ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR BRIDGE CONSTRUCTION ACROSS RIVER CHIRIN, KANO RIVER IRRIGATION SCHEME(KRIS), UNDER THE TRANSFORMING IRRIGATION MANAGEMENT IN NIGERIA (TRIMING) PROJECT.

SEPTEMBER, 2022

ESMP DRAFT

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2022

Prepared

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EXECUTIVE SUMMARY

This Environmental and Social Management Plan (ESMP) was prepared for the bridge construction across Chirin seasonal stream at Kano River Irrigation scheme to enhance transportation of agricultural produce from the irrigation fields to the centres of demand all year round. The justification for the bridge is based on popular demand by farmers and equally in line with underlying core objective of TRIMING to enhance livelihood of farming communities within the schemes and ensure economic growth within the agricultural value chain.

The environmental and social impact of the project as a whole has been assessed in an approved Environmental and Social Impact Assessment (ESIA) by TRIMING and the World Bank in 2017, therefore, this ESMP has factored all identified impacts from that study and build on it. The identified impacts are largely local and mitigatable. Preconstruction baseline measurements of environmental media are strongly advised to establish the status of the environment before commencement of works and to establish the basis for environmental monitoring of the project in due course.

To achieve maximum compliance with environmental laws and tenets of this ESMP, a lump sum amount of EIGHTY- FOUR MILLION SEVEN HUNDRED THAUSAND NAIRA ONLY (**84,700,000**) is required to fully implement this ESMP to the later in all the bridge construction phases.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The World Bank is supporting the Government of Nigeria to accelerate the development of irrigation through improving efficiency of existing irrigation schemes, expanded areas under irrigation, and improving the safety of dams in selected basins. Doing so is fundamental to achieving the FGN's objective under the Agricultural Transformation Agenda (ATA) of producing additional 20 million metric tons of food by 2020, and builds the longer-term resilience of the agriculture sector to climate risks.

The TRIMING Project Development Objective is to improve access to irrigation and drainage services and to strengthen institutional arrangements for integrated water resources management and agricultural service delivery in selected large-scale public schemes in Northern Nigeria.

This objective will be achieved through the implementation of four components, the design of which responds to the reality that water infrastructure (dams and irrigation systems), the farmers who use the water and irrigation lands, and the input and output markets for agricultural services and products are all interrelated in a larger connected system of technical, economic and social relationships. Th project is composed of four major components which includes:

Component 1 -Water Resources Management and Dam Operations Improvement;

Component 2 - Irrigation Development and Management;

Component 3 - Enhancing Agricultural Productivity and Support to Value Chains Development; and

Component 4 - Institutional Development and Project Management.

In order to ensure the adequate management of environmental and social impacts for the proposed civil works activities of Bridge construction, this Environmental and Social Management Plan (ESMP) has been prepared for the specific Bridge construction interventions. The proposed bridge construction will link the farming communities of KRIS to market centres and thereby promoting sustainable livelihood.

1.2 Objectives of the ESMP are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- To identify measures that could optimize beneficial impacts;
- To create management structures that address the concerns and complaints of stakeholders with regards to the development;
- To establish a method of monitoring and auditing environmental management practices during all phases of development;
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental and Social Management;
- Detail specific actions deemed necessary to assist in mitigating the environmental, social, Occupational Health and Safety impact of the project;
- Propose mechanisms for monitoring compliance with the EMP and reporting thereon; and
- Specify time periods within which the measures contemplated in the final environmental management plan must be implemented, where appropriate.

1.3 Kano River Irrigation Scheme

The intervention works being undertaken include (i) rehabilitation of the earthen supply and main canals with lining to be considered as an option of ease of maintenance and provided it is economically viable; (ii) rehabilitation of irrigation canals, drainages as well as road infrastructures; and (iii) management/control of typha grass in the storage pond and all canals. The Client had prepared and disclosed Environmental and Social due diligence instruments for these aforementioned intervention works. Instruments prepared include Environmental and Social Impact Assessment (ESIA) and (ii) Resettlement Action Plan (RAP).

1.4 Justification for Project Intervention and Location

The proposed location of the bridge is at N 1286355 and E448898.062 with 479.327m above sea level. The bridge across the Chirin river at siphon 02 will link the irrigation project site to major roads outlets of Bunkure LGA and to major market centres in Kano region and beyond via the East Branch Canal (EBC). It is the major route connecting the scheme to Bunkure and a major artery of movement of agricultural produce to markets centres.

LEGEND
Project site: KRIS
Project: TRIMING

Proposed Site

Date: 11th August, 2022

1.5 Need for ESMP for the Proposed Intervention – Bridge Construction at Chirin

The construction of this bridge is within the subsisting Lot 1 contract for the rehabilitation of Kano River Irrigation Scheme hence based on the understanding that the ESIA for KRIS documented relevant information on the study area, the screening exercise recommends the preparation of an Environmental and Social Management Plan (ESMP) for the TRIMING Project intervention at River Chirin. There is the utmost need to prepare this ESMP to fully capture the environmental and social risks of the bridge construction with a view to putting in place mitigation measures to ameliorate the negative effects of construction and equally accentuate positive impacts for the betterment of project beneficiaries and sustainable development in general.

1.6 Description of Proposed Activities

The proposed bridge construction activities are basically site clearance, setting out, excavation, stockpiling of excavated materials to approved dumpsite, construction of the bridge as per design and operation.

Other Project activities and processes during the construction period will include the following:

- Construction / setting up of temporary site offices, site facilities such as workshops, equipment storage, and site accommodation. The set up will include sanitary facilities with septic or conservancy tanks of sufficient capacity.
- Mobilization of equipment, labour and materials to site. This includes the sourcing of suitable base materials such as gravel and laterite for the road base.
- Surveying and setting out of the proposed alignments of the bridge.
- Construction of any temporary access or ramps, to ensure undisturbed access to road users during construction.
- Vegetation clearance.
- Earthworks and surfacing of the approach roads.

- Transportation of construction materials (both raw and finished materials) and machinery to site.
- Construction of the bridge foundation into the river bed.
- Sourcing of materials from borrow pits
- Construction of bridge support and bridge deck
- Construction of the road surfacing on the bridge
- Construction of Abutments on either side
- Road signage
- Landscaping and rehabilitation of degraded areas including borrow pits and detours
- Re-vegetation
- Decommissioning of Project

1.7 Approaches for Preparing the ESMP

This ESMP was prepared in accordance with the Nigerian EIA Act CAP E12 LFN 2004 and the World Bank's OP. A multidisciplinary approach was employed for the study in order to holistically address all pertinent aspects of the proposed intervention works on the bio-physical, socio-economic and health conditions of the project areas. Consequently, a team of experienced scientists and environmental professionals was assembled to carry out the required environmental resource assessment, generation and analysis of baseline data, determination of potential impacts and recommendation of mitigation measures.

Specifically, the methodology adopted for carrying out the assignment include Inception meeting with TRIMING project office, Desktop research, Reconnaissance visits to site, Data gathering (biophysical and socioeconomic) and Stakeholders' engagement. Identification of impacts and mitigation measures and preparation of ESMP report. Detailed description of methods used for each activity is provided in the applicable sections.

1.7.1 Literature Review

Review of some relevant documents such as Nigeria's National Policy on Environment, EIA Act, World Bank safeguards standards and other relevant laws. Review of socio-economic baseline information obtained from available literature. Literature reviewed also include the ESIA for the project, RAP, ESMF amongst others.

1.7.2 Field Visits

Field visits was carried out to all the proposed site of the bridge construction in KRIS to gather baseline environmental data mainly on the Biophysical Environment and have visual impression of the proposed project site.

CHAPTER TWO

2.0 INSTITUTIONAL AND LEGAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

The ESMF, RPF, PMP and other safeguards instruments prepared for the TRIMING Project already highlight all specific relevant policies, legal and regulatory frameworks including the administrative structures for management and implementation of the TRIMING Project. Hence under this section, reference is made to the disclosed Environmental and Social Impact Assessment (ESIA) report for the Kano River Irrigation Scheme for detailed information on the Institutional and Legal framework for Environmental Management. However, as a summary, the key legal and regulatory framework guiding water resources management, agriculture and rural development in Nigeria among others include; National Water Policy (2004), National Irrigation and Drainage Policy and Strategy (2015), Nigeria Agricultural Policy (2001), and Agricultural Promotion Policy (2016); while the Federal Environmental Laws, Regulations and Guidelines are applied to ensure international best practices in rural roads development with due considerations on the safety and health of the environment.

2.1 Legal and Regulatory Frameworks

Federal Ministry of Environment Regulations and Guidelines

The following are the applicable regulations, guidelines and standards of the FMEnv that affect dam operations and irrigation development activities; and specifically, the TRIMING Project.

- National Environmental (Noise Standards and Control) Regulations, (2009)
- National Environmental (Ozone Layer Protection) Regulations, (2009)
- National Environmental (Sanitation and Wastes Control) Regulations, (2009)
- National Environmental (Soil Erosion and Flood Control) regulations (2011)
- National Environmental (Surface water and Groundwater Quality Control) Regulations (2011)

- National guidelines for EIA Act 86 of 1992: Sectoral Guideline for Infrastructure development
- National Policy on the Environment, (2016)

2.2 Water and Agricultural Sector Regulations and Guidelines Targeted at Dam Operations, Irrigation Development and Agricultural Production and Value Chains Viability

Some important Regulations of the water resources and agricultural sectors relevant to the TRIMING Project are highlighted in Table 1 as captured in the project's approved ESIA.

Table 2.1: Water and Agricultural Sector Regulations

S/N	Policy/Regulation/Guidelines	Summary
	National Water Policy (2004)	
	National Irrigation and Drainage Policy and Strategy (2015)	
	Nigeria's Agricultural Policy (2001) Updated	
	Agricultural Promotion Policy (2016-2020)	
	State Agricultural Policy (1999)	
	National Agricultural Land Development Authority (NALDA) Act (2016)	
	Nigerian Agricultural Insurance Corporation (NAIC) Act (Decree No.37 of 1993)	
	The Agricultural Credit Guarantee Scheme Fund Act (Decree No. 20 of 1977)	

1.9 TRIMING Project PMU

The TRIMNG PMU manages the project operations of the TRIMING Project in-country, and reports to the Permanent Secretary of FMWR. The PMU is responsible for coordination and management of the project, including oversight of all technical, fiduciary, and administrative matters. With regards environmental and social safeguards compliance and reporting; the PMU has an Environmental Safeguards Specialist (ESS) and Social Safeguards Specialist (SSS). Additionally, for the management, advisory, supervision and reporting of safeguard issues at the scheme-level, the PMU has trained and assigned E&S Desk Officers (ESDOs) respectively, to each participating irrigation scheme. Figure 1 below is a representation of the structure of the TRIMING PMU.

CHAPTER THREE

3.0 SOCIO-ECONOMIC AND BIO PHYISICAL ENVIRONMENT

Bunkure LGA, where the proposed is to be located is situated between Latitudes 11º 34` 02``N to 11º 46` 05``N of the Equator and between Longitudes 8º 26` 36``E to 8º 46` 43``E of the Prime Meridian. The study area comprises of fifteen wards (15) with an aerial extent of 9911.22 Km^2 and is bordered by Dawakin kudu and Kura LGAs to the North, Wudil and Garko LGA to the East while Kibiya to the South Western part of the study area (Baffa, 2012).

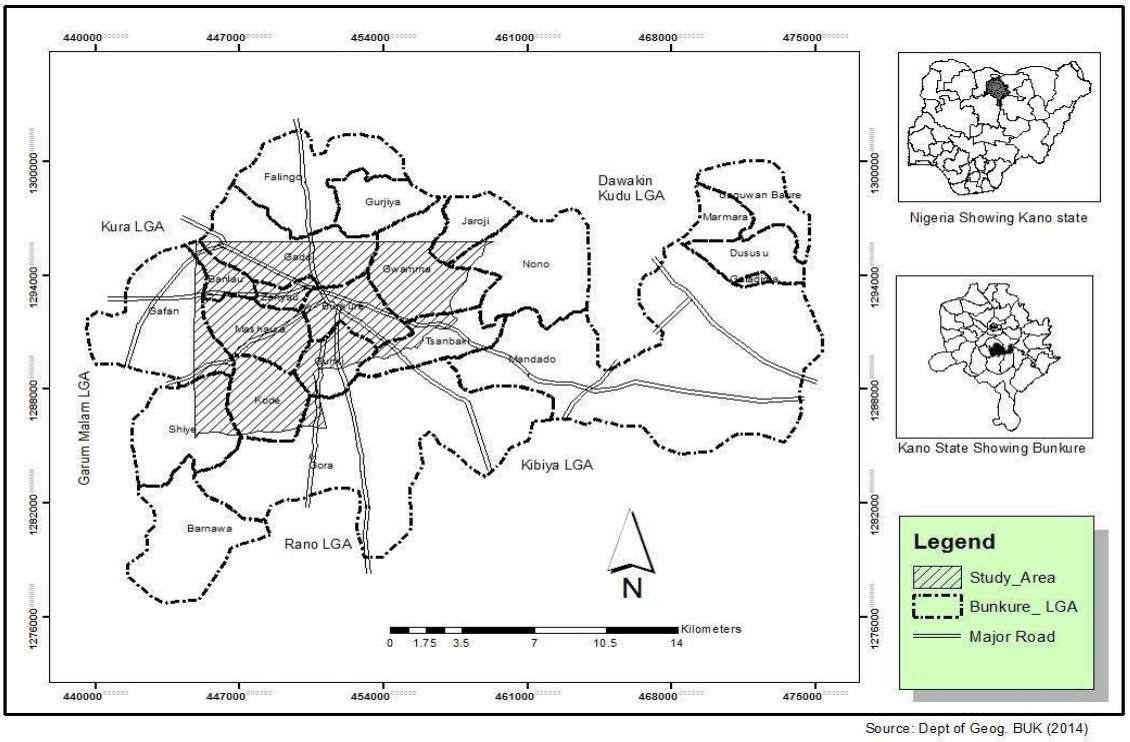
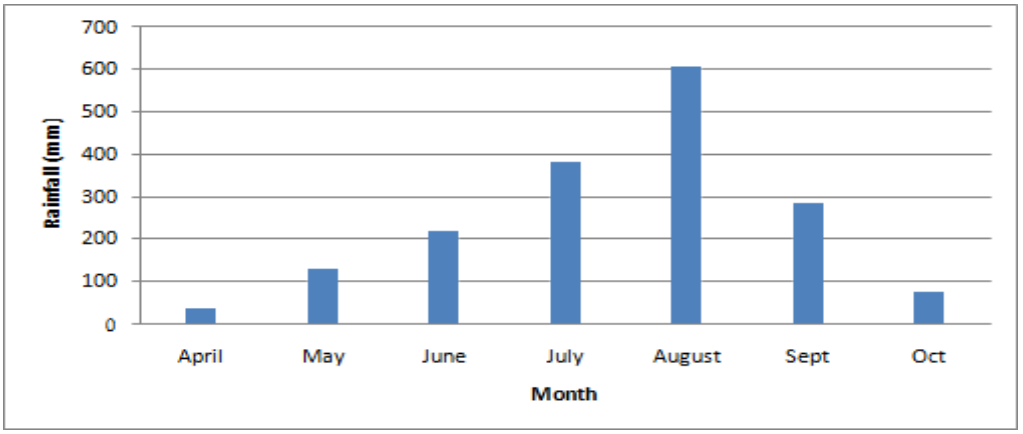


Fig 1: Map showing Bunkure LGA

3.1 Climate

Kano Region experiences four distinct seasons, *Rani, Damina, Kaka* and *Bazara* closely associated with the movement of the Intercontinental convergence zone (ITZ). The mean annual Rainfall is about 884mm varying greatly from the northern and southern parts of the Region.



Source: Adopted from Usman (2014)

Table 3.1: Monthly Rainfall Data of Kano (mm) 1985-2014

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1985	0	0	21.5	0	27.4	164.6	169.8	162.2	110.1	0	0	0
1986	0	0	0	2.1	9.8	136.6	259.2	175.2	105.8	4.2	0	0
1987	0	0	0	82.2	68.9	164.5	110.1	65.5	14.8	0	0	0
1988	0	8.1	0	32.8	16	149.2	213.6	488.5	154.1	0	0	0
1989	0	0	0	0	10.4	36	142.4	382.1	84	45.3	0	0
1990	0	0	0	0	40.1	54.8	233.1	142.4	89.2	0	0	0
1991	0	0	1.7	63	120	148.6	70	455.1	20	0	0	0
1992	0	0	0	37.4	122	45.1	191.4	324.8	205.5	0	0.7	0
1993	0	0	0	0	48.2	288.1	157.9	406.9	94.4	0.6	0	0
1994	0	0	0	17.2	6.5	101.6	149.1	325.2	156.5	35.8	0	0
1995	0	0	0	7.4	25.9	155	189.4	145	173.5	3.5	0	0
1996	0	0	0	0	37.2	143.1	253.8	417.6	235.5	47	0	0

1997	0	0	0	30.9	101	161.9	253.9	451.9	251.2	40	0	0
1998	0	0	0	14.1	69.6	173	573	571.8	444.1	26.4	0	0
1999	0	0	0	0	44.5	88.8	533.5	466.9	240.3	17.7	0	0
2000	0	0	0	0	98.3	135.7	364.2	332.4	174.4	34	0	0
2001	0	0	0	41.1	186	231.1	604.7	521.1	205.6	0	0	0
2002	0	0	2.8	1	124	274.9	376.6	199.9	54.1	0	0	0
2003	0	0	0	10	66.8	247.2	394.5	464.8	232.6	13	0	0
2004	0	0	0	176	190	406.7	277.7	229.4	0	0	0	0
2005	0	0	0	1.9	120	188.1	383.6	442.9	200.4	39.7	0	0
2006	0	0	0	0	150	114.9	374	334.4	336	0	0	0
2007	0	0	0	42.1	91.0	329.3	188.5	410.0	37.5	0	0	0
2008	0	0	0	0	11.0	171.7	421.7	276.8	146.6	8.1	0	0
2009	0	0	0	0	25.1	84.8	376.0	321.3	182.7	2.2	0	0
2010	0	0	0	65.7	43.6	121.0	266.1	291.5	252.4	57.4	0	0
2011	0	0	0	12.5	114.3	188.6	256.7	378.9	226.4	43.2	0	0
2012	0	0	0	0	71.9	436.4	466.4	646.9	123.5	19.6	0	0
2013	0	0	0	14.8	40.0	77.6	157.3	440.1	178.1	10.3	0	0
2014	0	0	0	23.5	87.5	88.9	469.4	509.6	192.7	24.4	0	0

Source: MINET,2019, MAKIA, Kano.

3.2 Topography

The Kano plain consists of the following morphologica1 units: an upland plain, two river terraces and wide channel beds, all sloping at angles less than 2 degrees. Others are inter-unit scarps sloping at angles steeper than 60 degrees and isolated residual hills ranging in height from 10m to 50m above the plains (Olofin, 2013).

3.4 Geology

Rocks of the basement complex underline over 70% of the Kano environment. The rock types in the area are older granites, met a sediments and older basement. The older basement is composed of migmatite, biotite gnciss, and blanded gneiss. Migmalite is composite gneiss produced by injection of granite magma in to schist host.

3.5 Soil

Latosols are the dominant soils in the wind drift of Kano state. They are well-drained and brownish to reddish in colour. They are also deep except where iron pans are exposed or occur near the surface (Olofin, 1987). Hydromorphic soils tend to occur throughout the state where annual flooding occurs (*fadama*). These hydromorphic soils are dark greyish in colour and have a high content of clay. On poorly drained sites one finds hydromorphic soils. These are in concave slope segments; the mineral soils exhibit no profile development. They are vertisol soils, which show deep and wide cracks in the dry season due to high content of clay (more than 30%) (Ahmed, 2006).

3.6 Vegetation

The climatically defined vegetation types in Kano region are the northern Guinea savanna and Sudan savanna. Northern Guinea Savanna is an open woodland or bush land with grasses shorter than in the southern guinea where grasses are 1.5 to 3m tall. The Sudan Savanna has scattered trees in open grassland with grasses under 1.2 m tall (Ahmed, 2006).

3.7 Population

The result of the 1991 census put the population of Kano at 5,725,116 and the results of the 2006 census further substantiated the earlier results whose tradition is to put Kano on

top. The recent (2006) census results put the population of Kano state at 9,383,682. The population of Bunkure LGA shows that in 2006 was 174,467 (NPC, 2006) and projected in 2019 to be 243,573. The population projection was done using compound interest method with a rate of 2.6(NPC National Growth rate).

CHAPTER FOUR

4.0 ASSESSMENT OF POTENTIAL IMPACTS AND ENVIRONMENTAL & SOCIAL MANAGEMET PLAN

4.1 Introduction

This chapter summarizes the likely potential impacts during the construction and operation of the intervention works due to the interaction between the project components, humans and the environment, and also provides specific brief description of Environmental and Social Management Plan for the bridge construction at chirin river, institutional arrangement and costs of implementing the ESMP, Capacity Building, Monitoring and Evaluation of Public Consultation Plan. The ESMP is to be implemented throughout the project life-cycle of the bridge construction.

4.2 Identified Potential Environmental and Social Impacts of the Proposed Project

The projects across the corridors are to exert minimal and reversible impacts on the social and physical environment. No major potential environmental impacts are expected. The potential negative impacts identified are:

- Air quality deterioration due to dust emission from cement, and haulage of materials to sites
- Increased noise level on surrounding environment.
- Degradation of soil landscape.
- Waste generation at sites.
- Disruption of vehicle and pedestrian traffic.
- Occupational Health Safety.

The risk of the impacts occurring was analyzed by determining the consequence severity of the impacts and the likelihood of consequences occurring. However, these impacts are short-term. The potential positive and negative impacts from the proposed projects are summarized in Tables 4.1 and 4.2 respectively.

Table 4.1: Potential Positive Impacts of The Project

ENVIRONMENTAL IMPACTS	SOCIAL IMPACTS
• Reclamation of eroding lands especially in chirin river at siphon 2, Kano River irrigation scheme, Bunkure LGA, Kano state- Nigeria. • Construction of the bridge at siphon 2 will entail stabilizing the gradually eroding portions of the sites. • Improved infrastructures specifically for water conveyance hence promoting sustainable useof water resources. • Improved traffic flow • Less travel time to farms • Post construction erosion control on embarkment will reduce erosion tendencies.	• Increase in employment opportunities. • Improved commercial activities. • Improved movement of agricultural produce from the fields to the points of demand. • Increased Gross Domestic Product and improved economy. • Developed and strengthened Institutions required to support sustainability of intervention project. • Improved infrastructures specifically for water conveyance; movement of people and goods. • Reduced poverty rate and increased shared prosperity. • Improved livelihood. • Increased access to markets by farmers

Table 4.2: Potential Negative Impacts of The Project

ENVIRONMENTAL IMPACTS	SOCIAL IMPACTS
• ***Air Quality*** Fugitive dusts, machinery exhaust fumes [nitrogen oxides (NO_X), carbon monoxide (CO), sulphur oxides (SOx), hydrocarbons and suspended particulates], and dusts from rehabilitation / construction activities. Exposure of residents living close to the poultry and fishery facilities to odour especially if the poultry dunks and fishery wastewater are not properly managed during operation phase. • ***Soil*** Leakages may occur from stacked equipment containing oil such as engine oil or fuel. This could result in the seeping-through of toxic fluid into the soil, thereby leading to possible contamination of soil. Change in soil morphology may occur due to influx and stationary positioning of heavy-duty equipment and vehicles. Loss in soil nutrients due to continued planting without leaving the soil to be fallow to regain adequate nutrient before next planting season. Heavy equipment vibrations may cause denudation which could subsequently lead to soil erosion. Displacement of soil important micro-organisms due to continues excavation of soil. • ***Noise and vibration*** Noise pollution as a result of movement of construction equipment in and out of the project sites. Cracks on buildings as a result of vibrations from construction equipment which may lead to subsequent collapse of such structure. Vibrations resulting from construction equipment may cause further soil destabilization and consequent erosion. • *Water Quality* Surface runoffs and effluents may cause turbidity, changes in water colour and in pH levels. Flood draining activities may introduce chemicals into water bodies leading to possible changes in water colour and pH levels, pollution and eutrophication in surface water.	• *Livelihood / Community Activities / Social Stress* Possible disruptions of movement of residents within the project area to places of work, and businesses, as a result of movement of equipment and materials along access roads. Destruction of farmlands within the project corridor. Possibility of grievances resulting from loss of livelihood Disruption of communal activities such as meetings, celebrations etc • *Risks associated with Labour Influx* Increased risk of illicit behaviour and crime (including prostitution, theft and substance abuse). Possibility of sexual exploitation and abuse and other forms of GBV during construction activities as a result of large influx of foreign labours. Possibility of child labour during construction works. • *Conflict* Conflict may arise between community members and contractor, especially when members of the community are not hired/employed at the construction site. Conflict between hawkers that will be selling within the project camp. Herdsmen encroaching farms which may lead to clashes between locals and the herdsmen. • *Community infrastructure* Pressure on community infrastructure such as transportation, restaurant etc if adequate provisions are not made for

Leakages may occur from stacked equipment containing oil such as engine oil or fuel. This could result in the seeping-through of toxic fluid into surface water and ground water. Increased demand on water resources. • *Waste* Generation of solid wastes from construction activities - soil excavated debris, metal scraps, plastics, wood, waste concrete, papers and cartons, etc. Generation of liquid waste – concrete washings, sewage, wastewater from site offices. At operational phase, indiscriminate dumping of waste may lead to blocking of drainages and channels. • *Flora and Fauna* Loss of flora and fauna during mobilization of equipment, construction activities such as grading, filling, excavation, etc. Vegetation clearing for location of campsite leading to loss of fauna andflora. • ***Community Health and Safety*** ✓ Accidents involving vehicles or pedestrians may occur during vehicle and equipment movement. ✓ Increased health risk such as respiratory infections and diseases (silicosis, asthma, bronchitis, etc) due to dust and fume emissions. ✓ Possible spread of water borne diseases (e.g. Cholera, Dysentery, Amoebiasis, Salmonellosis etc.) if contamination of ground and surface water occur. ✓ Increase in HIV transmission. ✓ Increased accidents due to unlit automobiles or bicycles ramming into stationary equipment in the night. • ***Occupational Health and Safety*** ✓ Occurrence of accidents and injury of workers at constructions sites. ✓ Exposure of workers to hazardous substances and unsafe working conditions ✓ Unsafe condition and unsafe acts by workers	workers. Possible of local inflation for goods and services.

Table 4.3: Environmental and Social Management Plan							
Component	**Sub-component**	**Activities**	**Potential Impact**	**Mitigation/ Enhancement Measures**	**Monitoring Indicators**	**Monitoring Frequency**	**Responsibility**
PRE-C0NSTRUCTION							
Environment	**Air**	Mobilization of personnel, equipment and materials to bridge construction site at chirin siphon 2.	Increase in amounts of fugitive dusts and exhaust fumes from movement of heavy-duty vehicles and equipment into work areas.	Sprinkling of water via spraying devices to limit dust. Cover trucks for transporting loose materials that may generate dust.	Ensure air quality parameters are within permissible limits.	Daily especially if the bridge construction is done during the dry season	**Mitigation:** Contractors **Monitoring:** NESREA (state), SME, PMU, HJRBDA, Contractors, Scheme officers, and supervision consultant.
				Ensure vehicles are serviced periodically; undergo Vehicle Emission Testing (VET) and Vehicle Exhaust Screening (VES) as laid down in the NESREA guidelines.	Ensure vehicles are serviced periodically; undergo Vehicle Emission Testing (VET) and Vehicle Exhaust Screening (VES) as laid down in the NESREA guidelines	Bi-monthly	
	Soil	Mobilization of workers,	Soil compaction due to movement	Limit zone of vehicle and	Visible demarcation of	Weekly	**Mitigation:** Contractors,

		equipment and other materials to site	of vehicles into the construction and stacking of heavy-duty equipment.	equipment weight impacts (designate an area for parking and stacking equipment). Avoid unnecessary moving of vehicles.	vehicles and equipment limit zone.		supervision consultant. Scheme level safeguards
			Leakages from stacked equipment containing oil, leading to soil contamination.	Ensure proper maintenance of all equipment and check for leakages.	Vehicle maintenance records.		
	Vegetation	Clearing of vegetation along bridge alignment; site- (45m length) and camp location including trees	Displacement of soil fauna and damage to flora Predisposing of soils to erosion	Implement the Mitigation hierarchy with Refusing to generate waste as the most preferred option. Other options are recycling, reuse, recover and dispose	Adherence to the Mitigation hierarchy	Monthly	**Mitigation: Contractors**, REMASAB/ BLG Waste Management Contractor, Consultant, **Monitoring:** PMU, Scheme officers
	Vegetation		Waste generation from accumulation of cleared	Implement the Waste Management Plan and liaise	The Waste Management Plan is being implemented.		

			vegetation and construction debris.	with REMASAB on proper waste management procedure.	Recycling of construction waste where possible.		
	Waste	Installation of temporary construction camps and on-site facilities	Generation of construction wastes	Liaise with REMASAB/BLG on proper waste management procedure and acquire approved dumping site/registered third party	Implementation of waste management systems	Daily	**Mitigation: Contractors**, Waste Management Contractor, Scheme officers
Social	**Traffic**	Mobilization of personnel, equipment and materials	Traffic congestion/travel delay along Bunkure- Chirin-shiye feeder road.	Diversion of motorist/pedestrian traffic	Lane configuration changes are being made where applicable	Daily	**Mitigation:** Contractors, FRSC (Federal Road Safety Corps) **Monitoring:** FRSC
	Noise	Mobilization of personnel, equipment and materials and Chirin bridge construction site.	Nuisance to nearby farmers and passers-by	Retrofit with suitable cost-effective vehicle sound mufflers	Retrofitting with vehicle sound proof material is being performed	Daily	**Mitigation: Contractors**, Project Office, WUA
	Air	Mobilization of personnel,	Exposure fugitive dusts	Provision of facemasks to farmers,	Provision of face masks and appropriate PPEs	Weekly	**Mitigation:** PMU, Public Health depts. of BLG

		equipment and materials	and exhausts fumes	passers-by, skilled and unskilled personnel.	are being provided		
				Restrict access of non-project personnel to work areas where dusts and emissions exist/persist from project works	Restriction barrier are being installed		
Social	**Diseases**	Influx of workers	There is likelihood on increased spread of STI and STD since there will be influx of workers into the schemes.	Awareness creation on expected behavior for the workers. Use of condom awareness to workers	Compliance	Weekly	Mitigation: Contractor, Monitoring: PMU, Scheme officers,
	Vegetation	Clearing of vegetation along road alignment.	Employment of labour.	Notify interested community members first through the LGA on the specific jobs and skills required for the activity prior to	Evidence that the LGA Council is duly notified	Employ the "*Just in time"* approach	**Mitigation:** Contractor, Specialized Contractors, LGA, PMU **Monitoring:** PMU

				civil works commencement			
	Others	Mobilization of workers, equipment and other materials into bridge construction site and work areas	Disruption of vehicle and pedestrian access to surrounding farmlands and part of the roads where construction work is to occur		Ensure adequate and timely sensitization program is being conducted; and Lane configuration changes have been made via road diversion	Monthly	Contractor, PMU (Communications unit), Contractor CLO
			Destruction of properties (public/private) during vehicle and equipment movement.	Training and sensitization of personnel (drivers) in road safety and traffic regulations; Ensure class "H" accreditation for heavy-duty vehicle drivers, and ensure status screening for drivers.	Evidence of training in road safety and traffic regulations; Evidence of class "H" accreditation and mental screening for drivers	Monthly	PMU, Independent Consultant, Contractors
Occupational Health and Safety	**Air**	Mobilization of workers, equipment and other	Respiratory disease risks from exposure to exhaust fumes of	Institute workers respiratory protection	Institution of WRPP	Weekly	**Mitigation:** Independent OHS Consultant, Contractors

		materials into site	equipment and vehicles	program (WRPP)			**Monitoring: Supervision Consultant**
	Accidents/ Personnel Safety	Mobilization of workers, equipment and other materials	Accidents involving pedestrians	Education and training of PAPs about the project and accident occurrence	Education and training is to be conducted	One-off	**Mitigation:** Independent OSH Consultant, Contractors, **Monitoring:** PMU,
				Contractor(s) education and training on pedestrian safety	Training has been conducted	One-off	
				Install safety signage	Safety signage has been installed	Weekly	
			Collapse of heavy equipment etc. being conveyed to rehabilitation work areas	Conduct haulage safety training	Ensure training is conducted	One-off	
				Enhanced fastening of equipment to carriage section of vehicles	Contractor(s) compliance	Weekly	
			Attack from dangerous animals during de-vegetation activities	Conduct safety and first aid training	Training has been conducted	One-off	
	Safety	Installation of temporary	Risk of exposure to occupational	Ensure safety measures are	Safety measures in place	All through the installation process	**Mitigation:** Contractor

		construction camps and on-site facilities	health and safety hazards, viz: Risk of occupational accidents and injuries e.g., falls, trips,	employed in all processes			**Monitoring:** PMU
CONSTRUCTION PHASE							
Construction Site Management	**Environment**	Haulage of laterite from borrow pit to bridge construction site	Accident	• Observe speed limit • Train drivers • Reduce fatigue • Reduce number of trips through innovative ideas • Maintenance of vehicles • Proper covering of laterite	Contractors' compliance	Daily	**Mitigation:** Contractors, Road safety **Monitoring:** PMU, Supervision Consultant.
			Air pollution	• Use of serviceable vehicles • Fit pollution	Contractors' compliance	Daily	**Mitigation:** Contractors, Road safety

				reduction devices. • Appropriate driving techniques • Switch off idea vehicles when not in use.			**Monitoring: REMASAB,** SME, PMU
		Operation of machinery utilized during construction phase	GHG Emissions	**Energy efficiency:** Reduce carbon footprint of machinery by switching them off when not in use **Multiple vehicle trip reduction:** as means of reducing carbon emission. Utilize vehicles, plants, and equipment's which are in good working condition, generally less	Compliance to proffered mitigation measures. Revegetation/replanting/landscaping to regain carbon capture capabilities of the area	Weekly	**Mitigation:** Contractors, **Monitoring:** REMASAB, SME, PMU,

				than three (3) years old			
		Borrowing operation	• Loss of aesthetic • Creation of Gully erosion • Breeding grounds for mosquitoes and habitat for dangerous reptiles/animals • Creation of 'death traps'	Develop borrow pit management and restoration plan: Available Strategies- Rehabilitation, reclamation, restoration, abandonment.	Contractors Compliance	Daily	**Mitigation:** Contractors, **Monitoring:** REMASAB, SME, PMU,
		Bridge construction activities	Contamination of surface water (discharge of sediment laden run-off into drainages, waterways etc.)	Disposal of sediment-laden run-off into surface water should be strongly discouraged and prevented. Implement site-specific waste management plans	Contractor Compliance	Weekly	**Mitigation;** Contractor **Monitoring: Supervision consultant**, and Contractors
		All bridge construction activities – foundation excavations,	Increase in punitive dust	Develop Contractors Site Specific Environmental and Social	Contractor Compliance	Daily	**Mitigation:** Contractors **Monitoring: REMASAB**, PMU, Contractors

		abutment, beams and columns. Both in-situ and pre-cast.		Management Plan (CESMP)			
		Defecation into drainages, water channels, surface waters etc.	Increase in pathogenic water coliform bacteria	Provide sanitary mobile toilets; around project work areas as a means of temporary support during construction works and at strategic locations along Chirin seasonal stream	Contractor Compliance	One-off	**Mitigation:** Contractor **Monitoring: REMASAB**, SME, PMU
		All bridge construction activities	Significant/insignificant increase in air quality parameters, e.g. VOCs, H_2S, NO_X, etc.	Ensure the monitoring of these parameters. may explore the use of Specialized air quality experts to monitor these impacts.	Air quality Monitoring certificates	Quarterly during civil works and during operation phase biannually	**Mitigation:** Contractor TRIMING PMU **Monitoring:** SME
	Livelihood	All road construction activities	Felling of trees	Implement the Mitigation hierarchy	Adherence to the Mitigation hierarchy	Daily	**Mitigation:** Contractors

							Monitoring: JISEPA, Contractors
Construction Waste Management	**Environment**	Bridge construction	Increase in waste material at site office	Appropriate waste management at source and implementation of the waste management plan	Contractors' compliance	Daily	Contractors, Supervisory contractor, SME, PMU
		Haulage of Laterite	Increase in waste generation	Implement the waste management plan	Contractors' compliance	Daily	**Mitigation:** Contractor **Monitoring:** REMASAB, SME
		Activities at the borrow site.	Increase in waste generation	Implement the waste management plan	Contractors' compliance	Daily	**Mitigation:** Contractor **Monitoring: Safeguards**, SME
		Generation of sewage overtime (from use of temporary mobile toilets by personnel involved in civil works)	Pollution of surface water	Liaise with REMASAB for collection and treatment of waste.	PMU, Contractor Compliances	Monthly	**Mitigation:** Contractor
Socio-economic	**Livelihood**	All construction and non-	Job creation	Adherence to Federal Government Circular on	Contractors' compliance	One-off	PMU, Supervisory contractor

		construction activities		employment ratio between unskilled and killed			
		Land acquisition for borrow operation	Litigation and communal conflict	Document land acquisition proceeding. Expropriation budget should be provided in the BOQ for Borrow pit acquisition Prepare a borrow pit management plan	PMU, Contractor	Daily	**Monitoring: REMASAB**, SME, PMU, Ministry for Mines and steel. Supervision consultant
	Sexual exploitation /Gender Based Violence	All construction and non-construction activities	Endangering the lives of women	Prepare Contractors Code of Conduct for labor (site workers) and management staff	Contractors' compliance.	Daily	PMU, Supervisory contractor
	Labour influx	All construction and non-construction activities	• Crowding out of local consumer • Increase in crime	Source labor locally as much as possible. Implement local content policy	Contractors' compliance – labor influx plan	Daily	PMU, Supervisory contractor.

			• Increase in STI/STDs and other communicable diseases • Possible child labour • Increase demand on existing local infrastructure • Food vendors.				
OHS	**Environment**	Bridge Construction works	Safety of workers during construction works	Implementation of the OSH Plan	Contractors' compliance	Daily	**Mitigation:** Contractor **Monitoring:** PMU

Source: Adopted and modified from TRIMING ESIA, 2017.

NOTE: Operational Phase

No significant negative environmental or social impacts are anticipated during the operation phase. During the operational period, the project is expected to result a positive socio-economic outcome for the local communities. Socially harmful consequences of the bridge operation are not anticipated. However, the continued operation of a GRM for one year following opening of the bridge for use will ensure that local community members have an accessible, fair and transparent means of reporting any emerging adverse impacts, and a means of obtaining mitigation.

4.3 Analysis of Project

In this report, alternatives are analyzed to evaluate the character, magnitude and time within which alterations are caused over each one of the environmental elements, considering the implementation of the ESMP for the proposed projects. Though, there are number of options, but the options considered here is Go ahead option.

4.3.1 Project Alternatives

Project alternatives options were explored. The first option was "No Project Option' and this turned out not to be best as the farming community within and around the scheme had great need for the bridge. More so, constructing the bridge would further complement the project development objectives TRIMING of promoting and enhancing livelihood of farmers. The next option explored was the "Project Delay option' and this turned not to tenable as the right for the bridge construction is now so as to take advantage of the ongoing TRIMING project which is time specific and delaying the project may amount to not using the opportunities presented by the project. Other options explored was the likelihood of changing the bridge location entirely and this would not make any economic sense as the road linking markets centers and the fields in the one in question and constructing the bridge will bring about huge economic development within the agricultural value chain. Therefore, in view of the preceding analysis, the 'Go ahead Option" was adopted.

4.3.2 Go Ahead Option

This means going ahead with project based on the professional advice and the cleared EIA/RAP/CESMPs and other relevant safeguards instruments and best practices relating to the execution of the projects. This will definitely aid in transporting agricultural produce from the irrigation schemes to markets centers and equally boast local economy and enhance livelihood of farmers. More so, it will bring about reduction in flooding of the project communities and loss of lives through drowning of human and animal occasioned by bad floods in the area. This option is therefore considered as the most viable and recommended

for implementation.

4. 5 Environmental Monitoring Plan

To effectively and efficiently implement this ESMP, Environmental Monitoring and Auditing has been incorporated into the overall management plan. This shall help to:

- Report safeguards issues and impacts on the proposed mitigation measures implementation and compliance.
- Enhance and improve environmental and social management practices, and
- Check and establish the efficiency, quality and reliability of the ESMP for the proposed projects. Monitoring data shall be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken.

A monitoring program will be implemented for the duration of the construction phase of the project. This program will include:

• Monthly environmental inspections to confirm compliance with the EMP and EIA License conditions. These inspections can be conducted randomly and do not require prior arrangement with the project manager;

• Compilation of an inspection report complete with corrective actions for implementation;

Table 4.4: Environmental Monitoring plan

Project Phases	Environmental Aspects	Indicators	Data source/ Monitoring Location	Monitoring Frequency		Responsibility	Supervising Consultant
				Construction	DLP: Operation		
Pre-construction stage	**Air Quality**	Particulates; Noise; Cl_2; CO; SO_2; H_2S; FL; NH_3; HCN; NO_2 etc	Downstream and midstream and upstream of the bridge within 200m from the site.	Monthly	No need	Contractor/Third party	EHS Team, Consultant.
	Water Quality	pH, Temperature; Conductivity; Turbidity; TSS; BOD, COD, Oil and Grease; Total Coliform; Nitrate; Lead; Chromium; Cadmium; Phenol; Total Hydro Carbon. etc	Downstream and midstream and upstream of the bridge within 200m from the site.	2 weeks, at 100m intervals (twice monthly)	No need	Contractor/third party	EHS Team, Consultant.
	Soil quality	Ph, Oil and Grease, Total Hydrocarbon Content, Lead, Etc	Downstream and midstream and upstream of the bridge within 200m from the site	2 weeks, at 100m intervals (twice monthly)	No need	Contractor/third party	EHS Team, Consultant
Construction stage	**Air Quality**	Particulates; Noise; Cl_2; CO; SO_2; H_2S; FL; NH_3; HCN; NO_2	Downstream and midstream and upstream of the bridge	Monthly	Quarterly.	Contractor/Third party	EHS Team, Consultant.

			within 200m from the site.				
	Water Quality	pH, Temperature; Conductivity; Turbidity; TSS; BOD, COD, Oil and Grease; Total Coliform; Nitrate; Lead; Chromium; Cadmium; Phenol; Total Hydro Carbon. etc	Downstream and midstream and upstream of the bridge within 200m from the site.	2 weeks, at 100m intervals (twice monthly)	Quarterly.	Contractor/third party	EHS Team, Consultant.
	Soil quality	Ph, Oil and Grease, Total Hydrocarbon Content, Lead, Etc	Downstream and midstream and upstream of the bridge within 200m from the site	2 weeks, at 100m intervals (twice monthly)		Contractor/third party	
	OHS monitoring	Worker's health surveillance	Surveillance record/health records/accident records	Bi-monthly	-	Contractor clinic.	Supervision consultant ESHS Team
	Loss of Habitat/ vegetation	- Alternative habitats/vegetation	Onsite/ off site	Monthly	Annually	Contractor	EHS Team, Consultant.

KEY

BOD = Bio-oxygen Demand

Cl_2 = Chlorine

COD = Chemical Oxygen Demand

CO_2 = Carbon dioxide

P^H = alkalinity or acidity

SO_2 = Sulfur dioxide

NO_2 = Nitrogen Dioxide

TSS =Total Suspended Solid HCN = Hydrogen cyanide

H_2S = Hydrogen Sulphide. NH_3 = Ammonia

NOTE: Reporting requirements

To ensure that the mitigation and monitoring measures are being carried out effectively with the required frequency, a clearly defined and regular reporting and response system must be established. The needed frequency of report generation for inspection and environmental/social monitoring is to be monthly, and for auditing to be once during project life-time (6 months?). The information will be made available to the relevant regulatory authorities or stakeholders as required. In addition to the monitoring and reporting requirements documented in the relevant sections of the ESMP, the following reporting regime will be implemented:

a. All incidents or accidents during the bridge's construction should be reported immediately to relevant authorities.

b. All corrective measures must be discussed to ensure compliance with laws and regulations. c. Reports for personnel training on environmental issues or emergency practices must be produced.

d. Progress reports, environmental monitoring report and other inspections reports must be produced periodically.

4.7 Public Consultation

This section captures the summary of the outcome of the public consultation with farmers that took place on the 19th September 2022.

Table 4.5: summary of public consultation

Major Issues raised	**Discussion**	**Remark**
Disruption of public traffic	The road on which the bridge is to be constructed on is a major throughfare of farm produce and the construction may disrupt movement of farm produce.	ESMP shall recommend a diversion for public traffic.
Increased movement of equipment	Increased movement may put public at risk of motor accident	Traffic management plan shall be prepared in the ESMP and the contractor will encourage to prepare a robust site-specific road traffic management.
Air quality	Increased dust concern during construction phase	Water sprinkling can be recommended and carefully monitored.
Flood concerns	The communities expressed concern that bridge construction may bring about blockage during run-off and the backwash effect may cause immediate flood.	The bridge will rather streamline the various tributaries and more re-enforcement will be provided to the bridge to avoid backwash effect of run-off.

4.8 Cost of Implementing the ESMP

In order to implement this ESMP, necessary budgeting provisions has been made which includes the environmental management costs other than the good engineering practices. The methodology employed for this environmental and social cost estimation is largely expert judgement and Delphi technique coupled with the provisions of the project approved Environmental and Social Impact Assessment (TRIMING ESIA,2017). The overall ESMP

is estimated at **84,700,000** naira only. This ESMP cost shall be budgeted as part of the project costing. The Contractor Site Specific Environmental and Social management plan (CESMP) which include a cashflow will give detail breakdown of the estimates in order to access the funds in a stepwise manner throughout the period of the sub-project execution.

Table 4.5: Bridge construction: Pre-construction Phase ESMP Budget Estimates

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Costs (₦)
Environment	**Air**	Mobilization of personnel, equipment and materials into Siphon 2 bridge construction site	Increase in amounts of fugitive dusts and exhaust fumes from movement of heavy-duty vehicles and equipment into work areas	Sprinkling of water via spraying devices to limit dust Cover trucks for transporting loose materials that may generate dust	Air quality parameters within permissible limits Contractor's compliance to the mandate	Daily especially if the Construction is done during the dry season	**Mitigation:** Contractors **Monitoring:** NESREA (state), SME, PMU (Environmental Safeguards, Scheme officers, HJRBDA, KRISMO, and Contractors	**2,000,000**
				Ensure vehicles are serviced periodically; undergo Vehicle Emission Testing (VET) and Vehicle Exhaust Screening (VES) as laid down in the NESREA guidelines	Ensure vehicles are serviced periodically; undergo Vehicle Emission Testing (VET) and Vehicle Exhaust Screening (VES) as laid down in the NESREA guidelines	Bi-monthly		
	Soil	Mobilization of workers, equipment and other materials into Siphon 2 bridge construction site.	Soil compaction due to movement of vehicles into the site and stacking of heavy-duty equipment which may affect underlying soil thereby increasing soil erosion	Limit zone of vehicle and equipment weight impacts (designate an area for parking and stacking equipment). Avoid unnecessary vehicular movement	Visible demarcation of vehicles and equipment limit zone	Weekly	**Mitigation:** Contractors, Project Office, Scheme officers, WUA	**1,000,000**
			Leakages from stacked equipment containing oil, leading to soil contamination	Ensure proper maintenance of all equipment and check for leakages	Compliance			
	Noise and Vibration	Mobilization of personnel, equipment and materials	Nuisance to sector most influenced by the noise generation	Retrofit with suitable cost-effective vehicle sound mufflers, where applicable	Retrofitting with vehicle sound proof material is being performed	Daily	**Mitigation:** Contractors, Project Office, WUA **Monitoring:** Scheme officers, PMU (Environmental and Social Safeguards Unit, Communication Specialist)	**1,200,000**
	Waste	Installation of temporary construction camps and on-site facilities	Generation of construction wastes	Effective Waste Management procedure	Compliance to frequent waste disposal/evacuation	Weekly	**Mitigation:** Contractors, REMASAB, Local Government Health and Waste Management Departments in the project areas (BLGA) **Monitoring:**	**6,000,000**

							SMEnv Supervisory consultant	
								SUB TOTAL 10,200,000
Cost estimates ref: Environmental and Social Impact Assessment Draft Final Report For the Hadejia Jama'are River Sub-Basin with the Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the associated Cumulative Impacts - Search (bing.com)								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Responsibility	Costs (₦)
Social	**Traffic**	Mobilization of personnel, equipment and materials to siphon 2 bridge construction sites	Traffic congestion/travel delay along siphon 2 axis to farm Also, likelihood of increase in traffic on the access roads boarding the main canal, WBC and EBC for KRIS	Road diversion to avoid construction site Use alternate roads; pre-sensitization of road commuters to use existing roads/accommodate themselves while plying the road	Lane configuration changes are being made where applicable (use of cones, curbs, etc.)	Weekly	**Mitigation:** Contractors, FRSC (Federal Road Safety Corps), Apex WUA, Contractor, PMU, Scheme officers, (Social Safeguards Specialist) **Monitoring:** Contractors, FRSC, PMU (Social Safeguards and Communication Specialists)	**5,000,000**
Social	**Security**	Mobilization of personnel, equipment and materials and bridge construction site at KRIS	Vandalizing of stored equipment as well as Hostility to workers	Contractor should establish relationship with community leaders (district heads of Bunkure LGA) to ensure that community members avoid vandalizing work equipment	Validation of introduction and liaison meeting	Monthly	**Mitigation:** Contractor, KRISMO, District heads and Security depts. of Bebeji, Bunkure LGAs **Monitoring:** Scheme officers, Communication and Social Safeguards Officer	**500,000**

Social	**Health**	Influx of workers	There is likelihood on increased spread of STI and STD since there will be influx of workers into the scheme	Awareness creation on expected behaviour for the workers, youth and general population of the community	Evidence Of report on sensitization of the subject matter	One-off	Mitigation: Contractor, Public health department of the LGAs Monitoring: Scheme officers, PMU (Social and Communication Specialist)	**1,500,000**
								SUBTOTAL-: 7,000,000
Cost estimates ref: Environmental and Social Impact Assessment Draft Final Report For the Hadejia Jama'are River Sub-Basin with the Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the associated Cumulative Impacts - Search (bing.com)								

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (₦)
Occupational Health and Safety	**Environment**	Mobilization of workers, equipment and other materials into siphon 2 bridge construction site at KRIS	Risk of respiratory disease risks from exposure to exhaust fumes of equipment and vehicles	Institute Workers Respiratory Protection Program (WRPP)	Institution of WRPP	One-off	**Mitigation:** Independent OHS Consultant, Contractors **Monitoring:** HJRBDA, KRISMO	**4,000,000**
	Accidents/ Personnel Safety	Mobilization of workers, equipment and other materials	Accidents involving pedestrians	Education and training of PAPs about the project and accident prevention	Education and training conducted	One-off	**Mitigation:** Independent OHS Consultant, Contractors, **Monitoring:** PMU (Environmental Safeguards), Supervision consultant,	**500,000**
				Contractor(s) education and training on pedestrian safety	Training has been conducted	One-off		
				Install safety signage	Safety signage has been installed	One-off		
			Collapse of heavy equipment etc. being conveyed to rehabilitation work areas	Conduct haulage safety training	Training conducted	One-off		
				Enhanced fastening of equipment to carriage section of vehicles	Contractor(s) compliance	Weekly		
			Attack from dangerous animals during de-vegetation activities	Conduct safety and first aid training	Training has been conducted	One-off		
	Safety	Installation of temporary construction camps and on-site facilities	Risk of exposure to occupational health and safety hazards, viz: Risk of occupational	Ensure safety measures are employed in all processes	Safety measures in place (Safe work procedure and manuals)	All through the construction process	**Mitigation:** Contractor **Monitoring:**	**5,000,000**

			accidents and injuries e.g., falls, trips,				PMU (Environmental Safeguards Specialist)	
								SUBTOTAL- 9,500,000
								PRE-CONSTRUCTION PHASE TOTAL: 36,500,000
								Cost estimates ref: Environmental and Social Impact Assessment Draft Final Report For the Hadejia Jama'are River Sub-Basin with the Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the associated Cumulative Impacts - Search (bing.com)

Table 4.6: Bridge construction – Construction phase ESMP Budget estimates

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (₦)
Bridge Construction Site Management	**Environment**	Operation of heavy-duty machinery during construction, welding, and galvanizing works	This activity will impact on discharge of water to bodies affecting the availability of water to the people downstream especially during raining season	Works should be undertaken during dry season when the stream is dry	Contractor Compliance	Daily	**Mitigation:** Contractors, Water Users, KRISMO M**onitoring: PMU, HJRBDA**	- **1,000,000**
			There could be possible contamination of water with hydrocarbons (e.g. oil and diesel) and from greasing/lubrication of gates	Device feasible alternatives, in collecting sediment laden water runoff.	Contractor Compliance	Daily	**Mitigation:** Contractors M**onitoring: PMU, Supervision consultant**	**3,000,000**
			Cement and fugitive dusts emission	Routine watering of the areas	Contractor Compliance	Daily	**Mitigation:** Contractors M**onitoring: PMU**	**6,000,000**
			AIR QUALITY: Increase in amounts of fugitive dusts and exhaust fumes from movement of heavy-duty vehicles and equipment into work site	Appropriate emission control devices should be in place in all construction equipment.	Contractors Compliance	Daily	**Mitigation:** Contractors, **Monitoring:** SME, PMU, Scheme officers	**5,000,000**
		Defecation into drainages, water channels, surface waters etc.	Increase in pathogenic water coliform bacteria	Provide sanitary mobile toilets; around project work areas as a means of temporary support during rehabilitation of existing ones	Contractor Compliance	One-off	**Mitigation:** Contractor **Monitoring:** REMESAB, SME, PMU, Scheme officers	**6,000,000**
			Generation of sewage overtime (from use of temporary mobile toilets by personnel involved in civil works)	Liaise with REMASAB/BLGA for collection and treatment of waste	PMU, Supervision consultant Contractor Compliances	Monthly	**Mitigation:** Contractor	
Bridge Construction Site Management		All construction activities	Significant/insignificant increase in air quality parameters, e.g. VOCs, H_2S, NO_X, etc.	Ensure the monitoring of these parameters. TRIMING may explore the use of Specialized air quality experts to monitor these impacts.	Air quality Monitoring certificates	Quarterly during civil works and during operation phase biannually	**Mitigation:** TRIMING PMU **Monitoring:** SME	**5,000,000**

		Livelihoods	Blockage of access routes to the grazing areas and water points during rehabilitation period will negatively affect livestock grazing and the health of the livestock.	Inform the members of the community/affected farmers about the remedial works. Ensure the remedial works are performed timely. Provide alternative routes if possible	Contractors' compliance	Throughout the activity	**Mitigation:** PMU, Contractors, HJRBDA, PMU, All stakeholders (including Farmer, herdsmen, fishermen etc.), ADPs **Monitoring: HJRBDA**	**4,000,000**
Bridge Construction Site Management	**OHS**	Bridge construction works/foundation, abutment/welding works/iron bending works	Fugitive dust and fumes from grinding, welding, cutting, or brazing surfaces coated with lead-based paint; Silica dust from cutting concrete; solvent vapours from adhesives, paints, strippers, cleaning solvents, and spray coatings; and isocyanate vapours from spray foam insulation and certain spray paints or coatings	Develop and implement the on-site Occupational health and Safety Management plan (Annex 6), Routine OHS training and education; Conduct routine JHA/PHA; Use of PPE; Establish fall protection program; Establish fleet safety management program; Establish and implement HazCom; Conduct hazard identification, control and analysis; Establish fire prevention program; Use material safety data sheets (MSDS); Employ hierarchy of controls procedure; Conduct OHSRA, Cost Benefit Analysis (CBA), Return on Investment (ROI)/pay-back period analysis	Contractors Compliance	Monthly	**Mitigation:** OHS Contactor, Contractors **Monitoring:** PMU	**5,200,000**
		All bridge construction works at siphon 2 at KRIS,	Increase in construction waste generation, debris	Implement the waste management plan to be prepared by the contractor	Contractors' compliance	Daily	**Mitigation:** Contractor **Monitoring:** LGAs SME, Scheme officers	**4,000,000**

			Contamination of surface water (discharge of sediment laden run-off into drainages, waterways etc.)	Disposal of sediment-laden run-off into surface water should be strongly discouraged and prevented. Implement site-specific waste management plans	Contractor Compliance	Weekly	**Mitigation;** Contractor **Monitoring:** HJRBDA, PMU, and Contractors	- **7,000,000**
		All construction activities for the bridge	Disrupt movement of farmers and grazing animals and Interruptions of free flow of water into downstream during the construction	Inform the members of the community/affected farmers about the remedial works. Ensure the construction works are performed timely. Provide alternative routes if possible	Contractors' compliance	Throughout the activity	**Mitigation:** Contractors, Communication unit of the PMU, **Monitoring:** PMU, Farmers groups, Pastoralist, Scheme officers,	**Already taken care of**
	Conflict/Grievance	All rehabilitation activities for bridge construction	Disrupt movement of farmers and grazing animals and Interruptions of free flow of water into feeder canals during the repairs	Inform the members of the community/affected farmers about the remedial works. Ensure the construction works are performed timely and during the dry season Provide alternative routes if possible.	Contractors' compliance	Throughout the activity	**Mitigation:** Contractors, Communication unit of the PMU, KRISMO **Monitoring:** KRISMO, PMU, Farmers groups, Pastoralist, ADPs, Scheme officers,	**Already addressed**
Occupational Health and Safety	**Personnel and Project Site**	All construction activities for the bridge works	Fugitive dust and fumes from grinding, welding, cutting, or brazing surfaces coated with lead-based paint; Silica (cements) dust from cutting concrete;	Develop and implement the on-site Occupational health and Safety Management plan (Annex 6), Routine OHS training and education; Conduct routine JHA/PHA; Use of PPE; Establish fall protection program; Establish fleet safety management program; Establish	Contractors Compliance	Monthly	**Mitigation:** OHS Contactor, Contractors **Monitoring:** PMU	**2,000,000**

				and implement HazCom; Conduct hazard identification, control and analysis; Establish fire prevention program; Use material safety data sheets (MSDS); Employ hierarchy of controls procedure; Conduct OHSRA, Cost Benefit Analysis (CBA), Return on Investment (ROI)/pay-back period analysis				
CONSTRUCTION PHASE TOTAL= 48,200,000								
Cost estimates ref: Environmental and Social Impact Assessment Draft Final Report For the Hadejia Jama'are River Sub-Basin with the Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the associated Cumulative Impacts - Search (bing.com)								

Table 4.7: Bridge - Operation Phase (Defect Liability Period) – ESMP Budget estimates

Component	Sub-component	Activities	Potential Impact	Mitigation Measures	Monitoring Indicators	Monitoring Frequency	Institutional Responsibility	Costs (₦)
Bridge construction	**Environment**	Demobilization of equipment	Release of fugitive and cement dust	Appropriate emission control devices should be in place in all construction equipment	Contractors Compliance	Daily	**Mitigation:** Contractors, **Monitoring:** SME, PMU	**0**
		Operation of heavy machineries for regular maintenance	Exhaust fumes from equipment and diesel generator plants	Specific air and noise pollution control measure to minimize impact on environment Periodic air quality monitoring (especially Hydrogen Sulphide (H_2S), NOx, SOx, CO. Machines could be turned off when not in use, in order to reduce emissions into the atmosphere. Establish and enforce emissions management controls.	0&M, KRISMO Compliance	Daily	**Mitigation**: KPRIMO, PMU **Monitoring**: SME, NESREA (state)	
Bridge construction	**Environment**	Traffic management	Accidents due tom increased traffic movement	Traffic management plan	Contractors Compliance	Daily	**Mitigation:** Contractor FRSC, WUA	0
		Closure of civil works	Loss of employment	Inform personnel that employment is short-term prior to their engagement.	Proper engagement of service documentation	One-off	**Mitigation:** Contractors **Monitoring:** PMU, Scheme officers,	**0**
Grievance Redress Mechanism	**Social component**	Complaints		A complaints register will be kept on site and this will feed into the GRM. Details of complaints received will be incorporated into the audits as part of the monitoring process	GRM log book	Daily	**Mitigation:** Contractors **Monitoring:** PMU, Scheme officers,	**0**

OPERATION PHASE TOTAL: 0
Cost estimates ref: https://documents1.worldbank.org/curated/en/504341474351284710/pdf/SFG2336-V2-EA-P155732-Box396308B-PUBLIC-Disclosed-9-19-2016.pdf

Table 4.8: OVERALL ESMP BUDGET ESTIMATES

Project Phases	Cost (₦)	Comments
Pre-construction	**36,500,000**	-
Construction	**48,200,000**	-
Operation (DLP)	0	-
GRAND TOTAL	**84,700,000**	-

The total estimates for the implementation of this ESMP is EIGHTY- FOUR MILLION SEVEN HUNDRED THOUSAND NAIRA ONLY.

CHAPTER FIVE

5.0 Summary and Conclusions

The proposed intervention work will improve road condition at the project sites and improves accessibility within the Kano River Irrigation Scheme. The bridge will enhance free movement of agricultural produce

Apart from improvement in the road conditions of the affected areas, it is expected to provide employment and boost local economy of the communities and those non-indigenes living within the catchment areas.

The main benefit of this intervention including multiplier effects such as poverty reduction, empowerment, employment opportunities, reduction in crime among others far outweigh any negative impacts.

The ESMP highlights that:

- Mitigation measures and management plan have been put in place for effective amelioration of any potential impacts in the Project.
- Potential positive impacts of the proposed intervention project far outweigh any negative impacts.
- The proposed project is most desirable and applauded by all the communities.
- It's recommended that, where involuntary land resettlement is to 'be involved along the right of way of the bridge, the RAP consultant should be called to conduct inventory and come with compensation for the PAP. However, this sub-project did not envisage any involuntary land resettlement.

In conclusion, the ESMP report recommends amongst others that the proposed intervention should be carried out as it will not significant negative impact on the existing

environmental, social, health as well as safe condition of the Project Affected Communities and People.

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APPENDIX

Annex 1; Safeguards Report (Accident/Incident Report)

TRIMING PROJECT- BRIDGE CONSTRUCTION AT CHIRIN, UNDER KANO RIVER IRRIGATION SCHEME – TRIMING PROJECT

ACCIDENT / INCIDENT REPORT (ACCIDENT/INCIDENT REPORT)								
Month	**Date**	**Time**	**Victim**	**Section**	**Nature of Incident**	**Action taken**	**Severity of incident**	**Remarks**

Annex 2: Images and Pictures of Proposed Bridge Site

Plate 1: Site of proposed Bridge

Plate 2: Site of proposed Bridge

Plate 3: Road where the bridge is to be located

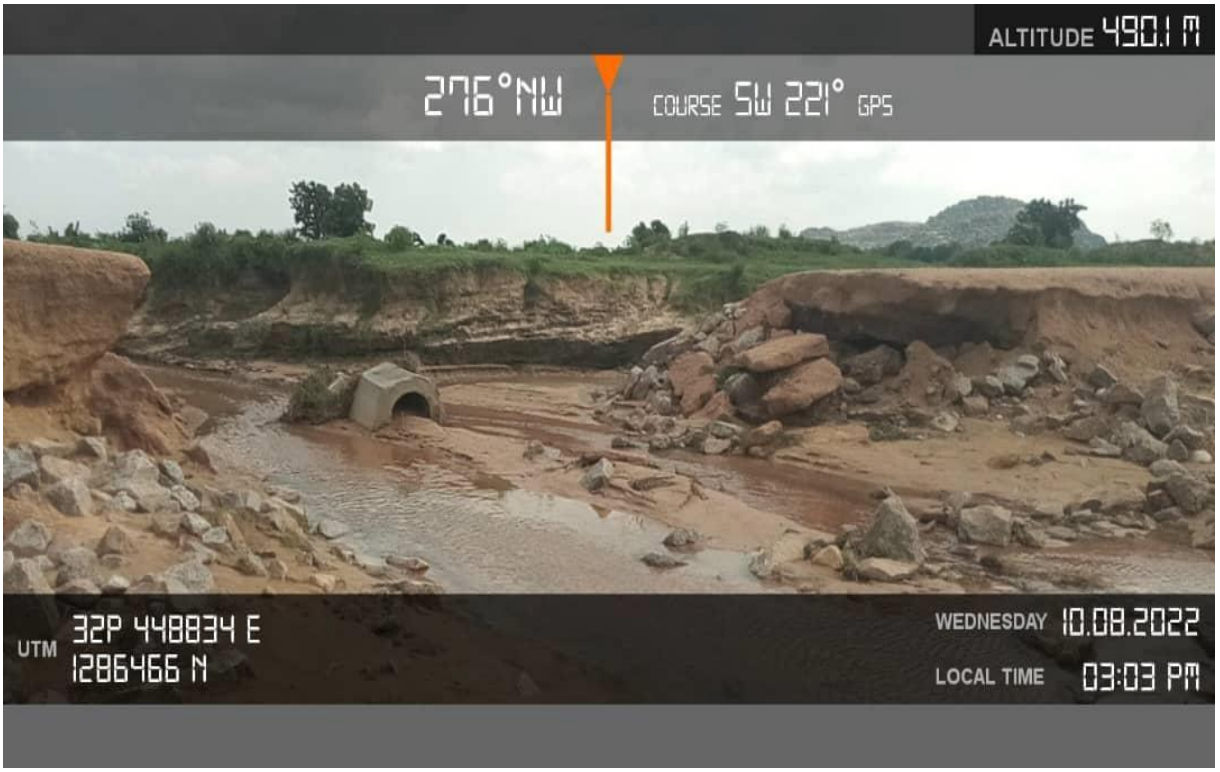

Plate 4: Plate showing extent damage by the flood at proposed site

Plate 5: Plate showing extend of erosion by flood at tributary at the river of the proposed bridge construction site

Plate 6: Plate showing depth of river

Plate 7: Plate showing erosion at the proposed bridge construction site


Proposed Bridge construction site
at KRIS,Under TRIMING Project
Legend
Google Earth
Image © 2022 Maxar Technologies
200 m
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