ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY

Project Title: Nairobi Rivers Basin Rehabilitation and Restoration Program: Sewerage Improvement Project Phase II

Project Number: P-KE-EB0-010
Country: Kenya
Department: AHWS
Division: AHWS2
Project Category: 1

1. Introduction

The Nairobi Sewerage Improvement Project phase 2 (NaRSIP II) is part of the larger Nairobi Rivers Basin Rehabilitation and Restoration Program which aims to enhance sustainable management of the Nairobi Rivers that support natural ecosystems regeneration, socio-economic activities and improved livelihoods. The rivers in the Nairobi Basin include; Nairobi River, Ngong river, Mathare river, Kiu river, Riara river and Gatharaini river. The growth of Nairobi city has surpassed the rate at which infrastructure is developed to meet the needs of the growing population. Urbanization, population growth, and industrialization are putting enormous pressure on the Nairobi Rivers – Mathare, Ngong, Athi and Kiu – the main source of water supply for the city. The rivers are heavily polluted from both domestic and industrial waste which is discharged directly into the rivers without being treated and adversely impacting its ecology. The existing sewer network infrastructure covers an approximate area of 208 km² which is approximately 40% of total coverage in the city. The Government of Kenya (GoK), recognizing the magnitude of the problem has requested the African Development Bank (AfDB) for support to develop wastewater facilities in order to enhance the sustainable management of the Nairobi urban environment. The NaRSIP II is a second phase following the successful completion of phase I.

The AWSB and Nairobi City Water and Sewerage Company (NCWSC) have undertaken the Environmental and Social Impact Assessment (ESIA) studies for the project components. In addition the Resettlement Action Plan (RAP) covering project intervention areas have been finalized and are the basis of the ESIA and RAP summaries prepared for disclosure on the Bank website. The project falls within Category 1 and in compliance with AfDB’s Integrated Safeguards System (ISS), the ESIA and RAP summaries will be disclosed on the Banks website for 120 days prior to Board presentation.

2. Policy, Legal and Administrative Framework

2.1 Constitution of Kenya

Article 42 of Bill of Rights of the Kenyan Constitution provides that every Kenyan has a right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislation and other measures. This bill of rights is directly relevant to the interventions intended under the NaRSIP II project which seeks to improve the environmental and sanitary conditions in the Nairobi rivers on which many communities depend.
2.2 Kenya’s Vision 2030

Kenya’s Vision 2030’s Social Pillar aims at improved and increased accessibility to both safe water and sanitation services beyond present levels by the year 2030. The project directly translates to achieving of Sustainable Development Goal (6) which is the new 2030 agenda and expands Millennium Development Goal (MDG) as guided by resolutions of Rio+20 conferences. The goal focuses more on investment in adequate infrastructure in Water Sanitation, Hygiene, Water Quality, Waste Water Management, Water Scarcity and protection of Water related Ecosystems. Implementation of the project will improve the health and quality of life to inhabitants of the Nairobi City and promote cleaner urban environment by providing sewerage services through efficient collection and conveyance of wastewater.

2.3 The Environment Management and Coordination Act (EMCA), 1999.

The main objective of EMCA (2015) and the related Regulations is to provide for the establishment of an appropriate legal and institutional framework including procedures for the management of the environment in Kenya. The Act further aims to improve the legal and administrative co-ordination of the diverse sectoral initiatives in the field of environment so as to enhance the national capacity for its effective management. In addition Act seeks to harmonize all the 77 sector specific legislation touching on the environment in a manner designed to ensure protection of the environment. This is in line with national objectives and sustainable development goals enunciated in Agenda 21 of the Earth Summit. As such, in terms of environmental management, EMCA (1999) provides a comprehensive and an appropriately harmonized legal and institutional framework for the handling of all environmental issues in Kenya and supersedes all sectoral laws. Among the provisions of the EMCA is the requirement of a proponent of any project to ensure that wastes generated by the project activities shall be disposed in such a manner as not to cause pollution to the environment.

Under the EMCA, 1999, all new projects must undergo environmental impact assessment so as to comply with the Environmental Impact Assessment (EIA) Regulation, 2003. Water related project including sewage disposal are listed in the 2nd schedule of EMCA, as among projects that should undergo EIA.

Part VI of EMCA (2015) makes provision for the carrying out of ESIA and makes it mandatory to submit a project environmental Impact Assessment report to the National Environment Management Authority (NEMA) in a prescribed format. The NEMA is required to publish such a report and invite comments thereon from the public before deciding to issue an environmental impact license. This project met these disclosure and NEMA approval requirements.

2.4 The Water Act, 2002

The Government of Kenya formulated the National Policy on Water Resources Management in 1999. This Policy eventually gave birth to the Water Act 2002 whose main focus is:

(a) Provisions for involvement of the private sector in water services,
(b) Setting up a Water Regulator and Water Boards to ensure that water will be adequately distributed to all parts of the country, and
(c) Provision to allow communities to run water projects.

The Water Act 2002, provides for the management, conservation use and control of water resources and for the acquisition and regulation of rights to use water; provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Cap 372) and certain provisions of the Local Government Act; and for related purposes.
In Kenya water is regarded as a national resource and therefore owned by the state for and on behalf of the people (Section 3). Thus the Minister in charge of water is empowered under the Act to control, plan and regulate the use of water. Further the Minister is vested with the duty to promote investigations, conservation and proper use of water.

The Act has set up subsidiary bodies with power to operate and regulate water use functions assigned to them by the Act. The Act further gives conditions relating to construction of works in its Second Schedule. As such, the Client shall observe these conditions which are in line with the spirit of ESIA.

This Act shall be relevant during both construction and operation phases of the Project whereby the contractor and proponent shall ensure that all relevant water resources are not polluted from both liquid and solid wastes. The Proponent will work closely with the Water Resources Management Authority (WRMA) and apply for discharge licenses after submitting an Effluent Discharge Control Plan. They will also seek authority for construction works crossing rivers.


The National Policy on Water Resources as well as the Water Rules established under the Water Act, 2002 calls for EIA on water related projects for long term sustainability and acceptability by the beneficiaries.

It enhances the systematic development of water resources for all the sectors in promotion of the country’s socio-economic development. It also recognizes the by-products of these developments as wastewater and therefore calls for development of appropriate sanitation systems to protect the people’s health and water resources from institutional pollution. The policy also recommends that all such developments should undergo comprehensive EIA that will provide measures to protect environment and people’s health in the neighbourhood of the project including the downwind communities. Like the EMCA (1999), the policy calls for annual Environmental Audits (EA) to ensure continuous implementation of Environmental Management Plans (EMP) proposed in the EIA and any other recommendations and issues arising. The policy requires that those who pollute water bodies must pay the full cost of remediation of the contaminated water; in tandem with the “Polluter Pays Principle.”

2.6 The Public Health Act (Cap 242)

The Public Health Act is the principle instrument for ensuring the health and safety of the people. Its core function is the prevention of disease, treatment and care of the sick (curative services) and control of nuisance. The Act therefore makes regulations and lays standards for a healthy living environment. Part XI Section 129 of the Act places the responsibility of protecting water supplies on the local authorities.

The Ministry of Health is in charge of administration of the Act with the Director of medical services as the Principal Officer. However, where a municipality is capable of discharging responsibilities under the Act, such a municipality is designated as a local health authority in such a situation the relevant powers under the Act are delegated to the municipality but the Director of Medical Services may take over if the Authority is in default.

During the execution of the proposed project, this Act is relevant in various ways:

Section 115 during construction, a nuisance is prohibited especially for all conditions liable to be injurious or dangerous to health.
Section 118 Outlines nuisance liable to be dealt with i.e. accumulation or deposit of refuse, offal, manure or any other which is offensive or injurious or dangerous to health and an accumulation of stone, timber or other machine likely to harbour rats or rodents.

Section 126 rule 62 – Drainage & latrine rules. It is a statutory requirement that drainage, latrines, septic and conservancy tanks and any other pre-treatment methods of sewerage effluents seek written permission or/and approval from the local authority and be built in conformity to provisions of sub-rules (a) to (e) of this section. During construction, the Contractor will ensure acceptable health conditions are maintained in the camp site as per this Act. Proponent will operate and maintain the STW and sewers during operations to ensure they do not become a threat to public health.

2.7 Occupational Health and Safety Act

This legislation provides for protection of workers during construction and operation phases. It is tailored at implementation of the EHS plan in compliance with the relevant sections of this Act. The Act makes provision for the health, safety and welfare of persons employed in factories and other places of work. The provisions require that all practicable measures be taken to protect persons in places of work from dust, fumes or impurities originating from any process within the workplace. The provisions of the Act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at a project site. The Act provides for all necessary safety precautions to ensure the health and safety of workers. The proponent and contractor undertake to prevent pollution, minimize the emission of dust and production of noise during the process of site preparation and development. The proponent should also undertake to provide all workers with appropriate PPEs so as to ensure health, safety and welfare for the workers that will be employed onsite. The Act provides Occupational Health and Safety guidelines to be followed by both the Contractor and supervising consultant during implementation of the Project in order to avoid injuries and even loss of life to workers and the community.

2.8 Land Act, 2012

The Land Act 29 (“LA”) is the Kenya’s framework legislation regulating compulsory acquisition of land (i.e. land, houses, easements etc.). The LA was adopted on 2nd May 2012 and provides for sustainable administration and management of land and land based resources including compulsory acquisition. The land Acquisition Process as spelt out in the Land Act involves the following steps: a. Proof that compulsory possession is for public good It is very explicit in the Land Act, 2012, Section 107, that whenever the national or county government is satisfied that it may be necessary to acquire some particular land under section 110 of Land Act 2012, the possession of the land must be necessary for public purpose or public interest, such as, in the interests of public defense, public safety, public order, public morality, public health, urban and planning, or the development or utilization of any property in such manner as to promote the public benefit.

The land Commission will prescribe a criteria and guidelines to be adhered to by the acquiring authorities in the acquisition of land. It is important to note that if the NLC is constituted prior to conclusion of land acquisition, it could prescribe criteria and guidelines necessitating variations or revisions to the current RAP. Similarly, the Commission has powers to reject a request of an acquiring authority, to undertake an acquisition if it establishes that the request does not meet the requirements prescribed.
2.9 Environmental Management and Co-ordination (Waste Management) Regulations 2006:
These regulations define the responsibilities of waste generators and define the duties and requirements for transportation and disposal of waste. The regulations provide for mitigation of pollution and handling of hazardous and toxic wastes. The regulations require a waste generator to dispose waste only to a designated waste receptacle. The proposed project, during construction phases will generate wastes which will need to be disposed of as per the guidelines in the regulations.

2.10 AfDB safeguards policies
The Bank’s Integrated Safeguards System (ISS) has a set of operational safeguards (OS) all applicable to the proposed project: OS 1 on conduct of ESIA, OS 2 on Involuntary resettlement: Land acquisition, population displacement and compensation which requires that whenever a project supported by African Development Bank involves displacement of people more than 200, a full RAP should be prepared. It is estimated that the proposed project will affect no less than 3,114 project affected persons (PAPS) in one way or another. Other operational safeguards include OS 3 on protection of biodiversity and ecosystem services as the project directly involves effluent discharge into the Nairobi rivers ecosystems, OS4 on Pollution prevention and control, and OS5 on Labour conditions, health and safety all of which will apply at various stages of project implementation.

3. Project Description and Justification
The Project objective is to improve the access, quality, availability and sustainability of wastewater services in Nairobi City with a view to contribute to the restoration of river water quality within the Nairobi Rivers Basin. The project will aim to increase sewer connection coverage by laying primary and secondary sewer lines covering areas of Zimmerman, Githutai 44, Kahawa West, Kasarani and Mwiki which are not connected to the main trunks.

Under NaRSIP I, Athi Water Services Board (AWSB) in partnership with Nairobi City Water and Sewerage Company (NCWSC) implemented Trunk Sewers projects along the main drainage basins and river valleys in the vicinity of the proposed project areas. NaRSIP I, however, had a small component of lateral sewer lines and therefore only a small number of beneficiaries located along the trunk lines could be connected to the trunk sewers. This has resulted in under-utilization of the trunk sewer facilities. To scale up works under NARSIP I and increase sanitation coverage to about 70% it is now proposed that Nairobi Rivers Sewerage Improvement Project Phase 2 (NARSIP-II) be undertaken. NaRSIP II will focus on constructing primary and secondary sewers to serve the areas covered by the trunk sewer system under NaRSIP I.

3.1 Project Components: The project will consist of the following components: (A) Institutional Development Support, (B) Wastewater Management and Sanitation Infrastructure, and (C) Project Management. The component with direct implications to environmental impacts will be the “Wastewater Management and Sanitation Infrastructure” component which includes the rehabilitation and expansion of wastewater infrastructure in Nairobi including in informal settlements. It will construct and rehabilitate appropriate wastewater management infrastructure, sanitation facilities in schools, health centers, and public areas. Public health and hygiene awareness and training will be in-built in the interventions. The component also entails tree planting to serve as carbon sink. To prepare for follow up on interventions and to leverage on additional resources, studies for future investments and methane capturing from wastewater treatment plants will be supported.

The specific project objectives include:
(i) To increase sewerage coverage in Nairobi City from the current 48% to 60% by 2021.
(ii) Reducing pollution levels of Nairobi River by collecting and treating 80,000m³/d of waste water.
(iii) Enhance sustainability of sewerage operations through increased revenue collection.

To achieve these objectives the detailed project components will include:

(i) **Rehabilitation and Duplication of Dandora Sewerage treatment plant (DESTP)**

**Rehabilitation Works:** The primary concern at the DESTP Inlet Works and Channel is the failure of the Programmable Logic Control system (PLC). The failure of the PLC system in 2010 had a significant impact on the proper functioning of the inlet works. The PLC system had no manual over-ride function. Following the failure of the PLC system, the following components were affected:

- The coarse, intermediate and fine screens;
- The Vortex De-gritters; and
- The trash compactors.

The implications of the failure of the PLC system is that the debris and grit that is trapped by the screens is manually removed but some of it manages to pass through to the anaerobic ponds. The effect of this is the accumulation of the grit and debris at the anaerobic ponds which leads to the effective depth being compromised thereby affecting the treatment process. The proposed measures include assessment of the current status of the inlet works and replacement of the electro-mechanical system with a new system that provides for a manual override. It is also recommended to de-sludge the anaerobic ponds due to the current buildup of sludge as a result of the failure of the inlet works.

**Duplication of the inlet works:** The Dandora Estate Sewerage Treatment Plant site was established as the principal long-term treatment site for Nairobi's Wastewater in the 1974 SWECO Sewerage Master Plan for the City. The phase II inlet works was equipped to pass a Dry Weather Flow (DWF) of 80,000m³/d. The original intention was that when the plant is expanded to treat 160,000m³/d the duplicate machinery would be installed and a second feeder channel to ponds constructed adjacent to the existing inlet works. The treatment plant has now been expanded to treat 160,000m³/d and therefore the duplicate inlet works need to be constructed to accommodate additional flows expected after the sewerage coverage has been expanded within the city.

The proposed inlet works comprise the following main components:

(i) **Screening**
(ii) **By-pass channel**
(iii) **Grit collection channels**
(iv) **Flow control facilities (flumes)**
(v) **Overflow chamber.**

(ii) **Construction of Secondary reticulation sewers**

During the implementation of NaRSIP Phase I, savings were realized after various procurements of works and services had been undertaken. Using the savings, a consultant was procured to prepare feasibility studies, detailed designs and tender documents for NaRSIP Phase II. This was prepared with an aim of scaling up works implemented under NaRSIP Phase I, and will include:

a. Construction of 81 km trunk sewers
b. Construction of 190 km reticulation sewers
Nairobi City Water and Sewerage Company has also prepared detailed designs on primary and secondary sewerlines of approximately 240km in areas such as Githurai 44, Kahawa West, Mwiki, Clay Works, Kasarani and Zimmerman. It was agreed between AWSB and NCWSC to prioritize construction of reticulation sewers prepared by both AWSB and NCWSC since much of the primary infrastructure was laid under NaRSIP Phase I. The agreed scope comprise construction of total length of 221km of the secondary reticulation sewers of various diameters. The sewers comprise 83km derived from AWSB designs and 138km derived from NCWSC designs.

(iii) **Interventions in informal settlements**

Due to the unplanned nature of the Nairobi informal settlements, the sewer service level coverage remains low despite various interventions that have been made. The informal settlements constitute about 50% of the population in Nairobi and therefore the overall objective of this component will involve;

1. Operationalization of non-performing ablution blocks previously constructed under earlier programs;
2. Construction of new ablution blocks;
3. Reconstruction/construction of water meter chambers with steel lockable covers;
4. Improved sewerage through provision of additional sewer lines.

The targeted informal settlements include; Mukuru Lungalunga, Mukuru Kaiyaba, Mukuru kwa Reuben, Mukuru kwa Njenga, Kibera, Mwengenye, Mathare, Kiambiu, Kahawa Soweto and Kambi muru to Kisumu Ndogo.

Table 1 below gives a summary of all the planned project components;

**Table 1: Summary of the Project Components**

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3.2 Project justification

Access to improved sanitation services remains a nationwide problem in Kenya and in Nairobi City in particular. Nairobi city has a population presently estimated at 3.6 million people with a population growth rate of 2.7% p.a. Most of these people live in the formal peri-urban areas which despite having good housing and yard water connections have no water borne sewer network. In addition the city has a number of informal settlements with very low sanitation coverage.

The limited sewerage infrastructure in the city, coupled with rapid urban growth without corresponding sewerage expansion has led to direct discharge of raw sewage into the Nairobi rivers. This has resulted in heavy pollution of the rivers, poor health and reduced quality of life. A majority of city residents use septic tanks and pit latrines for discharging their sewage with possibilities of environmental pollution, particularly in regard to water sources (surface sources and ground aquifers). However, when it rains, the septic tanks often overflow into the environment. The buildup of fecal contamination in rivers and other waters is not just a human risk: other species are affected, threatening the ecological balance of the environment. The overall goal of the project therefore is to improve access to sewer services to the residents of Nairobi County through the construction of additional primary and secondary sewer lines in selected settlements and promote cleaner and healthy environment. When the project is implemented, it is anticipated that the project will not only lead to reduced risks of health problems, but also lead to pollution control of waters, water sources and the environment in general. Construction of primary and secondary sewer lines, reticulation system will reduce the high pollution levels in the Nairobi Rivers, incidences of water-borne diseases and mortality rate.

4.0 Description of the Project Environment

The project will be located in Nairobi city, the administrative and commercial capital of the Republic of Kenya and seat of the Government. The growth of Nairobi city has surpassed the rate at which infrastructure is developed to meet the needs of the growing population. Urbanization, population growth, and industrialization are putting enormous pressure on the Nairobi Rivers – Mathare, Ngong, Athi and Kiu – the main source of water supply for the city. The rivers are heavily polluted from both domestic and industrial waste which is discharged directly into the rivers without being treated and adversely impacting its ecology.

Most land in Nairobi, including the central business district (CBD), is publicly owned and leased for 99 year periods to private owners. Government leasehold covers most of the legalized residential areas, and corporate ownership of land in these areas is becoming more common. Freehold land is privately owned either by individuals or by groups of individuals and can be sold without limits to the period of ownership. This covers a small portion of land mainly to the west and north-west of Nairobi and includes suburbs such as Dagoretti, Mwimuto, Runda, Gigiri and part of the Kahawa area in the north. Over 50 per cent of Nairobi is estimated to be under private ownership and any such areas where the sewer line will have to be laid will thus have to be acquired. Where the sewer line will pass along areas such as road reserves, no acquisition will be required.

4.1 Sewer system: The existing sewer network on the other hand comprises a trunk sewer system that has a total length of about 162.7 km and covers an area of about 208 km² which essentially covers only 40% of the city area served with water. The main problems identified in the system are non-functional sewers due to washed away sections, accidental breakages or deliberate vandalism of manhole covers, blockages due to deliberate dumping of solid waste or accidental entry of stones and boulders into open manholes and also blockage of sewer lines by urban farmers to catch sewage for irrigation and overflowing of sewers due to insufficient capacity.
There are 24 sewage treatment plants in Nairobi, the main ones being the Dandora and Kariobangi Sewage Treatment Plants. The Dandora Plant has design capacity of 120,000m$^3$/day and handles an average flow of 76,000m$^3$/day while the Kariobangi plant has design capacity of 32,000m$^3$/day and handles an average flow of 11,000m$^3$/day.

Recent surveys indicate that most of the sewage treatment plants are operating at very low efficiency despite the fact that they receive flows below their design capacity. It has been suggested that this may be attributed to poor maintenance, high organic loading and influence of industrial discharges.

4.2 Drainage and water quality in the rivers

The three major rivers traversing Nairobi include the Nairobi River, Ngong River and Mathare River. The city is drained mainly by the Nairobi River and the Mokoyeti River, both of which are the tributaries of the Athi River. A survey carried out to determine the nature and extent of pollution of the major rivers in Nairobi indicated that the rivers are highly polluted and concrete mitigation measures need to be taken if this situation is to be reversed.

4.3 Solid waste management

Waste management is a growing problem in Nairobi. Increasing urbanization, rural-urban migration, rising standards of living, and rapid development associated with population growth have resulted in increased solid waste generation by industrial, domestic, and other activities. However, this increase has not been accompanied by an equivalent growth in the capacity to address the problem. As far back as in 1992, from 800 to 1,000 tons of solid waste was generated in Nairobi every day, of which less than ten per cent was collected; by 2002, the amount had grown to 1,530 tons per day of which 40 per cent was either uncollected, or disposed of by burning or illegal dumping. The proper management of waste has thus become one of the most pressing and challenging environmental problems in the city. Waste in Nairobi comes from a variety of household, service, and industrial processes in the following proportions: domestic sources: 68 per cent; industrial: 14 per cent; roads: 8 per cent; hospitals: 2 per cent; markets: 1 per cent; and 7 per cent from other sources (NEMA 2003). Food waste, plastic, and paper are the most dominant forms of solid waste in Nairobi. One of the most ubiquitous forms of visible waste is the plastic bags which are disposed indiscriminately, including into the sewer systems.

The proposed project area is characterized by lots of solid waste dumping along the rivers and open spaces. This majorly applies to the slums especially in Maasai village, Deep Sea and Kibagare. The intervention will lead to decreased pollution in the rivers leading to a clean environment and reduction of diseases like cholera and Typhoid.
5.0 Project Alternatives

The alternative comparisons considered addressed the proposed project site, technology, design, and operation, in terms of their potential environmental and social impacts and the feasibility of mitigating these impacts. The main criteria adopted in selecting alternative sewer routes and sewage treatment works sites have considered the amount of sewage generated, available land and recent developments in sewage treatment technology. The identified alternatives have been subjected to technical, financial and economic, social and environmental evaluation. The proposed routes for sewers and sewage treatment works sites have ensured that there is least amount of disruption to existing features and services e.g. roads, railways, rivers etc. Sewage treatment technologies, construction materials and techniques has been proposed from best practice in the market place.

5.1 Alternative for the trunk sewers

The natural drainage system has been used as a basis of design of the trunk sewer system. The sewer route alignment is mainly dictated by gravity, with most of the trunk sewers lined along the river riparian areas. The trunk sewers therefore have been located at the lower drainage boundaries as much as possible so as to maximize sewage collection from feeder lines. Some trunk sewers drain into treatment works whilst some drain to other larger trunk sewers. Proposed sewer alignments have been routed on rivers riparian, road reserves and utility way-leaves as much as possible. Main sewers have been provided for areas currently served with piped water and those with the potential of being served with piped water soon.

5.2: Construction material alternatives

Among the alternatives examines in the ESIA is the construction materials to be used. The pipe materials have been selected taking into consideration availability, durability and cost. After considering various options, circular pipes have been adopted in this design. UPVC pipes are recommended for sewers with more less or equal to 300mm. Precast Concrete pipes have been adopted for the sewers greater than 300mm. Steel pipes are recommended for all river aerial crossings, Class A and B road crossings, rail crossings and deep sewers. Different pipe bedding types have been used depending on the nature of the ground. These have been classified as bedding type A, B, C, and D. On the other hand, spun concrete pipes to relevant Kenyan and British Standards are manufactured locally by a number of Companies. They form the most common choice for Sewer Pipes.
5.3 No project alternative

This “alternative” implies maintenance of the status quo. That is, the proposed project is put on hold and mechanisms currently being used for disposal of sewage be maintained. This would have far reaching negative implications on the environment in its totality including among others:
- Loss of economic benefits from the construction and operation of the proposed project.
- Continued pollution of ground due to reliance on pit latrines.
- Pollution of surface waters by raw sewage being washed into these bodies.
- Population will continue to be affected by water borne and other diseases associated with exposure to raw sewage.
- Access to proper sanitation is a human right. If this option is adopted, the population will be denied this right.

This being the case then, “No Project Alternative” was discarded in favour of the Preferred Alternative which will lead to realization of the project objectives which are for the good of the greatest majority.

6.0 Potential Impacts

Most of the environmental and social impacts associated with this project will result from activities associated with the construction phase. However, some impacts will also be associated with general site preparation and pre-construction activities which will include, among others:

Pre-construction activities
- Confirmation of trunk sewer routes through surveying.
- Pegging of trunk sewer route.
- Site clearance.
- Securing some areas through fencing.
- Erection of site office and contractors camp.
- Compensation of and resettlement of PAPs whose land is taken by the proposed project.
- Mapping of underground infrastructure.
- Relocation of underground infrastructure where necessary.

During the construction phase impacts are expected from:
- Excavation of sites in preparation for works including excavation of trenches for trunk sewers.
- Laying foundations and associated masonry works.
- Procurement and stockpiling of materials on the site.
- Laying of pipes along the wayleave.
- Backfilling operations.
- Blasting.
- Ballast crushing.

During the operations phase, most impacts will arise from the nature of interaction of the infrastructure with users and general population, including abuse such as breaking and vandalization of manholes, dumping of solid wastes into the sewer system that could undermine its performance.

6.1 Positive impacts: The proposed intervention projects are expected to have an overall positive impact to the people and the environment, as the project by its very nature will have significant inherent environmental benefits by reducing the amount of untreated sewerage discharged into the environment and Nairobi rivers, thus contributing to improving sanitation. Upon commissioning, the project will improve the sanitation conditions in the area leading to improved ground water quality, upgrade in real estate value and economic benefits by saving healthcare expenses among other benefits.
Elimination of Septic Tanks: Most of the consulted PAPs indicated that they use septic tanks at their homes. This project will benefit them as they will be connected to the sewer line and therefore no more use of septic tanks and the associated costs.

6.2 Potential Negative Impacts:
6.2.1 Construction Phase negative impacts

The bulk of negative environmental and social impacts will manifest at the construction phase and include:

- Potential displacement of people settled in the riparian areas where the sewer lines will be laid as well as those who have encroached on the areas where the sewer lines will pass. The RAP report has estimated the number of PAPs to be affected within the proposed project areas to be approximately 835 households which translates to 3,114 project affected persons.
- Potential damage to underground service infrastructure such as water mains, telecommunications infrastructure and underground power cables, among others.
- Insecurity: Land owners in the up market residential areas like Muthaiga and Ridgeways areas expressed their fears due to having strangers hang around their homes during survey and construction phase.
- Disturbance of traffic and difficulty of access: There may be temporary disruptions to traffic during construction. The main impact on roads traffic will be during possible laying of transmission mains along, or across main roads. The main impact on roads traffic will be during possible laying of transmission mains along, or across main roads. Longitudinal excavation will cause narrowing of the road for relatively long periods, while lateral crossing of roads may cause blocking of the road but for a relatively short period, probably few hours.

Excavation in residential areas will cause access problems to pedestrians, and possibly to riders of bicycles and motorcycles. This access difficulty will have more impact on elderly people, handicapped and children, who may accidentally fall in open trenches or make tedious long cycles before they reach their targeted locations.

- Excavation activities are also expected to cause interference to business operations and access to properties of some residents.
- The construction activities will introduce nuisances such exposed excavation trenches, increased solid waste generation, traffic diversion, dust, noise, vibrations and fumes during construction. Earth works during construction may also trigger soil erosion and localized flooding.
- Impacts on occupational safety and health of the workers during the construction phase. Work at water and sanitation facilities is often physically demanding and may involve hazards such as open water, trenches, and slippery walkways, working at heights, energized circuits, and heavy equipment. Use of heavy machinery in site clearing presents safety hazards. Vehicular movements can cause accidents resulting in injuries and probably death. Work at water and sanitation facilities may also involve entry into confined spaces, including manholes, sewers, pipelines, storage tanks, wet wells, digesters, and pump stations which will expose workers to occupational safety risks and accidents.
• Occupational safety risks also include exposure to dangerous working conditions at the sewerage treatment plants, including exposure to chemicals as water in the sewerage system may contain radioactive substances and heavy metals, which typically accumulate in the water treatment sludge. Wastewater may contain potentially hazardous chemicals depending on the source water quality, drinking water treatment processes, and industries discharging to the sewer, including chlorinated organic solvents and pesticides, PCBs, Polycyclic aromatics, petroleum, hydrocarbons, flame retardants, nitrosamines, Heavy metals, asbestos, dioxins, and radioactive materials. In addition, workers may be exposed to hydrogen sulphide, methane, Carbon monoxide, chloroform, and other chemicals generated during wastewater treatment.

• There is also concern for provision of sanitary facilities for workers during construction.

• Social vices associated with influx of job seekers can disturb the social order and even lay the ground for escalation of HIV/AIDS cases whose impacts are likely to be prolonged in prevalence. Large projects like the proposed sewerage project do attract migrant workers. These men and women away from their partners can get into sexual liaisons with people from the host community.

• Impacts of Construction wastes: Various wastes both liquid and solid are generated in the course of construction. The wastes range from general to hazardous categories. This impact is short term. However the disposal mechanism of the wastes can have long term consequences.

6.2.2 Operational phase negative impacts

During the operational phase, the anticipated impacts will include:

• Risks of sewers clogging by residents using the sewer line as place for solid waste disposal.
• Pollution of water and soil due to leaks and overflows: Leaks and overflows from the sewerage system can cause contamination of soil, groundwater, and surface water. Overflows occur when the collection system cannot manage the volume of wastewater, for example due to high flows during rain events or as the result of power loss, equipment malfunctions, or blockages. The excess flows may contain raw sewage, industrial wastewater, and polluted runoff.

7. Mitigation/Enhancement Measures and Complementary Initiatives

Whereas the construction phases and certain aspects of the operations are anticipated to have environmental impacts, the ESIA has identified measures to mitigate the anticipated impacts. These include the following key areas:

7.1 Acquisition of right of way: With regard to displacement of people, a Resettlement Action Plan (RAP) has been prepared and itemizes the number of persons to be affected and the nature of properties to be effected with estimate of financial resources required for their compensation. The affected assets will further be verified and evaluated once the route alignment of the various sewer lines has been confirmed and this will pave way to compensation of affected individuals.

However, in order to minimize the costs for compensation, efforts will be made to ensure that the Trunk and the reticulation sewers are aligned through the river riparian areas and road reserves which are government owned and will not require acquisition.

7.2 To mitigate against damage to underground service infrastructure, in areas where the sewer system will interfere with service infrastructure, it is highly recommended that the ASWB and the
Contractor obtain maps of the underground infrastructure from the relevant institutions and engage with them well in advance before any works are undertaken so that appropriate measures for the relocations of these infrastructure are agreed before works.

In addition, the Contractor shall:

- Sensitize workers carrying out excavations so that they exercise caution to minimize chances of underground infrastructure damage.
- Work closely with the responsible institutions so that in case of damage, the services are restored within the shortest time.
- Work closely with the responsible institutions so that in case of damage, the services are restored within the shortest time.

7.3 **Insecurity**: To address stakeholder concerns about insecurity of property during construction, notices will be posted prior to any activity that will be carried out to ensure no strangers will access their property without their knowledge. They were also informed that there will be compensation of their masonry walls that will be affected during construction.

7.4 **Mitigation against temporary disruptions to traffic during construction**: A construction itinerary should be given in advance so that the potentially affected population can use alternative routes and start early to get to their destinations on time.

**Mitigation measures for management of traffic will include:**

- Provide diversion routes where possible.
- Give a construction itinerary in advance so that the potentially affected population can use alternative routes and start early to get to their destinations on time.
- Erect warning signs of on-going works.
- Expedite construction works so as to reduce the times where roads are blocked.
- Traffic department should approve crossing plan prior to construction, and should approve obstruction times during construction.
- Access of residents should be facilitated by installing appropriate temporary bridges over the pipeline trenches.
- Suitable warning signs should be placed at near locations and should be visible at night.
- A guard should be available 24 hours to help people access across pipeline trenches.
- Alternatives access ways should be communicated to the community.

7.5 **Mitigation against nuisance associated with excavations**: By incorporating appropriate soil conservation measures and proper drainage facilities both during construction and operation phases of the project, soil erosion will be minimized. The Contractor shall also install warning signs where excavated areas have not been backfilled and shall backfilled those that should no longer be exposed in a timely manner.

7.6 **Mitigation against occupational safety and health risks to workers**: The Contractor shall ensure that workers receive safety training and daily basis and regularly before commencement work in high risks tasks and areas. Workers shall also be provided with appropriate personal protective equipment (PPEs) and clothing at all times and supervisors must ensure they are correctly used. Worksite supervisors shall ensure that there is compliance to use of PPEs first providing them and ensure that workers comply by wearing their protective clothing such as ear muffs, safety boots dust masks, gloves, helmets and safety goggles as appropriate and depending of the nature of their operation. The Contractor shall ensure that workers receive safety training on safe handling of equipment, and
application of safe personal hygiene practices to minimize exposure to pathogens and vectors. There should also be a safety policy clearly displayed on the site.

In view of the fact that the working environment is a busy urban setting, Contractors shall install adequate warning signs in active work site to alert other people to beware of these active work sites to avoid being harmed and also maintain work areas to minimize slipping and tripping hazards. When installing or repairing mains adjacent to roadways, adequate signage shall also be installed and procedures for traffic controls shall be put in place, including, among others; installation of signs for reduction of vehicle speeds in work zones; use of high-visibility safety apparel for workers in the vicinity of traffic.

For occupational safety risks associated with exposure to dangerous working conditions at the Sewerage treatment plants, workers shall be equipped with appropriate PPEs at all times and emergency safety measures must be provided at all sewerage treatment plants and laboratories in case of accidents such as injuries or explosions. Contractors shall also implement a training program for operators who work at the sewerage treatment plants and are involved in dangerous manual or machine operations and/or handle dangerous chemicals such as chlorine and ammonia regarding safe handling practices and emergency response procedures.

Mitigation against general safety risks: Visitors and trespassers at wastewater treatment facilities may be subject to many of the hazards for site workers. Appropriate deterrents should be provided to minimize trespassing into sewerage infrastructure areas especially the sewerage treatment plants where there could be risk of drowning. Installation of warning signs against trespassing could be considered.

First Aid kits: As an integral part of safety at work, first aid kits shall be provided and trained First Aiders shall be available and accessible in case of emergency.

7.7 Mitigation against sewer leaks: It will be essential to ensure that the design of manhole covers will done so as to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize entry of garbage and silt into the system. Pumping stations should also be equipped with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions.

Addition, sensitization of residents against dumping of solid wastes in the sewer system will greatly contribute to avoiding clogging of the sewers. AWSB has community liaison officers who will work with the relevant communities to effect such a sensitization program.

7.8 Mitigation for solid wastes generated

- All solid waste will be collected at a central location at each site and will be stored temporarily until removal to an appropriately permitted disposal site in the vicinity of the site.
- No dumping within the surrounding area is to be permitted. Where potentially hazardous substances are being disposed of, a chain of custody document should be kept with the environmental register as proof of final disposal.
- Waste generated at the site should be categorized by the contractor and disposed of in a suitable manner into different waste streams (including general and hazardous waste). Wherever possible recycling should be carried out.
7.9 **Provision of sanitary facilities for workers during construction:** The Contractor shall ensure that workers are provided with temporary mobile sanitary facilities that take into consideration gender disaggregation as access to sanitary facilities may be difficult in some locations. Besides mobile toilets, provision shall also be made for other employee facilities including shelter and hand washing facilities.

7.10 **To mitigate against spread of HIV/AIDS**. The Contractor shall institute an HIV/AIDS awareness program. This could be best handled in liaison with the local authorities that may already have such a program ongoing. Measures that shall be instituted shall include, among others:

- Sensitizing the migrant workers on risky sexual behaviour.
- Have VCT services on site and encourage workers to undergo the same.
- Provision of protective devices such as condoms.

8.0 **Expected Residual Effects and Environmental Hazard Management**

The main sources of potential hazards will be associated with the construction phase which will include activities such as excavation of the work sites including excavation of trenches for laying trunk and reticulation sewers, masonry works on the waste water treatment plants, earth works as well as associated backfilling and ballast crushing. However, the ESIA has built in remedial measures for restoration of all disturbed work sites.

9.0 **Monitoring Program**

Environmental and Social management/monitoring is essential for ensuring that identified impacts are maintained within the allowable levels, unanticipated impacts are mitigated at an early stage (before they become a problem), and the expected project benefits are realized. Thus, the aim of an ESMP monitoring program is to assist in the systematic and prompt recognition of problems and identification of effective actions to correct them, and ultimately seek to achieve good environmental performance of the project.

Environmental monitoring provides feedback about the actual status environmental impacts of a project. Monitoring results help judge the success of mitigation measures in protecting the environment. Monitoring is also used to ensure compliance with environmental standards and ESMP mitigation measures and to facilitate any needed project design or operational changes. A monitoring program, backed up by implementation of corrective action when the monitoring results show it necessary, is a proven way to ensure effective implementation of mitigation measures. By tracking the project’s actual impacts, monitoring will reduce the environmental risks associated with the project, and will allow for project modifications to be made where required.

As the Executing Agency, AWSB, in conjunction with Nairobi Water and Sewerage Company will bear overall responsibility for monitoring implementation of the ESMP. However, for day-to-day monitoring, it is expected that the supervising Consultant will hold the Contractor(s) accountable for all ESMP implementation requirements, including implementation of all NEMA approval conditions as stated in ESIA approval. It is expected that NEMA, as the agency responsible for environment will also conduct oversight monitoring on ESMP implementation as appropriate based on the approval conditions imposed in the ESIA approval. The Bank, on the other hand will conduct routine bi-annual supervision missions to ensure all activities, including ESMP implementation are on track. The ESIA and ESMP has identified areas for monitoring by the Contractor(s) and the Supervising Consultant(s). Key aspects of the monitoring program will include, among others; water quality monitoring, especially with respect to effluent discharged from WWTPs and receiving waters, reinstatement of areas disturbed by earthworks, occupational health and safety aspects and construction related accidents and protection of workers as well as status of RAP implementation.
10.0 Public Consultations and Public Disclosure

Kenya has entered the era of participatory development in all matters of national welfare. Participation in this case is not just through elected representatives but also through direct engagement with citizens. The Environmental Management and Coordination Act (EMCA, 2015) and its subsequent Environmental (Impact Assessment and Audit) Regulations, 2003 underscore the need for stakeholder participation in the ESIA process. Communities in neighborhoods to a proposed project are expected to live amicably with the project if implemented. They have the most to gain if the project impacts are beneficial to them. Conversely, they have the most at stake if the project generates negative impacts that can adversely affect their lives. Not just neighbours but for projects whose impacts have a wide geographical spread, distant communities need to be involved. Stakeholder input is thus vital at the earliest stage possible in project development and should continue throughout the project cycle.

The preparation of the ESIA and RAP benefited from a participatory approach at the various stages. Public consultation in this project was carried out with the following objectives:

- To inform the local people, leaders and other stakeholders about the proposed project and its objectives.
- To seek views, concerns and opinions of people in the area concerning the project.
- To establish if the local people foresee any positive or negative environmental impacts from the project and if so how the impacts can be addressed.
- To give a platform for information sharing and opinion gathering in relation to the proposed project.

Like in all civil works projects, the core stakeholders comprise people to be directly served by the sewerage system and the residents along the riparian reserves who will be affected in one way or another. Motorists, businessmen and other service providers who rely on the road reserves where reticulation sewers will be laid will also be affected. This is the group that is likely to benefit or be affected by the proposed development are the primary stakeholders.

For Government institutions, the ESIA and RAP consultation processes targeted local authorities and institutions whose roles where connected to the project, such as Nairobi County Council and NCWSC among others. This category was also consulted as key informants on sectoral policy and to provide advice on key issues emerging during the ESIA study and on mitigation measures to be put in place so as to minimize adverse impacts in respective sectors.

The community consultations on the other hand highlighted concerns on the benefits and possible impacts of the proposed program, and community involvement in program activities. It was noted that the selection of sites and infrastructure was in agreement with the desires of the beneficiaries who also indicated their willingness to fully participate in all program activities during implementation. All stakeholders acknowledged that the sanitation situation in Nairobi city requires urgent attention as it pauses serious risks to public health and livelihoods of the people in the City. During the ESIA and RAP preparation process, affected communities were given detailed information about the project through presentations by Consultant teams. The presentations highlighted the project background, objectives as well as potential socio-economic and environmental impacts with feedback and expectations received from those present. It is proposed to further continue with stakeholder engagement in line with a SEP which has been developed under the program.
10.1 Disclosure

In further fulfilment of Government requirements for disclosure, the ESIA for the project was disclosed in the local newspapers, daily Nation on 23rd May and 6th June 2017, and in the Kenya gazette on 2nd June 2017 and all these invited the public to review the project ESIA summary and provided feedback as appropriate.

10.2 Consultation outcome

The stakeholders consulted gave a candid view of the proposed project which reflected the diversity of stakeholder interest within the diverse project areas. The following is the summary of views that emerged from the consultations:

Positive impacts

i. **Employment:** Communities in project areas urged those responsible for project implementation to ensure that youth from the project areas are given priority when recruiting labour force. They were emphatic especially on the recruitment of manual labour.

ii. **Connection to the Sewer lines:** stakeholders were supportive of the project as it will enable connectivity of unserved areas to the sewer system and thus spur growth in the area.

iii. **Need for open and prompt communication:** To avert unnecessary conflicts, there is need for prompt communication to all stakeholders. This could be through the use of the local administration and other community fora. Any information or clarification about stakeholders’ position on project need to be promptly availed to any interested party.

iv. **Elimination of Septic Tanks:** Most of the consulted PAPs indicated that they use septic tanks at their homes. This project will benefit them as they will be connected to the sewer line and therefore no more use of septic tanks and the associated costs.

Negative Impacts identified included, among others:

(i) **Loss of livelihood:** individual engaged in various forms of trade and activities such as crop farming along the sewer wayleaves were concerned about possibility of losing their source of livelihood.

(ii) Interference with the existing service infrastructure, including, among others; water supply pipes, telecommunications cables.

(iii) **Insecurity:** Land owners in the up market residential areas like Muthaiga and Ridgeways areas expressed fear due to having strangers hang around their homes during survey and construction phase.

10.3 Stakeholder Engagement plan

It is also noteworthy that NaRSIPI prepared a Stakeholder Engagement Plan (SEP) which partly benefitted the preparation of documentation for NaRSIP II and in particular the ESIA process and it is intended that the participatory approaches prescribed in the SEP shall be adopted throughout the program implementation.

11.0 ESMP

The ESIA has elaborated a comprehensive ESMP covering key aspects of the project impacts that will require management during implementation phase. Key areas covered by the ESMP include, among others:
• Monitoring project impact on alleviating pollution of the Nairobi rivers,
• Management of solid wastes generated during construction,
• Management of construction impacts linked to disturbance and interruption of traffic, possible interference to other service infrastructure such as telecommunications,
• Management of the services affected by the construction works,
• Management of occupational health and safety compliance, as well as
• Management of impacts associated with displacement of people along the project wayleave.

The ESIA has provided a budget estimate of approximately Kshs 100,000,000 for ESMP implementation.

12.0 Institutional Capacities and Strengthening plan:

The Executing Agency (EA) for the project is the Ministry of Water and Sanitation (MWS), which will have a coordinating role. The actual implementation will be done by the AWSB. AWSB will use the regular reporting mechanisms as per the requirements of GoK and AfDB. The AWSB and Nairobi City Water and Sewerage Company Ltd will be assisted through the institutional development support component to enhance their managerial, commercial and technical capacity.

13.0 Implementation arrangements

The project will be implemented using existing organizational structures incorporating lessons and experiences gained with the other similar operations and in particular lesson from NaRSIP I.

Athi Water Services Board will establish a Project Implementing team (PIT) consisting of a Project Coordinator, Project Engineer, Procurement Officer, Environment Officer, Social/Community Development Officer, Project Accountant and M&E officer. NCWSC and Nairobi County Government will co-opt representatives to be involved in the implementation of the project. A steering committee chaired by the Permanent Secretary, Ministry of Water and Sanitation and representatives of key agencies will be constituted. Members of the steering committee will include; Chief Executive Officer AWSB, Managing Director Nairobi Water and Sewerage Company, CEC Environment, Water and Energy Nairobi County Government, Head planning and Engineering AWSB. The steering committee will monitor and guide the project implementation during quarterly coordination meetings

The Athi Water Services Board’s implementation team will be in-charge of the project implementation, and AWSB shall be responsible for overall coordination of the project and reporting obligations to donors.

A project implementation team will be constituted and staffed by seconded adequately skilled personnel including environmental and social experts who will be responsible for tracking implementation of environmental and social management plans (ESMPs) and RAP.

14.0 Conclusion

The relevant ESIA studies for the project have been approved by the Government for the entire scope of the project components, confirming that the program has met country level environmental approval requirements. Despite the implementation of NARSIP I, further reduction of pollution from domestic waste effluent to Nairobi rivers and Athi river basin water system is required, hence the phase two proposal.
The ESIA done for the various components of NaRSIP II has proposed a range of mitigation measures for the anticipated impacts and these, if implemented should be able to support environmentally sound implementation of the project. It is expected that in addition to the ESIA and the Environmental Management Plans, further complementary environmental management measures will be developed by contractors and overseen by supervising consultants who will be responsible for day-to-day environmental oversight on the project.

15.0 References and Contacts

This ESIA/RAP summary was prepared based on information contained in the detailed project ESIA and RAP documents provided by the client, AWSB.

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