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**AFRICAN DEVELOPMENT
BANK GROUP**

**PROJECT: NAIROBI RIVER REHABILITATION AND RESTORATION
PROGRAM: SEWERAGE IMPROVEMENT PROJECT**

COUNTRY: KENYA

SUMMARY OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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ATHI WATER SERVICE BOARD
NAIROBI RIVER REHABILITATION: SEWERAGE IMPROVEMENT PROJECT
EXECUTIVE SUMMARY OF THE
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Project Name : Nairobi River Rehabilitation and Restoration Program:
Sewerage Improvement Project
Project Number : P-KE-EB0-003
Country : Government of Kenya

1. INTRODUCTION

1.1 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 208km² which is 30% of total coverage in the city. The Government of Kenya (GoK), recognizing the magnitude of the problem has requested the Bank for support to develop wastewater facilities in order to enhance the sustainable management of the Nairobi urban environment.

1.2 This document summarizes the findings of the Environmental and Social Impact Assessment (ESIA), the legal and policy framework under which the assessments were undertaken, a description of the project environment, an analysis of project alternatives, an evaluation of potential impacts, and information related to the Environmental and Social Management Plan (ESMP). It also provides insight into the consultative process and resettlement action plan developed to deal with project affected people.

2. PROJECT DESCRIPTION AND JUSTIFICATION

2.1 The overall goal of the project is to improve the health and quality of life of inhabitants of the Nairobi city and promote cleaner urban environment by providing sewerage services through collection and treatment of wastewater. Laying down new trunk sewers, reticulation system and increasing the capacity of wastewater treatment plants will reduce the high pollution levels in the Nairobi Rivers, incidences of water-borne diseases, mortality rate and ultimately improve productivity of the population. This will be achieved by: (i) rehabilitating and expanding sewerage infrastructure, (ii) promoting community sanitation activities including tree planting which will be implemented in line with the on-going slum upgrading program, and (iii) enhancing institutional capacity of Athi Water Services Board (the implementing agency) and the Nairobi Water and Sewerage Corporation (the service providers).

2.2 The project components include: (i) rehabilitation of the Kariobangi conventional sewerage treatment plant currently operating at about 30% of its design capacity to the full capacity of 32,000m³/day, (ii) construction of two additional series of waste stabilisation ponds at Dandora to increase the capacity by 40,000m³/day from 120,000 to 160,000m³/day, (iii) rehabilitation and laying of new trunk lines at an overall length of 54km in addition to 40km of reticulation lines, and (iv) the duplication of inlet works at the Dandora for the increased wastewater flow.

2.3 The limited sewerage infrastructure coupled with rapid urban growth have led to direct discharge of raw untreated sewage into the rivers. This has resulted in heavy pollution of the rivers, poor health and reduced quality of life. The project intends to improve and extend the sewerage system in the city of Nairobi through the rehabilitation and construction of sewerage infrastructure, institutional capacity support and development of community programs.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 The Ministry of Environment and Mineral Resources (MEMR) of Kenya approved in 1999 a National Environmental Management Coordination Act (EMCA) which is a policy document outlining the priorities for environmental management and sustainable development in the country. According to the Environmental Act, any activity with a significant impact on the environment requires an environmental license which is issued by the government agency responsible for the management of the environment – the National Environmental Management Authority (NEMA) – which has an environmental impact assessment department. The Environment Act (EA) also states that the environmental license shall be subject to specific regulations on the process of Environmental Impact Assessment study. Of crucial importance for the Water Boards is legislation on, (i) the discharge of liquid/effluent waste into the environment, and (ii) the quality of treated waste.

3.2 In addition, the Kenya Water Act (no. 8 of 2002) stipulates key issues on ownership and control of water in Kenya and water resources management through the creation – under powers vested in the Ministry of Water – of Water Boards and Water Service providers. Kenya has under the EMCA also established a Standard and Enforcement Review Committee for Water Quality and the discharge of Effluent Waste charged with the responsibility to advise NEMA on, (i) standards of water quality for different water users, and (ii) standards and quality of effluent discharges and emissions into the environment for all activities.

4. DESCRIPTION OF THE PROJECT ENVIRONMENT

Bio-physical

4.1 The Nairobi city is located within the Athi River Catchment and is traversed by three key rivers namely Nairobi, Mathare and Ngong. All the existing trunk sewers run along the riparian reserve of these rivers, posing health risks to population as raw sewage from defective sewers automatically flows into the rivers by gravity causing river pollution. Currently, the rivers experience heavy pollution from both domestic and industrial point

sources and from agriculture non-point sources which have turned the colours of the water to greening indicating eutrophication and high content of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and high turbidity levels. Odors from the rivers also indicate high levels of pollution. Currently, most sections of the rivers are covered by solid waste which is adversely affected the river run-off.

4.2 Nairobi's main drainage follows the regional slope of the volcanic rocks towards the east, while subsidiary internal drainage into the Rift region is confined to the western part. The lava plains east of the line Ruiru-Nairobi-Ngong are underlain by a succession of lava flows alternating with lakebeds, streams deposits, tuffs and volcanic ash. These plains, comprising mainly the Athi plains and the northern section of the Kapiti plain, extend westwards, rising from 1493m at the Athi River to 1829m in the faulted region near Ngong. The lava plains are crisscrossed with steep-walled gullies and canyon-like gorges, such as those along the Mbagathi valley. Further east this valley widens slightly where soft material is being actively eroded. Water draining eastward from the hill area accumulates on the low-lying ground between Parklands in the north and Nairobi South estate, forming a perched water table above the Nairobi phonolite. The Kerichwa Valley Tuffs lying to the east of the highway function like a sponge and the contact between them and the underlying impermeable phonolite thus forms a perfect aquifer, so much so that a number of channels containing water occur beneath Nairobi.

Geology / Soils

4.3 The soils in Nairobi are products of mainly weathering and erosion of underlying volcanic rocks under relatively high temperatures, rainfall and poor drainage. As a result of impeded drainage of the plains, the soils are black to dark grey clays (Grumosolic) comprising black cotton soils with calcareous and non calcareous variants. Immediate rehabilitation of the areas disturbed is recommended to avoid loss of soil through agents of soil erosion. The project will not cause physical change to the environment because the topography, slope and stability of the soils will be maintained.

4.4 The rocks in the Nairobi area mainly comprise of a succession of lavas and Pyroclastics of the Cainozoic age and overlying the foundation of folded Precambrian schist's and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments and found as agglomerates derived from the former Ngong volcano. The soils of the Nairobi area are products of weathering of mainly volcanic rocks. Weathering has produced red soils that reach more than 15m in thickness.

Natural Environment

4.6 Eastern part of Nairobi area is dominated by savanna grasslands, with mainly grass (short) and scattered drought resisting trees. The surrounding undeveloped area consists largely of the following: Bushed grassland - Grassland with scattered shrubs, the shrubs being with a canopy cover of less than 2%. Grassland are dominated by grasses occasionally other herbs, sometimes widely scattered or grouped trees and shrubs, the canopy cover does not exceed 2%.The area also has medium sized indigenous trees mostly of acacia species

especially the *Acacia Abyssinica*, ferns, shrubs and grassland. Papyrus reeds and long green grasses are dominant along the main rivers - Ngong, Mathare and Nairobi River. The rivers exhibit high levels of eutrophication making algae bloom conspicuous and leafy green grasses mainly *Chloris gayana* and *Themeda thriandra* which form pasture to large numbers of livestock in the region. Western and Eastern part of Nairobi form catchments to Ngong, Mathare and Nairobi river. These rivers are dominated by exotic trees mainly *eucalyptus (grandis)*, *gravellia*, *whisling pines*, *Cyprus*, *Sesbania* and *lucena sp.*. In Ngong and Muguga, area isolated indigenous trees also exist and this are the *Kikuyensis sp.* *Mugumo*, *Bamboo*, *Croton megalocarpus*, *Acacia xanthopholea*, *Yellow oleander among others*. The project will not affect any natural forest as the trunk sewers do not traverse any protected zones, effects to biological environment will also be minimized. The trunks are to be constructed within the riparian zones of the river eliminating the possibility of destruction of wetlands and interference of the river course.

Climate

4.8 At 1,795 meters above sea level, Nairobi experiences a moderate climate. Under the Koppen climate classification, Nairobi has a subtropical highland climate. The altitude makes for some cold evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). The sunniest and warmest parts of the year are from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F). There are two rainy seasons but rainfall can be moderate. The long rains form the first season and fall in the months of March to May, and the short rains forming the second rainy season, fall between October and December. The cloudiest part of the year is just after the first rainy season, when, until September, conditions are usually overcast with light drizzles. The mean annual rainfall ranges between 850-1050mm. As Nairobi is located close to the Equator, the differences between the seasons are minimal.

5. PROJECT ALTERNATIVES

5.1 The proposed project comprises of two broad components namely construction of new sewerage pipelines and rehabilitation and expansion of existing sewage treatment plants. Identification of these components was established during preparation of a sewage and drainage Master plan in 1998 by City council of Nairobi. AWSB has reviewed and updated the plan to incorporate recent and current developments in the coverage area. Some of the specific impacts that would arise as a result of the “**No Project Alternative**” includes: (i) continued pollution of the environment from raw sewage which is overflowing from blocked or collapsed sewers as well as from filled up septic tanks or pit latrines, (ii) continued contamination of the aquatic environment by discharge of untreated or inadequately treated effluent from the Dandora Works Water Treatment Plant, (iii) restricted access to water borne sanitation for the population in informal settlements within Nairobi, (iv) continued menace of flying toilets, raw sewage flowing in open drains and excessive solid waste generation, (v) continued health and occupational hazards to the population living within areas contaminated with raw sewage, (vi) continued accumulation of persistent contaminants in the environment

that would otherwise have been conveyed and treated in a central plant. These persistent contaminants over time will surpass the toxic threshold levels and result in irreversible major environmental, social and health problems, and further reduce available freshwater and food reserves.

5.2 The Project alternative which is the designed project originates from implementation of sewerage and drainage master plan prepared in 1998 but was never implemented because of lack of financing. Naturally, a good sewerage system requires sufficient water to function well. This explains why in conventional sewerage systems, water supply precedes sewerage development. Because the project was long determined save for implementation, only the 'no project alternative' was considered as discussed above. The project proposes to rehabilitate two wastewater treatment plants namely Kariobangi (current design capacity is 32,000m³/day) and Dandora (current design capacity is 80,000m³/day). The efficiency of these plants is currently low and the effluent discharged into the receiving water bodies does not meet set standards by NEMA. This inefficiency of the treatment plant has continued to contribute to pollution of the receiving water bodies. The proposed project seeks to address this problem by rehabilitating the plants and laying trunk sewers and reticulation system.

6. POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 The impacts assessed cover the direct effects and any indirect, positive and negative effects of the development during construction, operation and in many cases possible decommissioning. The likely significance of the impact is based in the identification and prediction of the magnitude of any impact caused by the project on (i) a receptor (e.g. human beings, community facilities, etc.), or (ii) an environmental resource (elements of the existing natural or built environment), or on (iii) any process which is essential, or of value, to the functioning of human or natural systems, and (iv) the identification of the importance (and/or sensitivity) of that receptor/environmental resource/process. For all impacts, appropriate mitigation measures have been provided for, and contractors will be required to enforce them.

6.2 Positive Impacts

Overall, the construction and rehabilitation of trunk sewers, reticulation system and wastewater treatment plants will result in a significant positive impact through increase in collection and treatment of wastewater. Implementation of the project will result into improved health. Extension of the trunk sewers will result into more households and buildings having connections to the sewer network and therefore less effluent will end up into water bodies and the environment. With less polluted rivers, there will be reduced cases of water-borne diseases. Statistics have revealed that there is direct correlation water borne related diseases and quality of water and Sanitation services especially among the poor. Through improved water and sanitation access, cases of reported water borne diseases will drastically reduce impacting positively on the general welfare of the people. The anticipated health benefits from the proposed project will lead to direct savings for the individuals. The proposed project will **create employment opportunities**. Given that the terrain along the rivers riparian has limited working space due to encroachment by informal settlers, it will be

difficult to use machinery to dig trenches. There will be need for people to dig trenches and lay pipes manually. Such labour will be sourced from people within the locality of the sub projects. Youths in the informal settlements will therefore be employed during the implementation phase of the project. This approach will also create a sense of ownership of the infrastructure and hence reduce chances of vandalism during operational phase. The project will also result into **reduced cost of sanitation services** as well as **promote local entrepreneurship**. Employment of local residents will increase their income and well-being.

6.3 Negative impacts

The assessment revealed that the project has significant impacts than negative impacts. The potential environmental impacts of the proposed project will be experienced during the different phases of the project namely construction, operation and decommissioning. It is however worth noting that some potential impacts cut across the entire lifespan of the proposed project. The impacts vary in spatial extent; duration; intensity; reversibility and degree of certainty.

Potential negative impacts during project construction phase will include:

6.3.1 Risks Associated with Waste Handling and Disposal

The wastes generated during construction can be categorized into the following categories:

- Excavation waste, which is usually inert if the construction site, is free from land contamination,
- Water removed from excavated areas, piping trenches are an environmentally important issue in terms of quantity and quality.
- Human wastes generated by construction labour, including sewage and garbage collected from labour camps.
- Normal construction waste including concrete, steel, bricks, wood etc which are chemically inert.

6.3.2 Dust Emissions

The excavation of top soil in construction sites will generate dust that will vary according to the soil type and nature of excavation. Also there are other, relatively minor emissions, from construction trucks and power generators.

6.2.3 Risks of Damaging Underground Infrastructure

During excavation for laying the trunk sewer pipes there are risks of damaging underground potable water pipes, telecommunication or power lines. This could result in disruption of essential services. Consultation with other essential service providers prior to construction to establish location of the services will avoid interference. Where it must occur then prior

communication aimed at informing consumers of such disruption must be planned and effected at less critical periods and within very short durations.

6.2.4 Disruption of movement during Construction

Trenching and laying of pipe network will interfere with traffic flows resulting in delays. There may be delays for employees, merchants/suppliers and entrepreneurs reaching their work stations. Normally such impacts are minor/ short-lived and could be tolerated by the residents.

6.2.5 Accidents during Construction

Accidents do happen in construction sites. These accidents could be mild or fatal depending on various factors. During the implementation of the proposed project, accidents could be due to factors such as negligence on part of the workers, machine failure or breakdown or accidental falls. Cuts by machines and other tools can also occur during the implementation phase. These incidents can be reduced through proper work safety procedures.

6.2.6 Noise and Vibrations

During excavation of trenches, vibrations from excavators may affect the stability of some buildings. Other than vibrations, the proximity of the trenches to the houses has implications on the structural integrity. Affected buildings may crack and thus impact on their safety. During construction, noise is generated by machinery such as the vibrators, compressors and vehicular traffic. Construction is done during the day and therefore those nearby will bear the disturbance. Noise is also generated by delivery trucks as they bring materials to sites.

6.2.7 Occupational health risks

Open trenches that remain unprotected and without direction signs can be potential grounds for accidents to both adults and children. These calls for securing the site with danger tape and putting signs warning members of the public, wooden rails can be put along foot path to act as make shift bridges. In addition, the site should be manned throughout.

6.2.8 Relocation of structures on sewer routes

Sewers are laid within river riparian. Riparian land is defined according to WRMA guidelines and is a function of the width of the respective river. A resettlement action plan has been prepared to determine actual project affected people for compensation.

6.3 Mitigation Measures

Environmental and Social Management Plan – Construction Phase

Environmental issue	Anticipated impact (negative)	Management and Mitigation measure	Actors responsible for mitigation	Estimated Cost (KSh per annum)
Vegetation loss	Impact on	The clearance of the site for		

due site clearance	ecology and vegetation cover.	construction purposes shall be kept to a minimum	Contractor	500,000
		The extent of clearing within the work stations should be clearly marked		
		Rehabilitate all disturbed areas through re-vegetation		
		Instruct all construction workers to restrict clearing to the marked areas and not to work outside defined work areas;		
Trench Excavation	Soil disturbance, soil erosion and siltation in rivers	Earthworks should be restricted to construction sites as far as practical	Contractor	300,000
		Earthworks should be carried out during the dry season to prevent soil from being washed away by the rain		
		Excavated materials should be kept at appropriate sites		
		Protect areas susceptible to erosion using temporary and permanent drainage structures		
	Open trenches health hazard to individuals	Install warning signs and lightings at both deep and shallow trenches.	Contractor	250,000
		Backfilling trenches as soon as works are completed		
		Provide temporary bridges and protection rails at deep trenches to facilitate people movement		
	Dumping of waste material, broken pipes and excavated materials (health hazard)	Land scaping to blend with the surrounding area, re-vegetate the area		
Disposal at designated sites and in manner approved by the CCN				
Diversion of Sewage Flow during Replacement of Sewers pipes	Discharge / spillage into water courses therefore affecting water quality and aquatic life.	Careful Pumping of sewage from upstream manholes to downstream manholes through diversions.	Contractor	500,000
		Completely blocking off the main trunk line to minimize chances of exposing staff to raw sewage during work.		
		Regular inspection and monitoring of diversion routes for sewer to avoid contamination of the environment.		
		Immediate opening up of completed lines to minimize risks of pollution by sewage flowing in diversions.		

Construction activities	Soil, surface and groundwater contamination	Construct oil-water interceptors or sumps to capture discharge of oils, fuels and other polluting liquids	Contractor	300,000
		A safety and emergency response plan to be developed for all operations with emphasis on the protection of the environment		
		Surface runoff should be controlled by temporarily berming the outlet of the significant storm water features to provide some detention behind the berms		
Contractors camp sites.	Solid waste generation that pollutes the environment may cause diseases/eye sore	Establish good sanitation facilities approved by Public health department of CCN at campsite	Contractor	200,000
		Skips and bins should be strategically placed within the campsite and construction site, they should also be adequately designed and covered to prevent access by vermin and minimize odour.		
		The skips and bins at both the construction campsite and construction site should be emptied regularly to prevent overfilling.		
		Disposal of the contents of the skips and bins should be done at approved disposal site.		
		Compliance with waste management commitments contained in the Waste Management Regulations		
		Where possible solid waste should be recycled, re-used and utilized in an environmentally acceptable manner		
		Agreement with suppliers to accept the return of unused materials.		
		A Waste Management Plan to be developed to handle temporary storage, transport and disposal of hazardous waste		
		Careful disposal of non recycled wastes to sites designated by CCN		
Vehicular Traffic	Gaseous/dust emissions which pollute air causing respiratory problems (SO, CO, N ₂ O, are	Maintaining machineries at manufacturers specifications	Contractor	300,000
		Site roads should be dampened every 4-6 hours or within reason to prevent dust nuisance and on hotter days, this frequency should be increased.		
		Minimize cleared areas to those that		

	greenhouse gases)	are needed to be used. Cover or wet construction materials such as sand to prevent dust nuisance. Where unavoidable, construction workers working in dusty areas should be provided and fitted with N95 respirators. Wetting of unpaved areas and the entire work place Limit removal of vegetation and a rehabilitation programme on site and associated infrastructure following construction		
Project activities	Noise pollution and vibrations which are Nuisance and may cause health complications	Use of equipment that has low noise emissions by exposed workers as stated by the manufacturers.	Contractor	180,000
		Use of equipment that is properly fitted with noise reduction devices such as mufflers.		
		Construction workers operating equipment that generates noise should be equipped with noise protection. A guide is a worker operating equipment generating noise of ≥ 80 dBA (decibels) continuously for 8 hours or more should use ear muffs. Workers experiencing prolonged noise levels 70 - 80 dBA should wear earplugs.		
		Operate noise-generating equipment during regular working hours (e.g. 7 am – 7 pm) so as to reduce the potential of creating a noise nuisance during the night.		
		The movement of equipment (trucks) during the construction of the wetland should be limited to the working hours, 8:00 am - 4:30 pm a day.	Contactar	
		Heavy equipment should be transported early morning (12 am – 5 am) with proper pilotage.	Contactar	
		Encroachment of people on sewer way leaves	Inaccessibility by contractor (addressed in RAP)	Intensive public awareness campaign to those communities who will be affected by the project activities to appreciate that sewer infrastructure improvement is for the benefit of the entire community in terms of

		sanitation and hygiene. Establish and implement Resettlement Action Plan (RAP) Carryout monitoring and evaluation exercise to ensure that there is no re-occupation on the sewer way leave after compensation is made	AWSB/Contractor	RAP budget
Occupational health and safety	Impact on health of the workers	Ensure workers health and safety through awareness campaign and provision of appropriate PPE	Contractor	400,000
		Rehabilitate excavated sites as soon as construction is complete		
		provision of adequate sanitary facilities		
		Training of all workers in Safety Health and Environment (SHE)		
	Risk of fire	Label all inflammable materials and store them appropriately		500,000
		Provision of adequate firefighting equipment capable of fighting all classes of fire		
		Put “ No Smoking Signs” in areas where inflammables are stored		
		Train workers on the use of firefighting equipment		
Inadequate Capacity of Proponent staff	Inability to oversee execution of ESMP	-Train the relevant staff of the proponent on monitoring skills and implementation of findings to enhance effectiveness of ESMP - provide tools for monitoring effectiveness of ESMP	AWSB	2,500,000

Environmental and Social Management Plan – Operational Phase

Environmental activity	Anticipated impact	Management and mitigation measure	Actors	Estimated Cost (KSH)per Annum
Monitoring and inspection of the sewerage system.	Improved connectivity to service and corresponding improvement in quality of water in Nairobi rivers (Ngong, Mathare and Nairobi river)	Intensify connection of households to sewerage system to reduce illegal sewer connections which overload the infrastructure.	NCWSC	1,800,000
		Carry out self-audit exercise once every year in compliance with environmental regulations		
Encroachment on	Inaccessibility	<ul style="list-style-type: none"> Confine sewers within river riparian 	AWSB	

sewerage system	for routine maintenance hence collapse of system	<p>where possible</p> <ul style="list-style-type: none"> • Ensure there are no re-settlements within riparian • Awareness creation through publicity 	WRMA NCWSC	1,000,000
Break down of Sewerage system	Discharge of raw sewage into the receiving environment	Educate local communities to report immediately to NCWSC whenever they notice any malfunction of the sewerage system	NCWSC	100,000
		Regular inspection of the entire sewer system to check for blockages/vandalism etc. This should be followed by regular repairs and servicing of the plant whilst addressing cause of failure		
Deliberate Puncturing of sewer mains or blockage of manholes to get raw sewage for urban farming	Contaminated food crops (heavy metals)	Creation of awareness component to be integrated in the rehabilitation program, or monitoring as a sustainable mitigation measure which must be included in the rehabilitation program.	AWSB CCN	600,000
		Enforce ban on urban farming using raw sewage		
Compliance to set legal arrangement		Ensure compliance to the Environment Management and Coordination Act. All issues outlined in the section VI of the EMCA should be strictly adhered to	NEMA	100,000
		NEMA should penalize those industries which release untreated effluents into the environment, this can be achieved by enforcing the ' <i>polluter pay principle</i> ' and section IX of the EMCA 1999		

8. ENVIRONMENTAL AND SOCIAL MONITORING

8.1 The project impacts, which are the outcomes of project activities, will be monitored by the project monitoring-evaluation unit and NEMA. In order to ensure efficient implementation of the proposed ESMP, monitoring activities will include two major types of monitoring: (i) **Compliance monitoring** – the general environmental monitoring of construction and operation sites and activities; and (ii) **Impact monitoring** – the specific monitoring of quality of water in the rivers and sludge generated. The compliance monitoring for the construction and operation stages is presented in tabular form below. It should be noted that the contractor is responsible for the issues related to occupational safety and health and the National Environment Management Authority (NEMA) is responsible for environmental supervision.

Schedule	Activities	Responsibility			Comments
		Execution	Supervision	Funding	
Construction stage					

Year 1. Months 1-2	Prepare a Construction Site Environmental Management Plan (CSEMP)	Contractor	AWSB	Contractor	Draft Plan submitted not later than 1 month after contract notification Final plan before end of month 2 Review by AWSB
Construction period	Selection of optimal location of new constructions and routes for access roads, wastewater pipes	AWSB	AWSB		Records from site selection and land allocation documentation
	Safe working procedures to be written and followed by contractors	Contractor	AWSB	Contractor	Verify applicability of written safe working procedures. Regular inspection of construction works
	Working areas to be temporarily out of bounds to non-works personnel	Contractor	AWSB	Contractor	Regular inspection of construction sites
	Construction waste to be stored in a secure, designated area prior to removal to a designated waste landfill site	Contractor	CCN/AWSB/NEMA	Contractor	Regular inspection of construction sites
	In the event that asbestos-containing materials are encountered, workers must wear protective glasses, masks and gloves	Contractor	AWSB	Contractor	Regular inspection of construction sites
	Asbestos containing waste must be promptly delivered to appropriately designated waste landfill site	Contractor	CCN/NEMA/AWSB	Contractor	Regular inspection of construction sites Records from landfill site management
	Waste to be disposed of at a designated waste landfill site	Contractor	CCN /AWSB	Contractor	Records from landfill site management
	Daily checks of machinery for leaking oil	Contractor	AWSB/NEMA	Contractor	Regular inspection of construction sites
	No washing of machinery at construction site	Contractor	AWSB	Contractor	Regular inspection of construction sites
	Separation of topsoil and subsoil during excavation works, with careful replacement of topsoil after pipe is	Contractor	AWSB	Contractor	Regular inspection of construction sites

	laid				
	Works performed strictly during normal weekday working hours to minimize noise nuisance	Contractor	AWSB	Contractor	Regular inspection of construction sites. See also Section Impact Monitoring: Air Quality and Noise
	Minimize dust and traffic emissions by good operation management and site supervision	Contractor	AWSB	Contractor	Regular inspection of construction sites. See also Section Impact Monitoring: Air Quality and Noise
	Apply dust suppression measures (water sprinkling), especially during long dry periods	Contractor	AWSB	Contractor	Regular inspection of construction sites. See also Section Impact Monitoring: Air Quality and Noise
	If any archaeological artefacts are found, work must stop immediately and the respective local authorities and experts informed	Contractor	AWSB	Contractor	Regular inspection of construction sites
	Minimize time of replacement work and interruptions of water supply	Contractor	NCWSC/AWS B		Records from water supply management Regular inspection of construction sites
	Minimize time of construction work and provide crossings and/or alternative access routes to mitigate limited access to residential and business areas from trenches excavation	Contractor	AWSB	Contractor	Regular inspection of construction sites
	Develop a traffic management plan	Contractor	AWSB	Contractor	Records from construction management

Impact monitoring: water quality

It is expected that the project will have beneficial effect on the water quality through improved sewage conveyance and improved wastewater treatment. However, accidental discharges of unsatisfactory treated sewage can pollute ground and surface water. To avoid pollution and ensure prompt and efficient response in case such pollution occurs, effluent from waste water treatment plants (WWTP) should be constantly monitored, along with the water quality of receiving water bodies.

Sampling points should be established at (i) the treated effluent discharge point from a WWTP, (ii) downstream and upstream of the receiving river Water quality monitoring plan is presented in tabular form below.

Monitoring location	Responsibility		Monitoring parameters	Frequency
	execution	Supervision		
Treated effluent at the discharge point from a WWTP	NCWSC WWTP operator	NCWSC WWTP operator	Temperature, COD, BOD5, oils, suspended solids, N, P, pH, sulphates, inspect water quality analysis reports	Initial stage: first month-daily Later - routine monitoring 3 times per month
	NEMA - regular inspection	NEMA /WRMA		Quarterly
Water from a receiving water body (Nairobi River)	NCWSC WWTP operator	NCWSC WWTP operator	Temperature, dissolved oxygen, COD, BOD5, suspended solids, oils, N, P, pH, sulphates, chlorates, bacteria	Initial stage: first quarter – monthly; Later: - quarterly routine monitoring
	WRMA	WRMA		Quarterly
Effluent at the discharge points from local industries	NEMA/WRMA/NCWSC regular inspection	NEMA/WRMA/NCWSC	Temperature, COD, BOD5, oils, suspended solids, N, P, pH, sulphates, chlorates, Fe, Cu, Cr, Zn, Ni.	Quarterly

Monitoring is a duty of WWTP operator (NCWSC) and NEMA/WRMA and will be paid respectively from the WWTP's or NEMA/WRMA's budgets.

Impact monitoring: sewage sludge

The sewage sludge monitoring will be conducted by WWTP operator (NCWSC), with control sampling done by WRMA and NEMA. The sludge monitoring will be paid for from the WWTP's budget.

The purpose of this monitoring will be: (i) to enable the operator to control the operation of the wastewater treatment process, particularly with regard to sludge; (ii) to provide information concerning the composition of sludge and/or its toxicity in order to decide on how the sludge should be disposed off. Testing the quality/composition of sludge is a routine activity by WWTP operator.

Monitoring location	Responsibility		Monitoring parameters	Frequency
	execution	Supervision		
Sampling will be undertaken at WWTP	WWTP Operator	AWSB/NEMA	Depending on the type of disposal/reuse way for sludge, the chemical composition of the sludge	Initially: During first half a year monthly

			will be determined. For agricultural (land application including composting) the following measurements are to be undertaken: • Agronomic parameters : NH ₄ , P ₂ O ₅ , K ₂ O, CaO, MgO, As, B, Co, Fe, Mn, Mo, • Trace elements : Cd, Cr, Cr ⁶⁺ , Cu, Hg, Ni, Pb, Zn, • Organic components : PCB, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene.	sampling to build up a database concerning the chemical composition of sludge. Afterward: once a year.
	WWTP Operator	NEMA/ AWSB - regular inspection		<i>Ad-hoc</i> sampling when new industries are introduced which discharge their effluent to the municipal wastewater system

9. PUBLIC CONSULTATION

9.1 The broad objective of the Public Consultation Process was to provide the local population, statutory bodies, local organisations and interested parties with the opportunity to identify issues, concerns and opportunities regarding the proposed development. This allowed the ESIA team to explain to the public and others how the project might affect them, and receive feedback on particular concerns that they might have, in order that subsequent studies undertaken and actions could reflect those concerns.

9.2 In conforming to the environmental legislation, public consultations were held using interviews, questionnaire survey and consultative meetings to inform project affected people that the project is being undertaken, to record and understand any concerns, and to allow the project to be designed and the ESIA scoped so as to reduce any adverse impacts to an acceptable level; and – on completion of ESIA - to inform people of the outcome of the ESIA to communicate how issues/concerns have been addressed; and to record, and where necessary act upon any further issues/concerns.

10. RESETTLEMENT AND COMPENSATION

10.1 A resettlement action framework has been prepared based on African Development Bank guidelines, Kenyan law and procedures and precedents established in Kenya. The procedure incorporates objective assessment (pre-settlement and/or compensation investigation and analysis to determine the nature of each particular case), community-based decisions (consultation with affected person and communities, and post-disruption support (post-resettlement and/or compensation support to ensure that the actions taken). Post-resettlement and/or compensation support to ensure that the actions taken are sustainable is part of the procedure. Such actions will include social investment measures and ongoing monitoring and evaluation of the resettlement and/or compensation process.

10.2 Compensation will be paid as result of lost of crops/income-earning potential. This will be carried out in accordance with the established resettlement and damage compensation procedure and agreed formulae and price. Resettlement and compensation decisions are made in consultation with community representatives after taking into account the compensation requirements as identified. Cash compensation, replacement of lost property (including land, livestock and accommodation) and support such as crop starter packages and food support will be components of compensation packages. The success and effectiveness of the implementation of the compensation procedures will depend to a considerable degree on the effectiveness of the communication between the AWSB and project affected people.

11. CONCLUSION

11.1 The ESIA studies undertaken have provided a clear enough understanding of the impacts to support a positive decision on the project. Overall, the project will have significantly positive impacts on the environment of Nairobi. The project report has considered two options – the project and the No project option. The assessment has highlighted the potential negative and positive impacts of the proposed project. The benefits (environment, economic and social) accruing from implementing the project outweigh the negative impacts. The negative impacts are minor, short term and restricted to the construction phase and can easily be mitigated by the proposed measures. The positive impacts are long-term and have a multiplier effect on the three pillars of sustainable development: social, environment and economy. Successful implementation of the proposed project will increase access to sewerage /sanitation services thereby contributing positively to MDG goal 7 on environmental sustainability as well as Kenya's vision 2030. The project is highly recommended for implementation. The ESMP should form part of contract documents to compel the implementing stakeholders to follow it through.

12. **Documents Reviewed**

- (a) Pre-Investment Study report financed by UN-Habitat in 2007
- (b) Nairobi Sewerage Master plan Validation report November 2009
- (c) Sewerage and drainage Master plan of 1998
- (d) Informal Settlements Policy, Athi Water Services Board, 2007
- (e) Environment Management and coordination Act 1999
- (f) World Banks Operational Policy 4.01 Environmental Assessment
- (g) Water Act 2002
- (h) Environmental policy guidelines by AfDB

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ESIA SUMMARY ANNEX

RESETTLEMENT ACTION PLAN FOR COMPENSATION AND RELOCATION

Project Name : Nairobi River Rehabilitation and Restoration Program: Sewerage Improvement Project
Project Number : P-KE-EB0-003
Country : Government of Kenya

1.0 Introduction

1.1 The Nairobi River system: sewerage network improvement project involved construction of trunk (primary) sewer lines. According to the sewerage master plan of 1998 that has now been validated under this project, all these trunk sewers fall along the key rivers within Nairobi basin taking advantage of the slope line. The rivers originate in the western part of the city and drain eastwards. It is in the lower eastern part that the sewerage treatment plant has been constructed. Sewage therefore is collected from inhabited regions and conveyed by gravity to the sewage treatment plants. The sewers are designed to fall within the rivers riparian land. The riparian land is not meant for human settlement for safety reasons in case of river flooding. Over time, however, due to high population growth and slow rate of affordable housing development, some sections of these riparian lands have been settled by encroachers and illegal occupants/squatters. This is what forms the informal settlements.

2.0 Land tenure systems in Kenya

2.1 There are different types of land tenure systems in Kenya namely state or public, Customary, Freehold and Leasehold. It is important to note that the customary land tenure system that prevailed prior to the independence of Kenya is still valid. The latter however, is not applicable in the city where the project is to be implemented. The various laws of Kenya and other provisions of the constitution recognise the right to compensation for loss of land and assets. To be eligible for compensation one must have:

- Property right over a defined area through a title deed
- Right of use over a defined area and that the right is exercised accordingly and recognised as such. In Kenya, when compensation is to be made, the method of valuing assets is based on the principle of the “market value”.

2.2 The following relevant national laws, regulations and guidelines will inform any land acquisitions and compensations:

- (a) The Constitution of Kenya Section 70
- (b) The Land Acquisition Act Chapter 295
- (c) Physical Planning Act 1996 Cap 386
- (d) Physical Planners Registration Act 1996

3. Objective of the Resettlement Framework

The aim of the Resettlement framework is to outline the steps that will be followed in the event that a development project triggers and or results to a resettlement action.

Specific objectives include:

- 3.1 To raise the awareness of the project and its consequences among the public in general and those who will be directly affected by it in particular,
- 3.2 To estimate the costs necessary for resettlement/land acquisition where applicable,
- 3.3 To prepare a Resettlement Action Plan (RAP) that sets out strategies and schedules to mitigate adverse effects. The RAP sets the parameters and establishes entitlements for project affected people (PAP), the institutional framework, mechanisms for consultation and grievance resolution, the time schedule and budget, and proposed monitoring and evaluation system. The agreed entitlement package includes compensation and measures to restore the economic and social base of those affected. It takes into consideration the requirements of the Government of Kenya (GoK) and the African Development Bank (AfDB) on resettlement.

4. Project Affected Persons (PAPs)

4.1 Project Affected Persons (PAPs) are defined as those who stand to lose, as a consequence of the project, all or part of their physical and non-physical assets, including homes, communities, and productive land resources such as forests, range land, fishing areas, or important cultural sites, commercial properties, tenancy income earning opportunities, social and cultural networks and activities.

4.2 As stated under introduction above, this project involves construction of trunk sewers along River riparian. In well planned areas of the city, the riparian land is available and will not cause any serious challenges. The challenge is where encroachers/illegal occupants have settled. AWSB will tap into experience gained from ongoing water and sewerage programmes financed by AFD and the World Bank. Under the ongoing AFD and World Bank financed programs mainly in informal settlements, about 1100 households were within way leaves. AWSB has managed to lay water and sewerage pipelines in these densely populated areas by encroachers without any relocation. It is this experience that AWSB in partnership with other stakeholders including the encroachers hopes to embrace during this project.

4.3 The preliminary survey estimates the number of PAP households at 2930 households (see annex 2 of this report). The number of PAP is estimated at 14,930 persons. Compensation for crops along the sewer pipelines is **Ksh 2.5 million** while that for structures is estimated at **Ksh 92 million**. A provisional budget of **Ksh 125** has been provided to address RAP related concerns. Among the key lessons learnt from ongoing projects critical to successful project implementation are: (i) Awareness creation within project area, (ii) Re-routing the pipeline as far as practicable to avoid relocations of persons, (iii) Focussed discussions with groups affected by the project including implementing contractor's staff, (iv) Employ intensive human labour (youths) from affected groups and less motorised equipment

(trenching, pipe laying, back filling, landscaping etc), (v) Allowing enough time (at least 1 month) for landlords (encroachers) to clear their structures by themselves – they too know that they are encroachers, (vi) Educating the populace on benefit of the project to them and others, (vii) Integrating the project within local setting by involving the affected persons and incorporating their ideas, (viii) Acknowledge that you understand their challenges and see them as partners rather than enemies to development, (ix) Assuring that where compensation is to be made, it will be carried out before project implementation, (x) Using local leaders to call for meetings and recruit project affected people into jobs generated by the project, (xi) Spelling out wages for employees/casuals and modalities of payment from the onset during area meetings for transparency

5. Grievance Redress Mechanisms

5.1 Grievances can usually be redressed depending on the level and the scope of the consultations carried out within the impacted communities before and during the identification of the projects. Experience at AWSB has shown that the essential services (Water and sanitation) provided by the institution are Government sponsored hence attract little opposition from the public. Additionally, when Government has a project, it compensates before acquiring any way leaves. Riparian lands as well as road reserves are designated spaces for public utilities.

5.2 Dispute may arise if construction was to begin before compensation is finalised. For this reason, AWSB commits that any genuine payment will be made prior to project implementation and or land acquisition. In case of dispute, the use of established community structures will be explored as the first option for redress of grievances. If this mechanism fails to function, the affected people can under all circumstances resort to a legal process for the redress of their grievances. This process can however, be long and costly.

5.3 Any grievance regarding compensation will follow the procedure below:

- a) First the complainant will inform the other party in writing and copy to local Chief (administrator),
- b) Upon receiving the complaint, the same will be acknowledged within five days coping the letter to all concerned,
- c) AWSB will convene a meeting to discuss the case in point with local chief in attendance as observer,
- d) Should the matter fail to be addressed amicably among the parties, the same can be left to lawyers to seek redress in courts.

6. Monitoring Arrangements

6.1 Monitoring will be carried out by a committee comprising officials from the AWSB, NCWSC, MEMR, local Provincial Administration (under office of the president) and representatives of PAPs. Surveillance and Monitoring of the project implementation and auditing after execution will be systematic.

7. Compensation System

7.1 Compensation system is based upon the GoK laws, regulations/procedures and guidelines relating to land, structures and assets, crops and trees, income generating activities, and conflict resolution and grievances.

8. Implementation Arrangements

8.1 The Athi water services Board is the overall supervisor of the resettlement process. Implementation of any compensation will be executed through the same committee that will be conducting monitoring as stated in section 1.5 above. Technical assistance (TA) may be required to provide overall support to the team and ensure successful implementation of the ESMP.

9. Resettlement Budget

9.1 The component costs of compensation will be computed and will include the following: (i) Compensation for buildings, and (ii) Compensation for crops and trees.

This is estimated to be **Ksh 300 million**.

S/No	Component	Budget million (Ksh)
1	Capacity building and training	25
2	Compensation for way leaves	125
3	Public consultations/publications	10
4	Amenities for the communities (drainage/footpaths)	100
5	Technical assistance in implementing environmental safeguards	10
6	10% Contingency	27
	Overall Budget estimate	300