obtaining the informed views of the affected people and local non-governmental organizations (NGOs). The record specifies any means other than consultations (e.g., surveys) that were used to obtain the views of affected groups and local NGOs.
- Tables presenting the relevant data referred to or summarized in the main text.
- List of associated reports



## Annex D: Summary of Stakeholder Consultations (Issues and Participant Lists)

Consultations on the project were conducted via a series of interviews, and FGDs over the period 6 July to 29 October 2018. These discussions involved an explanation of the project objectives and design, including anticipated environmental and social impacts and their mitigation.

A summary of the feedback from consultations is provided below, and following that, a list of the consultation meetings and participants.

Date	Meeting description and objectives	Issues raised	Recommendations
6 July 2018	<b>Scoping Mission in Nyandarua</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	<ul style="list-style-type: none"> <li>• Need for sustainable projects that will benefit local communities.</li> <li>• Appreciation of the proposed project and expectations for its implementation were expressed</li> </ul>	<ul style="list-style-type: none"> <li>• Involve local communities (through WRUAs) in project implementation</li> <li>• Need for research on other innovative sustainable alternative livelihood options for communities</li> </ul>
9 July 2018	<b>Scoping Mission in Machakos</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	<ul style="list-style-type: none"> <li>• Need to integrate and have a coordinated approach for water resource management among the different users</li> <li>• Water scarcity is a perennial problem in the county. Long lasting solutions wanted</li> </ul>	<ul style="list-style-type: none"> <li>• WRA and County Government to play an active role in the coordination</li> <li>• Proposed project will contribute efforts towards addressing the water challenge</li> </ul>
11 July 2018	<b>Scoping Mission in Kiambu</b> <b>Objective:</b> Introduction of consultants and the ESMF; Understanding of the key issues and concerns; and identification of key stakeholders.	<ul style="list-style-type: none"> <li>• Project components and activities are compatible with the needs of vulnerable groups</li> <li>• Need to involve water companies in project implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Need for the project to be embedded within structures in the County.</li> <li>• Co-management approach of natural resources was emphasised.</li> </ul>
26 – 28 September 2018	<b>Field consultations in Nyandarua</b> <b>Objective:</b> Communication of project design and identification of potential positive and negative issues and proposed mitigation measures	<ul style="list-style-type: none"> <li>• Encroachment into water pan boundaries</li> <li>• Water scarcity – located on the leeward side of Aberdare ranges.</li> <li>• Inadequate involvement of local communities by governments in decision making processes</li> </ul>	<ul style="list-style-type: none"> <li>• Demarcate water reservoir boundaries</li> <li>• Promote land conservation initiatives for water recharge and discharge</li> <li>• Develop alternative livelihoods such as brick making</li> </ul>

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		<ul style="list-style-type: none"> <li>• Conflict between WRUA members and carrot traders who use the water from Kariaini water pan to wash their carrots</li> </ul>	<ul style="list-style-type: none"> <li>• Fence off water reservoir areas using indigenous tree species and other water friendly plants.</li> </ul>
2-4 October 2018	<p><b>Field consultations in Kiambu</b> <b>Objective:</b> Communication of project design and identification of potential positive and negative issues and proposed mitigation measures</p>	<ul style="list-style-type: none"> <li>• In one site (Gathiri springs), community have to walk down/up a steep slope to access water - Access issues.</li> <li>• Costs of supplying water far outweigh the revenue received (use of outdated technology in the borehole pump houses)</li> </ul>	<ul style="list-style-type: none"> <li>• Construct treatment plants next to water pans and earth dams to ensure water quality is potable</li> </ul>
11-13 October 2018	<p><b>Field consultations in Machakos</b> <b>Objective:</b> Communication of project design and identification of potential positive and negative issues and proposed mitigation measures</p>	<ul style="list-style-type: none"> <li>• Catchment degradation observed</li> <li>• Eucalyptus trees planted</li> <li>• Conflict from competing water users</li> <li>• Sand harvesting along river banks is a major challenge for water resources management</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthen capacity of WRUAs to better execute their mandates</li> <li>• Plant water friendly trees around the water reservoirs and in the general catchment area</li> <li>• Involve community members in project implementation</li> </ul>
25 October 2018	<p><b>ESMF Stakeholder Validation Workshop, Nyandarua</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Nairobi</p>	<ul style="list-style-type: none"> <li>• Mutonyora water pan borders a schools and hospital and there is potential for noise pollution</li> <li>• Need for construction for animal water troughs, drawing points to reduce water pollution</li> <li>• Need for fencing and ideas to engage the unemployed youths in the area.</li> <li>• Proposals made to have clear demarcation of the dam area and catchment protection.</li> <li>• Need for PIU to demonstrate lasting impact from the project.</li> </ul>	<ul style="list-style-type: none"> <li>• Desilted soils proposed to be used in local farms</li> <li>• Proposal for fencing of the area and install drawing pipes, followed by introduction of fish in the water reservoirs</li> <li>• Project to support planting bamboo species and <i>Prunus africana</i> in the riparian areas; Establishment of tree nurseries was also proposed around Magumu and Njabini</li> <li>• Explore payment for ecosystem services approach which would in turn support alternative livelihood sources</li> </ul>



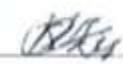
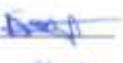
<p>26 October 2018</p>	<p><b>ESMF Stakeholder Validation Workshop, Kiambu</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Kiambu</p>	<ul style="list-style-type: none"> <li>• Changes to names of some infrastructure were made. e.g. Riara and Kamiti from dams to weirs.</li> <li>• Location of Riara Weir was noted as Cianda Ward and Kamiti Weir in Githiga Ward.</li> <li>• Need to review gender issues in line with water resources management and the roles they play.</li> <li>• Project components and activities are compatible with the needs of vulnerable groups</li> </ul>	<ul style="list-style-type: none"> <li>• In cases where the proposed structures lies in public land, there is need to engage the County government when it comes to establishing the boundaries as they are the custodians of public land. They will in turn work with the lands department on this.</li> <li>• Members emphasised on the need of giving priority to locals for employment during project implementation.</li> <li>• Need to do conservation upstream especially in Riara area</li> <li>• Plant indigenous tree species and progressively do away with Eucalyptus.</li> </ul>
<p>29 October 2018</p>	<p><b>ESMF Stakeholder Validation Workshop, Machakos</b> <b>Objective:</b> Share key findings and recommendations of the ESMF; Provide a platform for provision of concrete areas for improvement and exchange experiences and knowledge; To identify and propose focused strategic and feasible interventions to strengthen the ESMF and project implementation in Machakos</p>	<ul style="list-style-type: none"> <li>• Little to no consultation and/or involvement by county governments</li> <li>• Unemployment rates are high – activities that degrade the catchment area are related to livelihoods e.g. slope cultivation, sand harvesting, deforestation and overgrazing.</li> <li>• Poor incorporation of operations and maintenance at local level. This will support monitoring of water infrastructure and timeous responses.</li> <li>• Project components and activities are compatible with the needs of vulnerable groups</li> </ul>	<ul style="list-style-type: none"> <li>• Engage all stakeholders from planning, execution and closure of the project. This will ensure ownership and sustainability of the project</li> <li>• Build capacity of WRUAs for them to effectively deliver on their mandate.</li> <li>• Need for concerted efforts to address sand harvesting menace</li> <li>• 80 water tanks to be delivered to institutions such as schools and hospitals</li> </ul>

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

PARTICIPANT LIST | ESMF VALIDATION WORKSHOP

29 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | MACHAKOS COUNTY

No.	NAME	GENDER (M/F)	AGE GROUP	INSTITUTION	DESIGNATION	CONTACTS	SIGN
1.	MATIVO SAMUEL IC	M	50+	Community.	Representative Kalame ward	0772 635 088	
2.	JOSHUA K. MUSYOKA	M	40+	COUNTY GOVT OF MACHAKOS	RESEARCH OFFICER	0722 980 166	
3.	Jaqueline M. Malany	F	40+	COUNTY GOVT OF MACHAKOS	ENVIRONMENTAL EXPERT	0705 253 873	
4.	COSMAS N. KILANGO	M	40+	COUNTY GOVT OF MACHAKOS	SECRETARY MUNICIPAL WRUA	0710898474	
5.	JOSEPH M. KIMEU	M	82	ITETANI WRUA KALAMA	VICE CHAIRMAN	0724 975 274	
6.	SAMSON M. MATOBI	M	65	WRUA LUMBA	CHAIRMAN	0719773677	
7.	WILLIAM MAKAU	M	30	MACHAKOS COUNTY GOVT	WATER ENGINEER	0727291003	
8.	DANIEL KILUU	M	32	Machakos County Govt	Water engineer	0713 571 305	
9.	GIDEON MUTUA	M	29	Machakos County Govt	hospital Engineer	0712 000 968	

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

PARTICIPANT LIST | ESMF VALIDATION WORKSHOP

29 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | MACHAKOS COUNTY

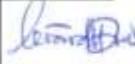
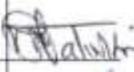
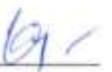
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Jaqueline M. Nalany	F	40+	COUNTY GOVT OF MACHAKOS	ENVIRONMENTAL EXPERT	0705 253 873	
COSMAS N. KILANGO	M	40+	COUNTY GOVT OF MACHAKOS	SECRETARY MUNICIPAL WRUA	0710898474	
JOSEPH M. KIMEU	M	82	ITETANI WRUA KACAMA	VICE CHAIRMAN	0724 975274	
SAMMY M. MUKITA	M	65	WRUA LUMBA	CHAIRMAN	0719773677	
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GIDEON MUTUA	M	29	Machakos County Govt	Coastal Engineer	0712 000 968	

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

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29 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | MACHAKOS COUNTY

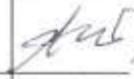
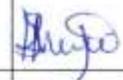
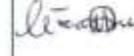
No.	NAME	GENDER (M/F)	AGE GROUP	INSTITUTION	DESIGNATION	CONTACTS	SIGN
1.	GERARD NGUMBI	M	29	ENVIRONMENTAL CONSULTANT	EXPERT	0722563637	
2.	NYAEGA Lilian	F	30-40	ESIA Consultant KRC	Consultant	0726962808	
3.	Doreen N. Simiyu	F	30-40	"	"	0720575050	
4.	Rhodah K. Munyao	F	46	WRUA/KATHIANI	Chair lady C/Head of	0727575986	
5.	Paul Maluki	M	39	WRA	SCDO	0721512400	
6.	BERNARD MALUKU	M	36	LOWER THIKA WRUA	MEMBER	0723026821	
7.	Paul Mutuzis Mubi	M	41	LOWER THIKA WRUA	SECRETARY-1	0720290488	
8.	DOUGLAS MUTAMU	M	47	CHIEF, KIMBWA	CHIEF	0724723166	
9.							

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

PARTICIPANT LIST | ESMF VALIDATION WORKSHOP

25 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | NYANDARUA COUNTY

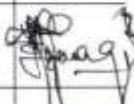
NAME	GENDER (M/F)	AGE GROUP	INSTITUTION	DESIGNATION	CONTACTS	SIGN
ROSEL KAMONYE KIAZIE	M	40-50	NYANDARUA COUNTY	M.C.A. OFFICE	0727 623664 0739 748292	
PETER MBURUA KIMATI	M	60-70	NYANDARUA COUNTY	FARMER	0724145544	
JOSEPH MUHORO GATI	M	60	NYANDARUA COUNTY	FARMER	0724487967	
PAUL WAINAINA MBURU	M	55	NYANDARUA COUNTY	FARMER	0701351336	
JOHN KIAZIE	M	40-50	SWRUA	C/MEMBER	0728386907	
MARY WAMBUI	F	25-30	WRA (NAIVASHA)	SWO	0704012247	
NYAEGA LILIAN	F	30-35	ESIA Consultant	Consultant	0726962808	
LUCY W. KARURI	F	40-50	SECRETARY S/WRUA	SECRETARY	0723952412	
GERARD NGUMBI	M	25-30	ESIA Consultant	Consultant	0722563637	

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

PARTICIPANT LIST | ESMF VALIDATION WORKSHOP

26 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | KIAMBU COUNTY

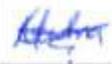
No.	NAME	GENDER (M/F)	AGE GROUP	INSTITUTION	DESIGNATION	CONTACTS	SIGN
1.	Beth MUGA	F	30-40	Kiambu Water	Technical manager	Wajiruma@gmail.com 0723018511	
2.	Mavel Kimpayeei	M	56	Kamiti WRUA	WEE chairman	0799727266	
3.	JAMES NDERITU	M	47	RUIRV WRUA	Treasurer	0722107606 ruiruvrua@yahoo.com	
4.	BONIFACE M. MURU	M	46	Kiambu County Water of Sereni Co.	R.D.	0722497991 Bboniface.kiambuwater@gmail.com	
5.	John Karode	M	50	"	R.D.	0722440659 jpkarode@karuriwater.co.ke	
6.	James G. Muraguri	M	54	SCWD, Kiambu KCG	SCWD Kiambu	0722955121 jmuraguri@gmail.com	
7.	Gilbert Mungai	M	48	Thirika Woua	Chair	0722-646106 gilmungai@yohobur	
8.	Francis Muhoko	M	45	BATH WRUA	Chair	muhokofa@yahoo.com	
9.	Mwaura Mueca	M	50+	WRA	WAO	0733498844 mwauramueca@gmail.com	
10.	Jane Mbugua	F	52	Kiambu County	Officer	0722250252	

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

PARTICIPANT LIST | ESMF VALIDATION WORKSHOP

29 OCTOBER 2018

UPPER ATHI CATCHMENT AREA | MACHAKOS COUNTY

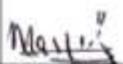
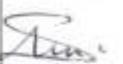
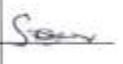
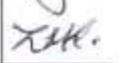
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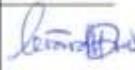
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1.	Stephen Macharia	M		WRUA	Chairman	0722397403	
2.	Sammy K. Thelki	M		SAGUMUA WRUA	V. Chair	0720884575	
3.	SERAH W. NIGROGE	F		SAGUMUA WRUA	member	0726376397	
4.	Marcy Wairihani	F			member	0722 326572	
5.	Sammy NBAKE WANYEKI	M	<del>20-35</del>	ICRAF	Coordinator	0723308777	
6.	Charles Maina	M		WRUA	Member	0727232446	
7.	ZACHARIAH M. KAMAU	Chemist	19-24	MUINYORA C	MUINYORA C. WATAR PROCT	0724761062	
8.	SIMIYU N. DOREEN	F	30-35	ESIA Consultant	Consultant	0720575050	
9.							

ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

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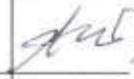
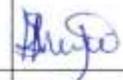
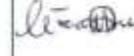
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ENHANCING THE RESILIENCE OF COMMUNITIES AND ECOSYSTEMS IN THE ATHI RIVER CATCHMENT AREA

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LUCY W. KARURI	F	40-50	SECRETARY S/WRUA	SECRETARY	0723952412	
GERARD NGUMBI	M	25-30	ESIA Consultant	Consultant	0722563637	

**Annex E: Coordinates of Project Sites**

No	Name	Type	County	Longitude	Latitude
1.	Kariani	Water pan	Nyandarua	-0.87125	36.59811111
2.	Gitwe	Borehole	Nyandarua	-0.89211111	36.56744444
3.	Kahora	Water pan	Nyandarua	-0.86594444	36.56033333
4.	Mutonyora	Water pan	Nyandarua	-0.82825	36.57652778
5.	Heni	Water pan	Nyandarua	-0.78691667	36.55938889
6.	Karanja Wanaina	Water pan	Nyandarua	-0.69983333	36.54838889
7.	Wanyeki	Water pan	Nyandarua	-0.71719444	36.57352778
8.	Koinange	Borehole	Nyandarua	-0.72377778	36.53313889
9.	Wachira Waheni	Water pan	Nyandarua	-0.75497222	36.64122222
10.	Mbiru	Water pan	Nyandarua	-0.79830556	36.61469444
11.	Kahungura	Spring	Nyandarua	-0.778	36.66147222
12.	Ebrahim Koikai	Water pan	Nyandarua	-0.7285	36.67188889
13.	Kwa Musa	Water pan	Nyandarua	-0.69352778	36.64097222
14.	Gachuchu	Spring	Nyandarua	-0.678	36.65516667
15.	Warungana	Water pan	Nyandarua	-0.71480556	36.62986111
16.	Churiri	Water pan	Nyandarua	-0.75544444	36.65497222
17.	Karuri town	Pipeline	Kiambu	-1.17322222	36.75486111
18.	Kambara	Spring	Kiambu	-1.18358333	36.753
19.	Karia	Spring	Kiambu	-1.18430556	36.75108333
20.	Gathiri	Spring	Kiambu	-1.18888889	36.76038889
21.	Ite dam	Dam	Kiambu	-1.15988889	36.75394444
22.	Loromo I and II	Borehole	Kiambu	-1.06572222	36.64936111
23.	Nguirubi	Borehole	Kiambu	-1.19791667	36.59225
24.	Kiriri	Borehole	Kiambu	-1.20755556	36.57019444
25.	Ndumberi	Pipeline	Kiambu	-1.15138889	36.8055
26.	Riara	Water pan	Kiambu	-1.14230556	36.78536111
27.	Kamiti	Water pan	Kiambu	-1.10994444	36.75525
28.	Kikuyu	Spring	Kiambu	-1.25013889	36.67072222
29.	Rugita	Borehole	Kiambu	-1.24327778	36.66997222
30.	Rungiri	Water pan	Kiambu	-1.24297222	36.67025
31.	Juja Farm	Pipeline	Kiambu	-1.152983	37.075186
32.	Ndarugu	River	Kiambu	-1.071102	37.012097000
33.	Musaalani	Water pan	Machakos	-1.39930556	37.39805556
34.	Kwale dam	Water pan	Machakos	-1.20966667	37.20913889
35.	Kailo spring	Spring	Machakos	-1.46533333	37.28572222
36.	Muuoni	Water pan	Machakos	-1.43436111	37.31911111
37.	Mitathini	Community Borehole	Machakos	-1.407228000	37.170124000
38.	Various Institutions	80 Water Tanks	Machakos	-	-
39.	Muthetheni	Earth dam	Machakos	-1.49313889	37.51350000
40.	Kwa Katheke	Water pan	Machakos	-1.60297222	37.23708333
41.	Miwani	Water pan	Machakos	-1.57938889	37.32858333
42.	Muumandu	Water pan	Machakos	-1.65788889	37.270750000
43.	Yatta canal	Canal	Machakos	-1.65788889	37.270750000



GREEN  
CLIMATE  
FUND

**Annex II – ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK  
GREEN CLIMATE FUND FUNDING PROPOSAL**

44.	Mekilingi	Water pan	Machakos	-1.38827778	37.75605556
45.	Ikombe	Sand Dam	Machakos	-1.27019444	37.697750000
46.	Kwa Matinga	Water pan	Machakos	-1.21211111	37.28916667
47.	Gimu	Borehole	Machakos	-1.436411	36.994351