ADDENDUM
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) ON TIGA DAM REMEDIAL WORKS
FINAL REPORT

FOR THE HADEJIA JAMA'ARE RIVER SUB-BASIN WITH THE KANO RIVER IRRIGATION SCHEME (KRIS) AND HADEJIA VALLEY IRRIGATION SCHEME (HIVIS) AND THE ASSOCIATED CUMULATIVE IMPACTS.

PREPARED BY:

TRANSFORMING IRRIGATION MANAGEMENT IN NIGERIA
FEDERAL MINISTRY OF WATER RESOURCES

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ABBREVIATION

ADPs:	Agricultural Developmental Projects
ATA:	Agricultural Transformation Agenda
CADA:	Commercial Agriculture Development Associations
CBD:	Conservation on Biological Diversity
CBO's:	Community Based Organizations
CMO:	Conservation of Migratory Species
EIA:	Environmental Impact Assessment
ESIA:	Environmental and Social Impact Assessment
ESMF:	Environmental and Social Management Framework
ESMO:	Environmental and Social Management Organization
ESMP:	Environmental and Social Management Plan
FAO:	Food and Agriculture Organization
FEPA:	Federal Environmental Protection Agency
FGD:	Focus Group Discussion
FGN:	Federal Government of Nigeria
FMENV:	Federal Ministry of Environment
FMWR:	Federal Ministry of Water Resources
FRSC:	Federal Road Safety Corps
GPS:	Global Positioning System
GRM:	Grievance Redress Mechanism
GSM:	Global Services for Mobile
HAP:	Health Action Plan
HEP:	Hydroelectric Power
HIV/AIDS:	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
HJKYB:	Hadejia-Jama'are-Komadugu-Yobe basin
HNW:	Hadejia-Nguru Wetlands
HOD	Head of Department
HSE:	Health Safety and Environment
ILO-OHSMS:	International Labour Organization - Occupational Health and Safety Management Systems
ILO:	International Labour Organization
IPM:	Integrated Pest Management
IUCN:	International Union for Conservation of Nature
JSME:	Jigawa State Ministry of Environment
KEDCO:	Kano State Electricity Distribution Company
KNARDA:	Kano Agriculture and Rural Development Authority
KRIS:	Kano River Irrigation Scheme
KRISMO:	Kano River Irrigation Scheme Management Office
KRISO:	Kano River Irrigation Project
KSG:	Kano State Government
LGA:	Local Government Area
MC:	Main Canal
MDA's:	Ministries, Departments and Agencies
NCWR:	National Council on Water Resources
NEMSA:	Nigeria Electricity Management Service Agency
NESREA:	National Environmental Standards and Regulations Enforcement Agency
NGO's:	Non-Governmental Organizations
NIMET:	Nigerian Meteorological Agency
NIPS:	National Irrigation Policy and Strategy
NIWA:	National Inland Waterways Authority
NIWRNC:	Nigeria Integrated Water Resources Commission

NPC:	National Population Commission
NTCWR:	National Technical Committee on Water Resources
NWRI:	National Water Resources Institute
NWRMP:	National Water Resource Master Plan
O&M:	Operation and Maintenance
OHS:	Operational Health and Safety
OHSMS:	Occupational Health and Safety Management Systems
OP:	Operational Policy
PAP's:	Project Affected Persons
PDO:	Project Development Objective
PHC	Primary Healthcare Facility
PM:	Project Manager
PMP:	Pest Management Plan
PMU:	Project Management Unit
PPP:	Public Private Partnership
RAP:	Resettlement Action Plan
RBDA:	River Basin Development Agency
REMASAB:	Refuse Management and Sanitation Board
RPF:	Resettlement Policy Framework
RUWASA:	Rural Water Supply and Sanitation
SEPA:	State Environmental Protection Agency
SHF	Secondary Healthcare Facility
SME:	State Ministry of Environment
SMS	Short Message Service
STD:	Sexually Transmitted Disease
STI:	Sexually Transmitted Infection
TBD:	To Be Determined
TRIMING:	Transforming Irrigation Management in Nigeria Project
VES:	Vehicle Exhaust Screening
WRSSP:	Water supply Sector Support Programme
VET:	Vehicle Emission Testing
WBC:	West Branch Canal
WUA:	Water Users Association

Executive Summary

ES 1 INTRODUCTION

The Federal Government of Nigeria through the Federal Ministry of Water Resources with support from the World Bank is implementing the TRIMING Project, a seven-year program with a credit of US$495.3 million from the International Development Association. In 2015, TRIMING Project proposed rehabilitation works for the entire irrigation scheme and drainage improvement including Tiga Dam which had series of rehabilitation works. As part of the Operational Policy of the World Bank and consistent with Nigeria EIA Act CFN 2004, these rehabilitation works were screened and rated as Category A Project, which led to the development of an Environmental and Social Impact Assessment for Kano River Irrigation Scheme and Hadejia Valley Irrigation Scheme[1].. This ESIA was completed and disclosed in January 2017 (hereinafter refer to as ESIA Hadejia 1.0). All these proposed works are documented in the ESIA Hadejia 1.0.

Over the years, there have been concerns about the safety of the dam due to inadequate design, construction and visible deterioration of embankment as reported by several companies and consultants. These concerns were further confirmed in 2020 through to 2022, when TRIMING Project was notified by Sinohydro Corporation Ltd of lateral cracks on the Embankment crest of Tiga Dam, which was also confirmed by the Staff of River Basin. Consequently, some improvements and upgrades were recommended by the Technical Committee[2] amongst include treatment of longitudinal cracks, restore downstream slope ratio, and improve downstream slope drainage and other ancillary activities. These remedial works will further ensure dam safety.

The proposed remedial works are quite different from the initial rehabilitation works as documented in ESIA Hadejia 1.0 and these remedial activities possess some risks and impacts as identified in the screening report[3]. Consequently, the Project needs to re-assess some aspects of the remedial works that are considered new risks/impacts that were not assessed in the ESIA Hadejia 1.0.

Purpose of this Addendum

The purpose of this ESIA Addendum is to provide updated information and assessment such as additional studies, impact assessments, mitigation and management plans regarding the remedial works for Tiga Dam. This Addendum focuses on risks/impacts that were not covered in the ESIA Hadejia 1.0 in particular works associated with treatment of cracks on Tiga Dam Embankment and downstream slope. Therefore, this Addendum should be read in conjunction with the ESIA Hadejia 1.0 and supporting documents such as the Technical Reports for Tiga Dam Crack Treatment prepared by Contractor, Environmental and Social Management Framework for TRIMING and Emergency Repairs of Longitudinal on the Crest of Tiga Dam

ES 2: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

As outlined in ESIA Hadejia 1.0, there are no new changes with respect to the identified relevant Nigerian environmental regulations and legal instruments including the World Bank Operational Policies. Further details are illustrated in the Chapter 2.

ES: PROJECT AND PROCESS DESCRIPTION

The proposed remedial works on Tiga Dam Embankment are within the Kano River Irrigation Scheme. KRIS is located about 30km southwest of Kano, the capital city of Kano State. KRIS covers Bunkure, Kura, Rano, Bebeji and Garun Mallam LGAs as seen in figure 1 below.

[1] ESIA for HJR Sub-Basin with KRIS and HVIS

[2] Draft Report On Emergency Repairs of Longitudinal Cracks on The Crest Of Tiga Dam Embankment, Kano State

[3] Screening Report for Remedial Works in Tiga Dam

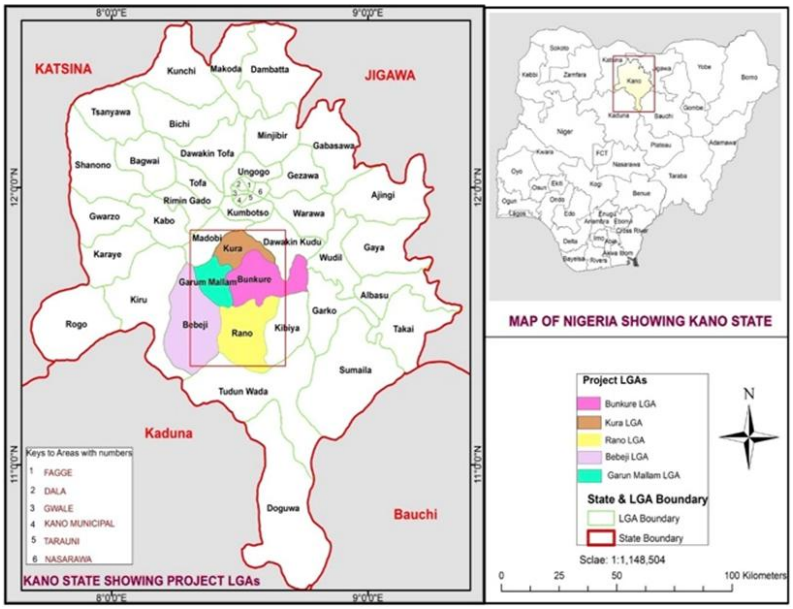


Figure 1: Map of Kano showing Project LGA

It is located downstream of Tiga Dam and this dam serves the KRIS via the Ruwan Kanya operation reservoir downstream of a feeder canal from Tiga Dam. The area is of hilly/rocky and undulating topography. The scheme is divided into two phases; the first phase was originally designed with a capacity of 22,000 ha of land, out of which 13,890 ha have been fully developed.

Main Irrigation Infrastructures in KRIS consist:

- Tiga Dam and reservoir
- Main canal (MC) system – including the Ruwan Kanya Dam and Reservoir.
- East Branch Canal (EBC) system with 3 sectors
- West Branch Canal (WBC) system with 29 sectors (27 constructed)

Tiga Dam falls within Bebeji LGA, one of the five LGA covered by KRIS. The dam is a zoned earth dam with a wide clay core wall. The dam was constructed with permeable weathered soil in both the upstream and downstream shells, with slope ratios of 1:3 for the upstream side and 1:2.5 for the downstream side. In 2017, the rehabilitation of the dam commenced including asphalt surface dressing of the dam crest which was completed by 2020. However, from September to October 2022 numerous longitudinal cracks began to appear on the asphalt surface of the dam crest. According to the Technical Report[4] these cracks occur parallel to the centerline of the asphaltic pavement or laydown direction, which could have been caused due to shrinkage of the asphalt, poorly constructed joints, poor paver operation, or reflective cracking (cracks from a deeper layer).

The remedial activities covered within the Addendum ESIA include assessment of:

A. **Repair and Seal Existing Cracks**
B. **Restore the Downstream Slope Ratio:**
C. **Improve the Downstream Slope Toe Drainage:**

[4] Technical Report for Tiga Dam Longitudinal Crack Treatment

Due to the high dam body, short contract period, large earth filling and low efficiency of dam slope filling construction, these activities have been segmented into two phases. Further details on the sub-activities for the treatment of cracks on Tiga Dam Embankment are presented in Chapter 3 of this report.

ES 4: DESCRIPTION OF PROJECT ENVIRONMENT & BASELINE

The assessment of impacts within this Addendum ESIA include the study of physical components, biological components, and socio-economic components.

Physical Components

The baseline studies found that Tiga Dam and associated facilities are located in open Sudan Savannah woodland vegetation of Nigeria. Also characterized with the pattern of rainfall, temperature and humidity within the northern region of the nation. With the relatively tropical weather, the land is arable and supports the cultivation of many crops, which includes tomato, onion, pepper, groundnut, cowpea, millet, sorghum etc. Residual trees, shrubs, and aquatic vegetation/weeds were also found within the project area.

The Baseline assessment of ambient air quality for eight sites met the national standards including noise conditions.

Soil analysis conducted shows that all the elements analysed for are all within the Nigeria FMEnv limits except for Nitrate and Phosphate which are above the standard limit. This may not be unrelated to the agricultural activities within the project area.

Surface and Groundwater analysis: the analysis of surface water for coliform group of bacteria shows the heavy presence of *Total Coliform (T. Coliform), Escherichia Coli (E. Coli)* and *Salmonella*. *T.Coliform* and other heavy metals which points to the fact that there is lots of domestic activities and defecating into the river body while groundwater analysis shows a healthy concentration of elements analysed and ideal for human consumption and domestic use. Detailed analysis can be found in annex 6 of the report.
Biological Components: Cattle Egret (*Bubulcus ibis*), Grey Heron (*Ardca cineria*), White-faced whistling duck (*Deridrocygna vidnata*, Hooded vulture (*Necrosyrtes, Quella birds)*

Environmental Baseline of Intervention Area (Tiga Dam)

During the Environmental Baseline Assessment, issues observed include the following:

- Presence of borrow pits around the intervention area
- Rock blast activities at Tiga dam due to installation of hydro power plant caused damages to the Tiga dam manager's office, Tiga main canal and its surrounding.
- Longitudinal cracks on the dam embankment with overgrown weeds on both the upstream and downstream slope
- Presence of few weeds on the edge of the dam
- Pest management concerns and the unsafe use of Agricultural chemicals within the project area e.g. herbicides, pesticides have been over-exploited
- Debris in the main-canal with movement of stones and debris as a result of possible seepage

Socioeconomics Baseline for Intervention Area

The following issues were observed under the Social Baseline Assessment:

- Competition for the surface water between the legally identified water users, water *siphoners* (mostly upland farmers)including herdsmen
- Non-compliance to set agreements between Fishermen and River Basin Development Authority
- Poor coordination between institutions who have the statutory responsibilities for managing water resources in the HJKY basin
- Significant O&M problems especially as regard access road for movement of farmers goods

- Non-inclusion of fisherman (Upstream and Downstream) concerns by RBDA especially as regard blasting of the rocks, integrity of dam embankment, maintenance of main-canals and tidal waves movement

ES 5: Stakeholders Consultation

Consultations with the stakeholders were carried out throughout the process of preparation of the ESIA including focus group consultation (26th – 28th September 2024) for this addendum. Three major levels of consultations carried out as outlined below including series of feedback meetings carried out) where inputs, and concerns were addressed by the relevant stakeholders.

Level	Overview of Consultation
Level 1	Consultations with the Environmental & Social Unit of Kano River Irrigation Scheme Office (KRISO)
Level 2	Focal Group Discussions with Farmers in both Upstream and Downstream of the Dam including fishermen group. Members of the communities located within Bebeji LGA such as Tiga Town, Gwarmai, Ranian, Katsalle and Kuki town.
Level 3	Consultations with Tiga Dam Project Manager, Supervising Consultant of Tiga Dam and design Engineers for the treatment of the cracks.

Detailed information from the consultations is documented in Chapter 5 of this report. Few feedbacks from consultations can be seen below:

Stakeholder	Concerns/Response
Upstream Farmers around Tiga Dam	**Concerns:** they requested that the cracks should be done properly and quickly for adequate access routes for their goods **Response:** Representatives from KRISO assured the farmers that the necessary works will soon commence shortly after this studies and their concerns for access route will be delivered to the Project Manager of Tiga Dam
Fishermen (KRIS)	**Concerns:** They also complain that RBDA do not take their concerns into consideration especially as regard the dam embankment **Response:** The ESIA team assured the fishermen that the study will proffer mitigation measures in the addendum. Their concerns would be related to the appropriate office

ES 6: RISKS AND IMPACTS

Impact assessments and the associated level of significance considered the likelihood and magnitude of the environmental or social impact, its geographical scale, and duration in relation to the sensitivity of key receptors and resources. Criteria for assessing the significance of impacts are based on a combination of: determination of magnitude and receptor sensitivity to determine severity, and then combining assessment of severity with the assessment of impact likelihood to assign an impact significance level.

Below are some of the beneficial and negative impacts that were identified associated with the remedial works

Beneficial impacts

Environment

- Reduced risk of flooding and improve flow regime
- Improvements in dam infrastructure, dam safety, canal monitoring and overall dam operations, management and maintenance (OMM).

Social

- Increase in employment opportunities
- Improve livelihood for farmers and fishermen
- Increase in demand for local produce
- Construction of new roads and rehabilitation of the old ones will improve the transportation system

Potential Negative impacts

Environment

- Contamination and infiltration of surface water with geotextile materials, oil, discharge of sediment runoff.
- Increase in pathogenic water coliform bacteria as a result of indiscriminate defecation into drainages, main canals, surface water and other water channels
- Increases demand for potable water
- Abandoned borrow pits and hotspots for waste dumpsite, pathways for vector multiplication and
- Land degradation
- Release of fugitive and cement dust likely to exceed limits by FMEnv
- Noise level within the project area which might exceed the FMEnv tolerance level of 70 Db
- Increase in waste generation from the removal of asphalt, debris on the crest, clearance of vegetation (grasses, shrubs, trees) and sediments along the downstream slope
- Pollution of the reservoir water from on-site waste
- risks of accidents/incident (e.g drowning, fall from height etc) associated with occupational hazards
- Flood risk in the event of dam failure due to impact on the structural integrity after intervention

Social

- Likelihood of increase in spread of communicable diseases, STI and STD
- Increase in demand on social facilities and infrastructure e.g healthcare facilities, transportation, communication etc.
- Risk of social conflict between local communities and contractors
- Increase in insecurity and work-related accidents
- Gender based violence as a result of culture difference
- Increased opportunities for the host community may lead to child labour
- Interruption and reduction of water supply during civil works which will affect their farming activities
- Grievance among the water users as a result of improper communication/ awareness prior to temporary disruption of water supply

ES 7: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP Matrix as seen in Table 21 and 22 took cognizant of the work methodology as proposed by the Contractor, in which the sub-activities are segmented into two phases: Phase 1 and Phase 2. Consequently, impacts and corresponding mitigation measures would occur at different times. Thus, the ESMP Matrix have been phased into two (see chapter seven) with the appropriate responsible parties.

Cost of Implementing the ESMP Matrix

In view of the work methodology outlined by the Contractor in implementing the sub-activities in two phases, the overall total estimated cost to effectively implement the mitigation and monitoring measures recommended in the ESMP Matrix for both Phases is N98, 250,442 as seen in chapter seven and the table below. The cost of mitigation for Phase 1 is N41, 199,694 while Phase 2 is N32, 049,194, these costs should be included in the contract as part of the implementation cost by the Contractor

Summary of Cost for Implementing ESMP Matrix

Item	Responsibility	Cost Estimate in Naira (N)
Phase 1		
Mitigation	Contractor	41,199,694
Monitoring	KRIS E&S Team	11,976,027

Sub-total for Phase 1		**53,175,721**
Phase 2		
Mitigation	Contractor	32,049,194
Monitoring	KRIS E&S Team	11,025,527
Sub-total for Phase 2		**43,074,721**
GRM Operation	State Safeguard Team, WUAs	2,000,000
OVERALL ESTIMATED COST		**98,250,442**

TAKAITACCEN BAYANI

ES1: GABATARWA

Gwamnatin tarayya ta Najeriya, ta hanyar ma'aikatar albarkatun ruwa ta tarayya tare da tallafi daga Bankin Duniya, na aiwatar da shirin TRIMING, shiri na tsawon shekaru guda bakwai da rancen dala miliyan 495.3 daga Kungiyar Taimakon Ci gaban Kasa da Kasa (IDA).

Tun daga shekarar 2015, shirin TRIMING yana tallafawa, daidaita, da kuma kula da ayyukan gina da gyara don inganta gudanar da albarkatun ruwa cikin hadin gwiwa a cikin shirin shayar da gona guda biyar da ke cikin kundayen koguna guda uku a Arewacin Najeriya, wato; Shirin shayar da gona na Bakolori; Shirin shayar da gona na Tsakanin Kogin Roma; Shirin shayar da gona na Kogin Kano (KRIS); Shirin shayar da gona na Hadejia Valley (HVIS) da Shirin shayar da gona na Dadin Kowa.

A cikin shekarar 2017, shirin ya fara ayyukan gyaran fuska a cikin KRIS, inda aka gudanar da wasu ayyukan gyara a Tiga Dam domin inganta tasirin Dam ɗin a matsayin wani ɓangare na manufofin aiki na Bankin Duniya, tare da daidaitawa da Dokar Muhalli ta Najeriya (EIA Act CFN 2004). Wadannan ayyukan an tantance su kuma an sanya su a matsayin aikin rukuni na A, wanda ya kai ga ci gaban yin nazarin tasirin muhalli da zamantakewa (ESIA). An kammala ESIA ɗin kuma an bayyana shi a watan Janairu na shekarar 2017 (wanda daga nan za a kira shi ESIA Hadejia 1.0).

Manufar Wannan Karin Bayani

Manufar wannan karin bayani ita ce don samar da sabbin bayanai da ƙarin kimantawa, kamar ƙarin bincike, kimantawar tasiri, da shirye-shiryen rage tasiri da kula da ayyukan gyaran da za a yi wa Tiga Dam.

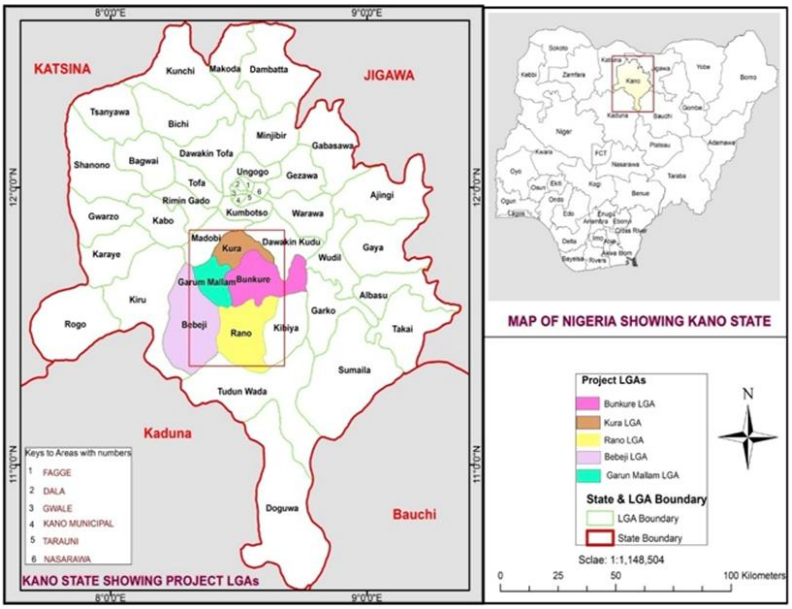
Wannan karin bayani yana mai da hankali kan batutuwan da sakamakon kimantawar ESIA Hadejia 1.0 game da yiwuwar tasiri ya samu canji mai yawa sakamakon gyaran ƙaryewar dake kan Tiga Dam. A inda ba a sami canji ba a cikin tasirin da aka kimanta, ba a buƙatar ƙarin kimantawa, kuma tasirin da aka hasashe zai ci gaba da kasancewa iri ɗaya kamar yadda aka kammala a cikin ESIA Hadejia 1.0. Saboda haka, wannan karin bayani ya kamata a karanta tare da ESIA Hadejia 1.0 da sauran takardun goyon baya kamar rahotannin fasaha na gyaran ƙaryewar Tiga Dam da kamfanin Sinohydro Ltd, tsarin gudanar da muhalli da zamantakewa na TRIMING, da gyaran gaggawa na tsawon layin kan saman Tiga Dam.

ES2: MANUFAR DOKOKI, SHARUDDAN SHARI'A, DA TSARIN ADMINISTIRASI

Kamar yadda aka bayyana a cikin ESIA Hadejia 1.0, babu wani canji sabo game da dokokin muhalli na Najeriya da kayan aikin shari'a da aka gano, har da manufofin aiki na Bankin Duniya. Karin bayani akan wannan yana cikin babi na 2.

ES: BAYANIN AYYUKAN SHIRIN DA TSARI

Ana shirin gudanar da ayyukan gyaran fuska a kan Tiga Dam a cikin shirin shayar da gona na Kogin Kano (KRIS). KRIS yana a kusan kilomita 30 kudu maso yammacin Kano, babban birnin Jihar Kano. KRIS yana rufe kananan hukumomi guda biyar, wato Bunkure, Kara, Rank, Bebeji, da Garun Mallam, kamar yadda aka nuna a hoto mai zuwa.



KRIS yana ƙasa da Tiga Dam, wanda ke samar da ruwa ga shirin shayar da gona ta hanyar ruwan Kanya, wanda yake cikin babban tafkin ruwa na kasa, wanda ke karkashin ruwan kwararar ruwan shayarwa daga Tiga Dam. Yankin yana da yanayi mai duwatsu/rokoki da kuma tudu-tudu. Shirin yana da matakai guda biyu; mataki na farko an tsara shi ne da ƙarfin shayar da gona a fili guda 22,000ha, daga ciki 13,890ha sun riga sun kasance cikin cikakken ci gaba.

Babban gine-ginen shayar da gona a cikin KRIS sun haɗa da:

Tiga Dam da tafkin ruwa

- Tsarin babban ruwan shayarwa (Main Canal MC), wanda ya haɗa da Ruwan Kanya Dam da tafkin ruwa
- Tsarin ruwan shayarwa na reshen gabas (East Branch Canal EBC) tare da sassa 3
- Tsarin ruwan shayarwa na reshen yamma (West Branch Canal WBC) tare da sassa 29 (27 an gina su).

Tiga Dam na cikin Karamar Hukumar Bebeji, daya daga cikin Karamar Hukumomin guda biyar da KRIS ke kula da su. Dam din na da tsarin kasa mai laushi tare da bango na laka mai fadi a tsakiya. An gina dam din ne da ƙasa mai sha ruwa da aka lalace, a bangarorin sama da ƙasa, tare da ƙididdigar kusurwa na 1:3 a gefen sama da 1:2.5 a gefen ƙasa. A cikin shekarar 2017, an fara aikin gyaran dam din wanda ya haɗa da shafa farantin asfalto a saman dam din, wanda aka kammala a shekarar 2020. Duk da haka, daga watan Satumba zuwa Oktoba 2022, wasu manyan tsage-tsage na dogon layi sun fara bayyana a saman farantin asfalto na saman dam din. Waɗannan tsage-tsagen suna bayyana cikin layi daya da tsakiya ko kuma a cikin hanyar da aka shafa asfalto, wanda hakan na iya zama sakamakon ƙarin ƙarfin asfalto, haɗin gwiwar da ba a gina shi da kyau ba, rashin kyawun aiki da masu shafa, ko kuma tsagewar da ke fitowa daga cikin ƙasa mai zurfi.

Ayyukan gyaran da aka haɗa cikin ƙarin bayanin ESIA sun haɗa da kimanta:

- Gyara da rufe tsage-tsagen da ke akwai
- Sake dawo da ƙididdigar kusurwa na gefen ƙasa

- Inganta drain na ƙasa a gefen ƙasa

Cikakkun bayanai kan ayyukan gyara da ƙananan ayyukan da za a yi don magance tsage-tsagen a kan dam din Tiga suna cikin babi na 3 na wannan rahoton.

ES 4: BAYANI GAME DA MUHALLIN AYYUKAN DA KAYAN GINA JIKI

Binciken tasirin ayyuka a cikin wannan ƙarin bayanin ESIA ya haɗa da nazarin abubuwan jiki, na halittu, da na zamantakewar al'umma da tattalin arziki.

Abubuwan Jiki

Binciken tushen muhalli ya nuna cewa Dam din Tiga da sauran kayan aikin da suka shafi shi suna cikin gandun daji na savannah na Sudan a Najeriya. Hakanan, wannan yankin yana da yanayin ruwan sama, zafi, da danshi na arewacin ƙasar. Tare da yanayin ciyawar da aka saba, ƙasar tana da amfani don noma kuma tana tallafawa aikin noma na amfanin gona da dama, ciki har da tumatir, albasa, barkono, gyada, waken garin saniya, gero, da shinkafa, da sauransu. Hakanan, an samu itatuwa, bishiyoyi, da kuma kayan lambu na ruwa/kazami a cikin yankin aikin.

Binciken tushen ingancin iska a wurare takwas ya nuna cewa yana cika ƙa'idodin ƙasa ciki har da yanayin hayaniya.

Nazarin ƙasa da aka gudanar ya nuna cewa dukkanin sinadarai da aka bincika suna cikin iyakokin hukumar FMEnv ta Najeriya, sai dai Nitrate da Phosphate waɗanda ke sama da iyakar ƙa'idar. Wannan na iya zama saboda ayyukan noma da ake gudanarwa a cikin yankin aikin.

Binciken Ruwa na Sama da Ƙasa:

Binciken ruwa na sama don gano ƙungiyar bacteria na coliform ya nuna cewa akwai yawa sosai na coliform gaba ɗaya (T. Coliform), Escherichia coli (E. Coli), da Salmonella. T. Coli da sauran wasu karafa masu nauyi sun nuna cewa akwai yawancin ayyukan gida da kuma zubar da fitsari a cikin ruwan kogin, yayin da binciken ruwa na ƙasa ya nuna cewa ƙasar tana da ma'aunin sinadarai mai kyau wanda ya dace da amfani na ɗan adam da kuma ayyukan gida. Cikakken bincike na wannan yana cikin annexe na 6 na rahoton.

- Abubuwan Halittu
- Cattle Egret (Bubulcus ibis)
- Grey Heron (Ardea cineria)
- White-faced Whistling Duck (Dendrocygna viduata)
- Hooded Vultures (Necrosyrtes monachus)
- Quella Birds

Binciken Muhalli na Tiga Dam:

- A cikin binciken tushen muhalli, wasu matsalolin da aka lura da su sun haɗa da:
- Samuwar ramin hakowa a cikin shirin inda masu kwangila ke hakar laterite.
- Ayyukan fashewar duwatsu a Tiga Dam sakamakon shigar da tashar wutar lantarki ta ruwa wanda ya haifar da lalacewar ofishin manajan Dam din Tiga, babban ruwan Tiga da kuma kewaye da shi.
- Tsage-tsagen dogon layi a kan dam din da ƙasa mai yawa na ciyawa a kan ƙasan sama da ƙasan ƙasa.
- Samuwar ciyawa kaɗan a gefen Dam.
- Matsalolin kula da kwari da kuma amfani da sinadarai na noma da ba su da lafiya a cikin yankin aikin, misali, herbicides da pesticides da aka yi amfani da su fiye da kima.
- Gubobin ƙasa a cikin babban ruwan Tiga tare da motsin duwatsu da gubobi a sakamakon yiwuwar shigar ruwa.

Binciken Zamantakewa da Tattalin Arziki na Tiga Dam:

- A cikin binciken tushen zamantakewar al'umma, an lura da wasu matsaloli kamar haka:
- Gasara akan ruwa na sama tsakanin masu amfani da ruwa na doka, masu zubar da ruwa (mafi yawan su manoman da ke kan tsaunuka) da kuma makiyaya.
- Rashin bin ƙa'idojin yarjejeniyar da aka cimma tsakanin 'yan kifi da Hukumar Ci gaban Hanyar Kogin.
- Rashin kyakkyawar hadîn gwiwa tsakanin hukumomin da ke da alhakin kula da albarkatun ruwa a yanki HJKY.
- Matsaloli masu yawa na kula da aiki da gyara (O&M), musamman a cikin maganar hanyoyin samun damar jigilar kayan manoma.
- Rashin haɗa damuwar masu kifin (a saman da ƙasa) daga RBDA, musamman game da fashewar duwatsu, lafiyar dam din, kula da manyan ruwan sha da kuma tasirin gungun ruwa.

ES5: Tattaunawar Masu Ruwa da Tsaki

An gudanar da tattaunawa da masu ruwa da tsaki ta hanyar shirya ESIA wanda ya haɗa da tattaunawar rukuni (26 ga Satumba - 28 ga Satumba 2024) don wannan ƙarin bayani. An gudanar da matakai guda uku na tattaunawa kamar yadda aka bayyana a ƙasa, wanda ya haɗa da jerin tarukan ra'ayi inda aka tattauna da amsa shawarwari da damuwar masu ruwa da tsaki na musamman.

Level	Overview of Consultation
Mataki daya	Tattataunawa da sashen muhalli da zamantokewa na ofishin tsarin ban ruwa na kogin kano (KRISO)
Mataki na biyun	Tattaunawar rukunin masu ruwa da tsaki tare da manoma a cikin yankunan sama da ƙasa na dam dîn, har da ƙungiyar masu kamun kifi, da mambobin al'ummomin da ke cikin karamar hukumar Bebeji, kamar garin Tiga, Gwarmai, Ranian, Katsalle da Kuki.
Mataki na uku	Tattaunawa da manajan aikin Tiga Dam, mai ba da shawara kan kula da aikin Tiga Dam, da injiniyoyin zane don magance barazanar fissures (gurɓatattun rami).

Cikakkun bayanai daga tattaunawar an rubuta su a cikin babi na 5 na wannan rahoton. Wasu daga cikin ra'ayoyin da aka samu daga tattaunawar za a iya gani a ƙasa.

Stakeholder	Concerns/Response
Manoman da ke a cikin yankin sama na Dam dîn Tiga.	Damuwar: Sun nemi a gyara barazanar fissures (gurɓatattun rami) yadda ya kamata kuma cikin sauri domin samun ingantattun hanyoyin jigilar kayansu. Martani: Wakilan KRISO sun tabbatar wa da manoman cewa aikin da ya kamata za a fara shi nan ba da jimawa ba bayan kammala wannan bincike, kuma damuwarsu game da hanyoyin jigilar kayansu za a isar da ita ga manajan aikin Tiga Dam.
Masu kamun kifi (KRIS)	Damuwar: Suna kuma kukan cewa RBDA ba ta dauki damuwarsu cikin la'akari, musamman game da ƙaƙƙarfan ginin dam dîn. Martani: Tawagar ESIA ta tabbatar wa da masu kamun kifi cewa binciken zai ba da shawarwarin hanyoyin irigason a cikin ƙarin bayanin. Za a tura damuwarsu zuwa ofishin da ya dace.

ES6: HADARI DA TASIRI

Binciken tasiri da kuma matakin muhimmancinsa sun yi la’akari da yiwuwar da girman tasirin muhalli ko na zamantakewa. Hakanan, an duba girman yankin da kuma tsawon lokacin tasirin dangane da jinƙai na masu karɓa da albarkatu masu muhimmanci. Ka’idoji na tantance muhimmancin tasiri sun dogara ne akan haɗakar

da kimanta girman tasiri da jinƙan masu karɓa don tantance tsanani, sannan a haɗa wannan kimanta tsanani da kimanta yiwuwar tasiri don bayar da matakin muhimmancin tasiri.

Manyan hadarurruka da tasirin muhalli da na zamantakewa mai amfani daga ayyukan gyara sun yi kama da waɗanda aka bayyana a cikin ESIA Hadejia 1.0

ES7: SHIRIN KULAWA DA TSARE-TASARE NA MUHALLI DA ZAMANTAKEWA (ESMP)

An sabunta matrix na ESMP da aka tsara don ESIA Hadejia 1.0 don haɗa ƙididdigar kudî don rage haɗari da sa ido kan haɗarin da ke da alaƙa da ayyukan tashar wutar lantarki ta ruwa (Hydro power station).

Wasu matakan gudanarwa don rage tasirin negatifi da kuma tasiri:

- RBDA ya kamata ta hada kai da masu kamun kifi domin tabbatar da dorewar ginin ƙaƙƙarfan dam ɗin Tiga.
- Ayyukan tashar wutar lantarki ta ruwa (Hydro power station) ya kamata manajan aikin ya sanya ido a kai domin tabbatar da kyawawan dabi'u da tsare-tsaren muhalli masu lafiya.
- Akwai bukatar a tanadi akwatunan koke-koke tare da rubutun a cikin harsunan gida a ofishin manajan aikin.

CHAPTER ONE: INTRODUCTION

1.1 Background

The Federal Government of Nigeria through the Federal Ministry of Water Resources with support from the World Bank is implementing the TRIMING Project, a seven-year program with a credit of US$495.3 million from the International Development Association. The TRIMING Project since 2015 has been supporting, coordinating and supervising the constructions and rehabilitation activities towards integrated water resource management in five irrigation schemes located in three river basins within Northern Nigeria namely: Bakolori Irrigation Scheme; Middle Rima Valley Irrigation Scheme; Kano River Irrigation Scheme (KRIS); Hadejia Valley Irrigation Scheme (HVIS) and Dadin Kowa Irrigation Scheme.

In 2017, the project commenced the rehabilitation activities within KRIS, of which Tiga Dam had series of rehabilitation works in order to enhance the effectiveness of the dam. As part of the Operational Policy of the World Bank and consistent with Nigeria EIA Act CFN 2004, these activities were screened and rated as Category A Project, which led to the development of an Environmental and Social Impact Assessment. The ESIA was completed and disclosed in January 2017 (hereinafter refer to as ESIA Hadejia 1.0)

1.1.1 Justification for Remedial Works

Around September 2020, TRIMING Project was notified by Sinohydro Corporation Ltd of lateral cracks on the Embankment crest of Tiga Dam, which was also confirmed by the River Basin Staff. It was reported that the crack (measuring: length-30 meters, width- around 10 cm, visible depth-60cm) was observed 200 meters away from the left outlet of Tiga dam. This became the second crack observed since the retrofitting works of the Penstock by Messrs. Skipper Nigeria Ltd. Sequel to devastating flood incident witnessed between September-October 2022 especially within the Hadejia-Jama'are River Basin, new longitudinal cracks were reported by Department of Dams and Reservoir Operations in November 2022 and TRIMNG Projects in December 2022. A technical committee was authorized to inspect the above concerns and report[5] observations with the following objectives below

- Identify the causes of the longitudinal cracks (analysis of Geophysical and Geotechnical reports, soil analyses, reports of remedial works from Contractor.s). Considering factors such as dam material properties, foundation conditions, the entire dam drainage system, the embankment configuration, construction practices, and environmental factors including.
- Assess the stability of the dam, existing condition, evaluate the risks posed by the cracks including potential failure modes and their consequences.
- Propose appropriate rehabilitation measures to address the identified issues and mitigate risks associated with the longitudinal cracks.
- Develop a comprehensive plan outlining the recommended rehabilitation works, including detailed design requirements, construction timeline, and estimated costs.

[5] Report on Emergency Repairs of Longitudinal Cracks on the Crest Of Tiga Dam Embankment, Kano State

One of objectives above was to investigate the root causes of the dam cracks and to propose remedial works. Subsequently, about 11 typical crack development zones were identified using probe pit, geophysical and geotechnical surveys. In order to treat these cracks, a set of integrated remedial measures were proposed, including repair and sealing of existing cracks, restoration of the downstream slope ratio and improvement of the drainage system.

As the project ends in 2025, Dam Operations Improvement and Safety have become utmost important for the sustainability of Tiga Dam. Hence, TRIMING Project has approved further remedial works in Tiga Dam within KRIS.

1.2 Rationale for the Addendum

As earlier stated, in 2017 the project embarked on rehabilitation works within KRIS and HVIS including civil works on Tiga Dam and sundry as documented in ESIA Hadejia 1.0. also referred to as "*Environmental and Social Impact Assessment (ESIA) For the Hadejia Jama'are Sub-Basin with Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the Associated Cumulative Impacts*". This report was comprehensive and also covered potential risks impacts associated with works around Tiga Dam.

However, over the years, there have been concerns about the safety of the dam due to inadequate design, construction and visible deterioration of embankment as reported by several companies and consultants. These concerns were further confirmed in 2020 through to 2022, when TRIMING Project was notified by Sinohydro Corporation Ltd of lateral cracks on the Embankment crest of Tiga Dam, which was also confirmed by the Staff of River Basin. Assessment conducted by Messrs. NESPAK and confirmed by the Project Technical Committee revealed additional works are required to protect the Scheme and avoid the emerging environmental degradation. In order to treat these cracks, a set of integrated remedial measures were proposed, including repair and sealing of existing cracks, restoration of the downstream slope ratio and improvement of the drainage system.

These remedial works will further ensure dam safety and mitigate possible risks from identified cracks. Consequently, the Project needs to re-assess some aspects of the remedial works that are considered new risks/impacts that were not assessed in the ESIA Hadejia 1.0. Furthermore, according to EIA Act CAP LFN 2004, an assessment done within a span of seven years and within the project site requires an UPDATE OF THE ASSESSMENT AND NOT A FRESH EIA. Hence, the need for this addendum to ESIA Hadejia 1.0

1.3 Objective of the Addendum to ESIA Hadejia 1.0

The objective of this Addendum is to provide updated information and assessment such as additional studies, impact assessments, mitigation and management plans regarding the remedial works for Tiga Dam. This Addendum focuses on issues where the conclusions of the ESIA Hadejia 1.0 regarding potential impacts are significantly affected by the treatment of cracks on Tiga Dam

Embankment. Where there is considered to be no change in the assessed impacts, no further assessment is required and potential impacts remain the same as concluded in the ESIA Hadejia 1.0. Therefore, this Addendum should be read in conjunction with the ESIA Hadejia 1.0 and supporting documents such as the Technical Reports for Tiga Dam Crack Treatment prepared by Contractor, Environmental and Social Management Framework for TRIMING and Emergency Repairs of Longitudinal on the Crest of Tiga Dam.

1.4 Methodology for the Process

A. This addendum utilized various reports prepared for TRIMING Project for the schemes, which includes: Operation & Manual for Tiga Dam; Technical Report for Tiga Dam Cracks Treatment; Feasibility studies for the schemes, the Environmental and Social Management Framework (ESMF); ESIA Hadejia 1.0; Project Appraisal Document etc.

B. Baseline assessment and stakeholder consultations were very critical to this Addendum. Baseline assessment of KRIS was carried out in order to gain an understanding of the scheme whilst comparing the ambient conditions (physical, biological and social) with the proposed remedial works.

The stakeholders consulted were categorized into two (2) broad groups:

- Primary stakeholder-Groups that will be affected directly from the remedial works and;
- Secondary stakeholder: This constitutes groups, agencies and public institutions that will be affected indirectly or may have interest in the project.

Table 1: Stakeholder Groups

Primary stakeholders	Secondary stakeholders
Upstream and Downstream Farmers of Tiga Dam	• Federal Ministry of Water Resources • Ministry of Environment at state and federal levels • Ministry of Power, Housing and Works
Women farmers/water user associations within the schemes	Transmission Company of Nigeria, Kano Electricity Distribution Company
Hadejia River Basin Development Authority	• Sinohydro Corporation Ltd. • Skipper Nigeria Limited
• Kano River Irrigation Scheme Office	• Traditional Council – the emirate council, district and village heads
• Hadejia Valley Irrigation Scheme Office	NGOs
Association of fishermen along Tiga Dam	
Vulnerable group - Association of disable farmers within the schemes	
Farmers, herdsmen, Women farmers, from HNW	

C. In order to ensure inclusive consultation, Hausa and English languages were used for consultation. The consultant worked with Project staff of KRISO and WUA to ensure that all stakeholders were identified, reached out to and communicated in their preferred language (Hausa). The use of Hausa and/or translation in Hausa helped to ensure robust engagement, inputs, expressions of concerns and meaningful responses.

CHAPTER 2: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

This chapter outlines existing environmental legislations, policies, institutional frameworks, identifiable World Bank Safeguard Policies, and international regulations deemed relevant to the KRIS.

2.2 Relevant Regulatory Policies in Nigeria

An overview of relevant Ministries, Departments and Agencies (MDAs), responsible for Environmental, Water, Power, Agricultural and Rural Developmental sectors at the Federal level are itemized below. Detailed functions of these MDAs are outlined in the TRIMING ESMF report.

Environmental Mandate

National Legal Instruments on the Environment

ENVIRONMENTAL PROTECTION; these are laws that enforce compliance with environment policies in Nigeria and PMU should ensure compliance from the Contractor. during project implementation period.

a) National Environmental Policy
b) National Environmental Standards and Regulations Enforcement Agency Act 2007 (NESREA Act.)
c) National Guidelines and Standards for Environmental Pollution Control in Nigeria 1991

ENVIRONMENTAL IMPACT ASSESSMENT

a. Environmental Impact Assessment Act No. 86, 1992 (FMEnv)
b. Environmental Impact Assessment (Amendment) Act 1999
c. Environmental Impact Assessment Procedural Guidelines 1995
d. Sectoral Guidelines for EIA

ENVIRONMENTAL AUDIT

National Guidelines on Environmental Audit in Nigeria 1999

AIR QUALITY; during construction phase the PMU should ensure that the Contractor. comply with this regulations to provide protection of air from pollutants.

National Environmental (Control of Vehicular Emissions from Petrol and Diesel Engines) Regulations, 2010. S. I. No. 20.

NOISE AND VIBRATION; these law prescribes the maximum permissible noise levels from a project activities to which a person may be exposed which the PMU should ensure the Contractor.s adhere to National Environmental (Noise Standards and Control) Regulations, 2009. S. I. No. 35.

WASTE MANAGEMENT

a) FMEnv Policy Guidelines on Solid Waste Management 2005
b) Pollution Abatement in Industries and Facilities Generating Waste Regulation 1991
c) Management of Hazardous and Solid Wastes Regulation 1999
d) Harmful Wastes Act (Criminal Provisions) Act. No. 42, 1988
e) National Environmental (Sanitation and Waste Control) Regulations, 2009. S.I No. 28.

BIODIVERSITY

a) National Environmental (Access to Generic Resources and Benefit Sharing) Regulations, 2009. S. I. No. 30.
b) National Environmental (Control of Bush/Forest Fire and Open Burning) Regulations, 2010. S. I. No. 15.
c) National Environmental (Protection of Endangered Species in International Trade) Regulations, 2010. S. I. No. 16.

Water Resources Mandate

National Legal Instruments on Water Resources; these are legal frameworks that provide proper water resource development, management and conservation and should adhered to throughout the implementation process by the Contractor.s.

a) Water Resources Act No. 101 of 1993
b) National Water Policy
c) National Environmental (Wetlands, River Banks and Lake Shores Regulations, S. I. No. 26 of 2009.
d) National Environmental (Surface and Groundwater Quality Control) Regulations 2010. S. I. No. 22.
e) National Environmental (Soil Erosion and Flood Control) Regulations, 2010. S. I. No. 12.
d) National Irrigation Policy and Strategy (NIPS)

Agricultural Mandate

National Legal Instruments on Agriculture

Agriculture Policies

a) The Agricultural Promotion Policy (APP)
b) The Agricultural Transformation Agenda (ATA)

2.3 Relevant Acts and Legislations

In addition to the legal instruments itemized in previous sections, the following are other important instruments relevant to the proposed project..

- Land Use Act of 1978 (reviewed CAP 202 1990)
- Criminal Code Act
- Rehabilitation, Reconstruction and Development Act, 1990

2.4 State Legislation

2.4.1 Kano State

a) **Kano State Ministry of Environment (KSMEnv):** is responsible for protecting, preserving and improving the state environs. This Ministry is in charge of executing State programmes relating to control of droughts, desertification, flood, erosion and management of forests estate.
b) **Kano State Environmental Planning and Protection Agency (KASEPPA):**IA government agency under the KSME responsible for all environmental related issues in the state. Responsibilities include planning and development of urban centers, provision of amenities, infrastructures and other functions necessary for healthy and orderly urban growth.
c) **Kano State Ministry of Agriculture and Natural Resources:** The Ministry is primarily responsible for planning, formulating, implementing and coordinating of agricultural policies of the State.

d) **Kano State Ministry of Water Resources:** The Ministry is responsible for provision of sustainable drinking water and irrigation facilities in the State.

2.5 World Bank's Safeguards Policies triggered in KRIS

The likely World Bank Safeguard Policies triggered in KRIS are outline in Table 2 below.

Table 2: WB Safeguard Policies Triggered by sub-project activities at Tiga Dam (KRIS)

Safeguard Policies	KRIS	Reason for Triggers
Environmental Assessment (OP 4.01)	Yes	The ESIA Hadejia 1.0 was screened and rated Category A. Hence, these remedial works falls under KRIS and is still rated, Category 'A' project
Pest Management (OP 4.09)	Yes	Irrigated agricultural activities will involve use of fertilizer and chemicals including pesticides.
Physical Cultural Resources (OP 4.11)	Yes	Excavation activities during construction can lead to impacts on physical and cultural resources
Involuntary Resettlement (OP 4.12)	Yes	Project intervention may result in some degree of land acquisition and temporary loss of livelihood. Resettlement Management Plan (RAP) to be prepared for KRIS and HVIS
Safety of Dams (OP 4.37)	Yes	Scheme dependent on existing multi-purpose dams and reservoirs

CHAPTER 3: PROJECT AND PROCESS DESCRIPTION

3.1 Background

This Chapter provides an overview of the TRIMING Project, Existing Project Activities, and proposed remedial works as documented in the feasibility studies and technical report prepared for Tiga Dam Embankment Crack Treatment.

3.2 Overview of TRIMING Project

The Transforming Irrigation Management in Nigeria currently covers five irrigation schemes located in three river basins in Northern Nigeria of which Kano River Irrigation Scheme (KRIS) falls under the Hadejia River sub-basin, which is part of the Hadejia Jama'are Komadugu Yobe (HJKY) Basin. The main goal of the TRIMING Project is to rehabilitate the irrigation schemes to optimum potential, concomitant with all future of water demand and sustainably fulfilling overall environmental constraints. The intended outcome is to

- rehabilitate and improve large-scale public irrigations schemes for a total irrigation area of about 50,000 ha and concomitant activities in agriculture with approximately 140,000 farm families and over 1 million people beneficiaries.
- Strengthen five Water User Associations Federations (WUAF), comprising 550 multiple secondary and tertiary level water users associations (WUAs) servicing and representing the beneficiary farmers. This is complemented with improvements in dams/reservoirs to assure integrated water resources management and to improve safety for people downstream to benefit a population of about 10 million people.
- Increase agricultural productivity of the irrigated lands as well as the processing and marketing side of the increased output.
- Improve capacity building for institutional development and project management

3.2.1 Project Component

The Project Development Objective is to improve access to irrigation and drainage services and to strengthen institutional arrangements for integrated water resources management and agriculture service delivery in selected large-scale public schemes in Northern Nigeria. The project is structured into four main components and eight sub-component as illustrated in table 3 below

Table 3: TRIMING Components and Sub-component

Project Component	Key Activities
Component 1: Water Resources Management and Dam Operation Improvement	
Subcomponent 1.1: Support to Integrated Water Resources Management	The *piloting* of anticipated provisions for separation of government regulatory and operational powers and responsibilities for integrated water resources management (IWRM) of basin-wide allocation, control, and river channel maintenance for sustainable public irrigation scheme functioning
Subcomponent 1.2: Dam Operations Improvement and Safety	Investments for sustainable operational safety, improved operational practices, and increased dam safety of selected dams and reservoirs including Bakolori, Zobe, Goronyo, Tiga, and Ruwan Kanya operational reservoir and Hadejia Barrage
Component 2: Irrigation Development and Management	
Subcomponent 2.1: Irrigation	Rehabilitation of 27,000 ha to improve the performance of a total of 50,000 ha irrigation area in five schemes downstream of the existing storage reservoirs and

Infrastructure Investments	major investment in irrigation civil works and related studies.
Subcomponent 2.2: Improving Irrigation Management at Scheme Level	Aims to ensure the long-term viability of the irrigation and drainage services delivered on public irrigation schemes by implementing a progressive management transfer to Water Users Associations (WUAs) and to autonomous professional operators, either public or private.
Component 3: Enhancing Agricultural Productivity and Supply Chains	
Subcomponent 3.1: Support to agricultural productivity and market linkages	Provide resources to enhance farmers' productivity in the rehabilitated schemes and improve their participation in value chains through a matching grant mechanism; and the establishment of Farmers' Management and Service Delivery Centers on each scheme, supported by extension and marketing agribusiness professionals.
Subcomponent 3.2: Support to Innovation and R&D	Technical assistance for farmers, water schools, applied research such as improving irrigated agronomy, and introduction of innovations such as new crops or production techniques as part of emerging commercial partnerships.
Component 4: Institutional Development and Project Management	
Subcomponent 4.1: Institutional Development and Governance	This subcomponent includes five activities: capacity building and training of FMWR staff; support to RBDAs; consensus building and supporting the change process; generation, feedback, and dissemination of data, and strengthening supervision and accountability in the sector.
Subcomponent 4.2: Project Management and M&E	The activities here will support the establishment of the Project Management Unit and other key coordination institutions within Government, and will provide guidance on change management processes. The M&E activities will develop an Information System for project purposes, studies and analytical work and a records and document management system.

3.3 Decription of the Project Area: Kano River Irrigation Scheme (KRIS)

KRIS is located about 30 km southwest of Kano, the capital city of Kano State. KRIS cut across five (5) Local Government Areas (LGAs), namely Kura, Garun Mallam, Bunkure, Bebeji, and Rano LGAs (See Figure 1). The scheme is divided into two phases; the first phase was originally designed with a capacity of 22,000 ha of land, out of which 13,890 ha have been fully developed. The project area is divided into the East and the West branch sections by the Shimar River, which together with the Kano River drains the scheme. In addition, three (3) sectors (589 ha) are abstracting water directly from the Gayare Branch Canal.

In the West Branch Canal region at present approximately 12,000 ha (28 Sectors) have been fully developed as irrigable land, however, according to the information obtained from the HJRBDA, about 50% of the area is not receiving water due to a number of reasons.

The treatment of dam embankment cracks, rehabilitation and expansion works for KRIS will be undertaken mainly at the Tiga Dam Crest, KRIS Office, Dam location, Irrigation Scheme and river network as indicated in Figure 2 below.

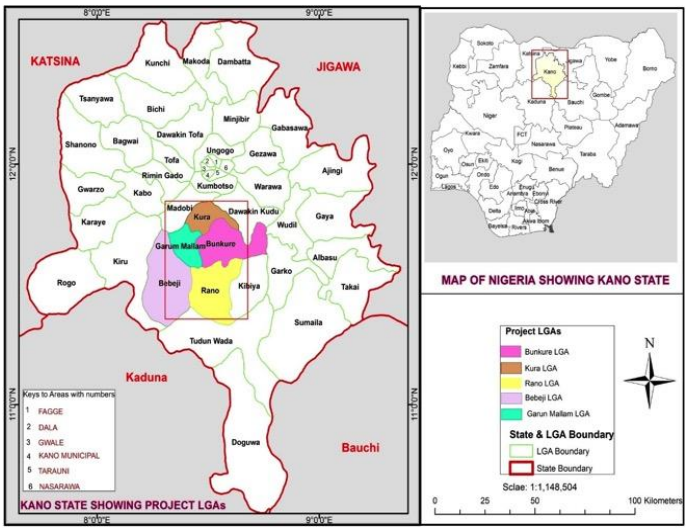


Figure 2: Map of Kano State showing the LGAs covered by KRIS

3.4 Overview of Tiga Dam & Its Activities

The Water Resources Division of the Kano State Ministry of Works and Survey constructed Tiga Dam from 1971 to 1974, while the Water Resources and Engineering Construction Agency (WRECA) designed the dam. The construction commenced after various feasibility and preliminary studies by, inter alia, the US Bureau of Reclamation and NEDECO Consultants. The dam is owned by Federal Ministry of Water Resources (FMWR) and operated by Hadejia Jama 'are River Basin Development Authority

3.4.1 Tiga Dam & Surroundings

The Tiga Dam is a zone-filled earth dam, which was designed and built between1970 to 1974. The dam reservoir surface area as originally designed is about 18,900 ha with a structural height of 48m, hydraulic height of 42.68m and an active storage capacity of 1,845 million m^3 at full supply level. It lies across the Kano River, the main tributary of the Hadejia River. Water from the dam supplies KRIS. The loss of reservoir capacity due to sedimentation since its construction has not been assessed. However, since the outlet pipes have not been blocked by the accumulated sediment in the reservoir, it is believed that the sediment level may still be within the dead storage zone. The outlet works of the dam have a maximum capacity of $47m^3/s$, which is achieved at full reservoir level. In 1988, in order to contain the threat of overtopping and seepage through the dam, it was deemed necessary to reduce the spillway crest elevation by 2.00m, thereby effectively reduce the active storage capacity to 1,283 million m^3 - about 68% of its original full capacity. This exercise also reduced the outlet discharge capacity. There is a bypass gate located at the very beginning of

the supply canal. This delivers water back to Kano River as a recharge. Specific information and features of the dam are outlined in table 4 below

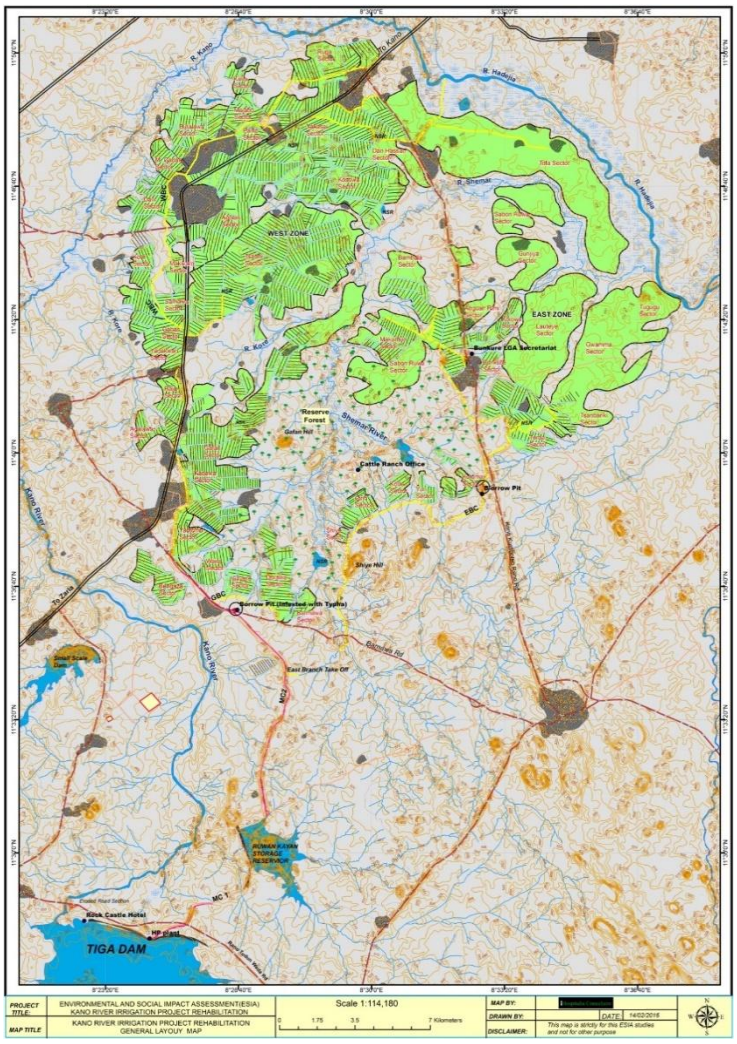


Figure 3: An overview of KRIS Layout including Tiga Dam

Table 4: Basic Features of Tiga Dam

Dam Features	Measurement
Embankment height river bed level	48m
Embankment length	6000m
Crest elevation	530.96masl
Upstream slope	1:3
Downstream slope	1:2.5
Crest width	7.6m
Catchment	6,553 km^2
Average Annual rainfall	1,000mm
Average annual runoff	1.3 x 10^9 m^3

Average annual Inflow	1.11 x $10^9 m^3$
Annual evaporation losses	120 x 10^6 m^3
Full supply level	527.304m (lowered to around 524m)
Reservoir Volume at FSL	1.974 x $10^9 m^3$
Reservoir area at FSL	18,900 ha
Outlet capacity at FSL	65 m^3/s
Average Annual Spill	30.9 x $10^6 m^3$

On the downstream side, the clay core wall is equipped with a vertical drainage body connected to the horizontal blanket drainage layer at the foundation. The upstream slope is protected by rock riprap, while the downstream slope is covered with grass. The dam design is viewed in figure 4 below

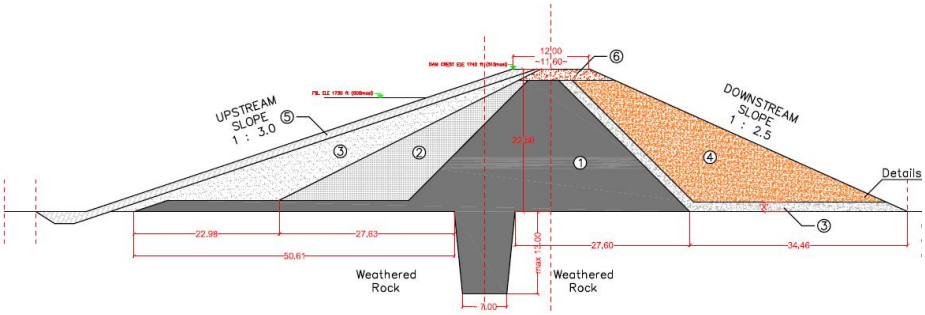


Figure 4: Design Section of Tiga Dam

The Upstream: the upstream slope is protected with riprap and is generally intact. The slope is gentler at the bottom and steeper at the top with the lower slope having a ratio of 1:2.5 to 1:2.08 and the upper slope having a ratio of 1:2 to 1:1.5. Field consultation with some fishermen suggested some riprap have been displaced due to rock blast in 2015 during the construction of the hydropower plant. Consequently, causing the upstream slope to be exposed to impact from flooding especially during the rainy season. Figure 4 below provides pictorial illustration of the exposed portions of the slope vegetated with grass.

Figure 5: Upstream Slope protected with Riprap

The Downstream: the face of the dam is vegetated with turf grass (see figure 5 below) and incorporates a system of drainage ditches. The slope exhibits good overall integrity, with no deformations (bulges or depressions), zones of saturation or seepage, evidence of internal erosion (piping), and indications of mass wasting or soil liquefaction. The geometry of the downstream slope is characterized by non-uniform gradient with the lower section of the slope having a more gentle inclination with slope ratio ranging from 1:3.5 to 1:1.5, and the upper section of the slope presenting a steeper profile with slope ratio varying between 1:3 to 1:1.5.

Figure 6: A Section of the downstream slope of Tiga Dam vegetated with Grass

3.4.2 Summary of Activities on Tiga Dam and Environs

Since its completion in 1974, several international engineering companies have conducted safety appraisal on the Tiga Dam. The main conclusions of those safety appraisals are as follows:

a. In 1978, the dam safety assessment report made by Haskoning (Netherlands) concluded that the design was incomplete in sufficient detail for the size of the dam, and the design of the outlet was inadequate; the foundation treatment was not adequate and quality control on embankment placing and compaction was inadequate. The recommendations proposed included improvements to the outlets and dam drainage, lower the full supply water level, strengthen monitoring and management.

b. In 1987, the USBR conducted a safety assessment on the dam and provided recommendations: taking temporary measures to reduce the risk of dam piping (such as excavating a seepage berm); lowering the full supply water level by excavating a new by-wash spillway.

c. In 2002, safety appraisal of the Tiga dam was conducted. The appraisal report pointed out that the main threats on the Tiga dam are internal erosion due to arching of fill material over cut off trench, internal erosion caused by a fracture of one of the two secondary outlet pipes, and slope failure under seismic load.

d. Royal Haskoning DHV (Netherlands) conducted an assessment on the safety status of the Tiga dam between 2014 and 2016. Some proposals were outlined such: maintenance and upgrading plan for embankment, mainly including: heightening the dam crest elevation to 531.20m (the maximum settlement between 1978 and 1990: 1.2m), adding a layer of large-particle riprap to the upstream slope, repairing the upstream sliding surface tension cracks, dredging piezometer, and adding new dam crest settlement observation piers.

e. From 2015 till date, two companies are working within Tiga Dam, namely: Messrs. SKIPPER Nig Ltd, Contractor. responsible for the construction of the Hydroelectric Power Plant (HEP) at the dam; while Sinohydro Corporation Ltd is responsible for minor remedial works around the dam.

3.4.3 History of Cracks Development on Tiga Dam Embankment

After the completion of the Tiga Dam, the Federal Ministry of Water Resources (FMWR) through Hadejia Jama 'are River Basin Development Authority have conducted series of safety appraisal on the dam especially with respect to crack development as follows:

a. In 1987, cracks on the dam crest were mentioned in USBR's safety assessment report on the Tiga Dam, with a depth of up to 2m, but it concluded that it is unlikely that they are sign of embankment failure. Filling cracks by silt-clay-sand slurry was recommended.

b. In 2016, in Royal Haskoning DHV's safety evaluation and design of upgrades report, it was mentioned that only one crack was found in the crest near main outlet, and later determined to be caused by blasting for the hydroelectric power station.

c. On September 6th, 2020, SINOHYDRO reported to TRIMING Project that longitudinal cracks were found on the embankment crest, one of those was 30m long, 10cm wide, and 60cm deep visually, located 200m away from the left outlet of Tiga dam. At the end of October 2020, SINOHYDRO heightened and filled the embankment crest according to the owner's instructions. This activity is part of the remedial works recommended to improve the dam safety. However, after the unprecedented flood in Hadejia-Jama'are River Basin of Nigeria from September to October 2022, numerous longitudinal cracks begin to appear on the asphalt surface of the dam crest.

3.4.3.1 Description of Cracks

Longitudinal cracks are cracks that occur parallel to the centerline of the asphaltic pavement or laydown direction. There are currently many cracks on the dam crest, mainly distributed along 11 typical zones and between chainages 0+060 to 3+350 vary in length from 2 to 65 meters, and in width from 0.5 to 75cm, with some localized areas reaching 10 to 27cm. Most of the cracks were maintained with bitumen, but many have re-cracked after the initial maintenance. Further maintenance work with cement was recently adopted in an attempt to seal up the cracks, but some portions have also re-cracked as shown in figure 5-8 below.

Figure 7: Cracks on Tiga Dam Crest

Figure 8: A section of the Dam Crest showing remedial works on the Cracks

Figure 7: A section of cracks sealed by cement on the Dam Crest

Figure 8: A section of the Dam Crest

The primary longitudinal cracks identified in the dam structure are located between chainage 0+500 to 2+500. These cracks exhibit an almost vertical orientation, with depth reaching up to 2.8 meters or more. The majority of these cracks are classified as expansion-type, and no evidence of vertical displacement between the two sides of the cracks was observed in the probe pit dug to investigate the on-site cracks. A summary of these cracks are further elaborated in table 5 below

Table 5: Summary of Dam Crack Statistical

Zone	Chainages (CH)	Crack Length	Length (m)	Opening (cm)
Zone 1	1+844.3~1+885.8	L1	26	0.5~9
Zone 2	1+510.7~1+554.3	L2	15	5~10, max 22
		L3	14	7~27
Zone 3	1+348.5~1+391.5	L4	36	1~2,locally 5~17
Zone 4	0+906~0+930	L5	9	0.5~7
		L6	16	0.5~7.5
Zone 5	0+933.6~0+962.5	L7	28	0.5~4
Zone 6	0+798.5~0+842.5	L8	29	1~2
		L9	18	0.5~9
Zone 7	0+673~0+724	L10	13	0.5~1.5

		L11	31	1~3,locally 6~16.5
Zone 8	0+534.5~0+585.5	L12	10.5	0.5~1.5
		L13	8	1~3.5
		L14	33	0.5~1.5
		L15	25	0.5~2.0
Zone 9	2+345.5~2+368.5	L16	35	0.5~1.5,locally 5~7
Zone 10	3+004.5~3+082	L17	65	No cracking observed after asphalt repair
Zone 11	0+982~1+030	L18	42	0.5~3,locally 4~10

Source: Technical Report Tiga Dam Crack Treatment, 2024

3.5 Proposed Remedial Works on Tiga Dam Embankment

The proposed remedial works to treat the longitudinal cracks on Tiga Dam Crest are categorized into rehabilitation and construction. There are currently many cracks on the dam crest, mainly distributed along 11 typical zones and between CH 0+000 to 3+400 chainages as seen in table 5 above . The proposed remedial plans are itemised as follows;

Repair and Seal Existing Cracks: The construction sequence is as follows:

- Demolish the bituminous pavement on the dam crest (15cm thick) and remove shallow cracks on the surface (not exceeding 1m);
- Inject the cracks with slurry without pressure;
- Backfill clay and compact to the elevation of 530.95m, with a compactness of not less than 98%;
- Lay geotextile, 200g/m^2;
- Lay PE geo-membrane, 0.5mm thick, to prevent rain from entering;
- Lay geotextile, 500g/m^2;
- Lay crushed stones and compact them, 20cm thick;
- Pave bituminous pavement, 5cm thick (option);

Restore the Downstream Slope Ratio: The construction sequence is as follows:

- Clean the downstream face of the dam, remove weeds, trees, drainage channels, etc.
- Backfill clay and compact to the design slope ratio (1:3.0), with a compactness of not less than 98%, and the material used for heightening of dam shall be consistent with the material used;
- Plant grass on the compacted slope to prevent soil loss and restore facilities behind the dam

Improve the Downstream Slope Toe Drainage: construction sequence:

- Dig trench at downstream slope toe, expose the horizontal drainage body in the dam body and connect to the collection well;
- Lay geotextile in the trench, 200g/m2;
- Lay crushed stones in the trench to divert seepage water from the dam to the collection well;
- Top covered with 1m thick clay

Figure 9 gives a plan view of the downstream slope

However, due to the high dam body, long downstream slope of Tiga Dam, short contract period, large earthwork filling volume and low efficiency of dam slope filling construction, these works have been segmented into two phases- Phase 1 and 2. This will further ensure that the magnitude of the potential impacts and risks are minimized which will allow quick recovery of the carrying capacity of the intervention area.

Phase 1 Work Program for Tiga Dam (Completion Period – January, 2025)

A. General Work

- Mobilization of Staff and Equipment
- Temporary Camp site
- Access road and ancillary works for temporary work
- Detailed design drawings

B. Embankment and crest

- Strip asphalt pavement
- Removal existing curbstone
- Excavate very loose material and Transport
- Drilling hole along the dam axis
- Total Number of holes（825）
- Curtain grouting along the dam axis
- Non pressure grouting of embankment crest cracks

C. Toe Drain

- Excavate and Install horizontal drain pipes
- Excavation of downstream toe area for finger drains
- Place geotextile in the finger drain trenches
- Backfill and compact aggregate in and around the trench
- Backfill with appropriate materials and compact in the trench
- Prefabrication of new relief wells It is estimated that the average depth of each relief well is 3 meters, the length of each prefabricated well is 1 meter, and the total number of prefabricated wells is 72.）
- Construction of new relief wells (The number of newly designed relief wells is 24）

Phase 2 Work Program for Tiga Dam (Completion Period - December, 2025)

A. General Works

- Mobilization(Staff and Equipment)
- Access road and ancillary works for temporary work
- Look for Borrow Pit and do test

B. Embankment and crest

- Fill back the Dam Crest
- Place geotextile above the embankment
- Place PE geo-membrane above the geotextile,
- Place geotextile above the embankment
- Place and compact aggregate of 200mm thickness
- Construction of new curbstone. (Chainage 0+000 to 3+ 400)
- Laying asphalt pavement on the embankment crest

C. Downstream Slope

- Allow for stripping and removal of overgrown grasses & root and treatment of Shrubs and trees & drainage channels and stairs away & top soil
- Replace the vegetative soil on to the repaired section of the downstream slope
- Fill and compact the downstream curvilinear section to achieve required slope. The compaction degree shall not be less than 98% (Chainage 0+000 to 3+ 400)
- Restore drainage channels and stairs

Although the project closes in January, the work program as itemised above indicates that proposed remedial works will not be fully completed as of January 2025. However, this Addendum ESIA will address the potential environment and social impacts of the full scope of work (Phases 1 & 2).

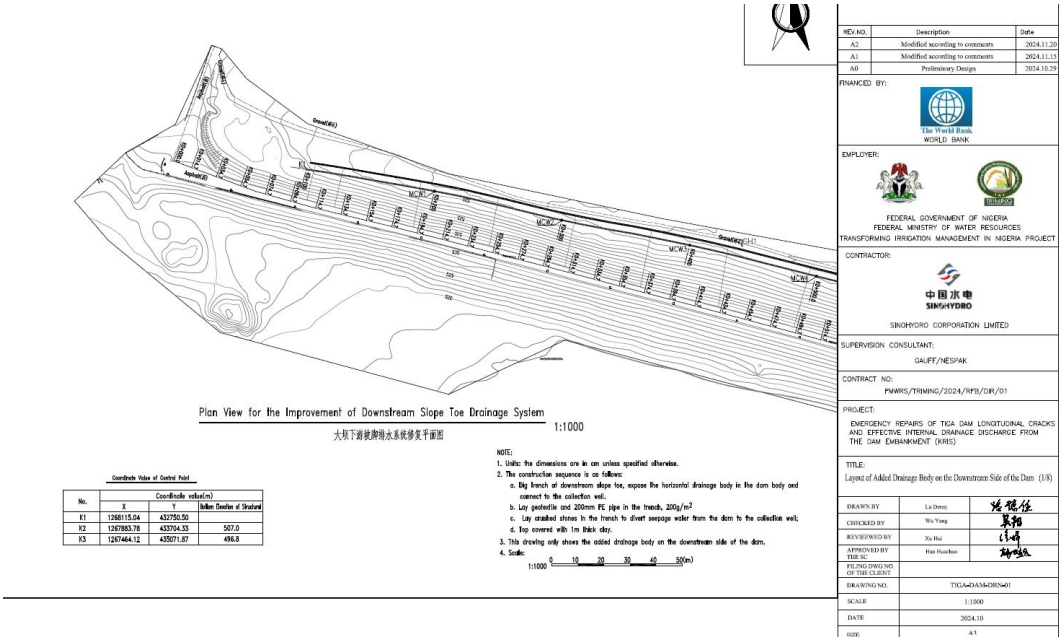


Figure 9: Plan View of the Downstream Slope, Tiga Dam

CHAPTER 4: DESCRIPTION OF THE PROJECT ENVIRONMENT AND BASELINE STUDIES

4.1 Introduction

The fieldwork conducted with respect to the physical, biological and socio-economics assessment indicated similarities with the information provided in ESIA Hadejia 1.0. For extensive information, refer to ESIA Hadejia 1.0. Therefore, this chapter provides information on only key environmental indicators such as waste, erosion sites, flooding, borrow pits and drainage including specific details on socioeconomics for Tiga Town and environmental baseline for environmental data (air, water and soil analysis)

4.2 Overview of Project Environment

4.2.1 Key Environmental Indicators

The screening and scoping exercise conducted identified key environmental indicators that are precursor in identifying inherent social and environmental risks and impacts. These indicators are discussed below

.

Water and Drainage

Majority of communities source their water from hand-pump borehole, Kano River and streams. Farmers both from upstream and downstream use pumping machine to source water from the main-canal. The closure of the main-canal for repairs affected their livelihood especially during the blasting of the rocks by the Hydropower Contractor.. Major rocks from the blast were found along the main-canal causing debris in the water and possible reduction in water quality.

The drainage network was designed to dispose of storm water runoff and irrigation surplus water. Runoff from the field were originally intended to be collected by the tertiary and field drains and passed into the secondary and main drains. However, most of these drains are heavily silted and blocked by molders from the rock blasting.

Flooding and Erosion

Field visit shows that the downstream farmers experience regular flooding especially during the rainy season when the dam was closed for construction. Opening of the dam caused massive release of water downstream causing them economic loss of their crops. The excessive use of agrochemicals in addition to flooding has aggravated erosion sites and reduced water quality.

Borrow Pits

Only two borrow pits were identified within Tiga Dam as seen in figure 8&9 . These two borrow pits have become ponds and heavily infested with Typha grass. These borrows pits where created to support construction activities of embankments, access roads and canals. They posed useful at the time, as Contractor.s did not need to travel far to source earth for their civil works. The activity resulted in short-term employment of the locals who were engaged by the Contractor.s.

Other borrow pits identified outside the project perimeter have become waste dumpsites and erosion sites while others have been reclaimed by some individuals, who use it as a means of livelihood for laterite supply. They sell the laterite to Contractor.s for construction purposes at a stipulated fee.

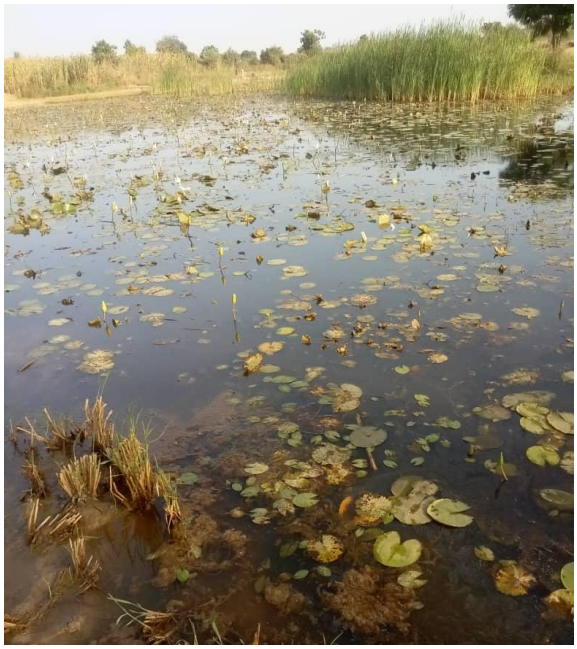


Figure 11: Borrow Pit infested with Typha Grass and Water

Figure 10: Infested Borrow Pit with Typha Grass

4.3 Socio-economics for Tiga Town

Socioeconomics survey provides a ground to understanding the household behavioural dynamics of project affected individuals, Water User Associations (WUAs) and communities within project corridor. The scope of investigation under this section includes but not limited to political and administrative setting, demography, and women's right and participation, and livelihood concerns including perceived impacts of the proposed remedial works. The outcome of this section will be useful for futuristic programs for potential project activities. It will also be helpful in the safeguards audit/measurement and monitoring of mitigation results, and the overall TRIMING project implementation.

4.3.1 Methodology for the Social Assessment

The social assessment was carried out in line with the requirements and scope defined in the terms of reference for this addendum assessment. A checklist was developed for profiling the social groups and attributes in the study area. The first step was consultation with major stakeholders and project management offices as provided by KRIS Office, TRIMING. These include but not limited to HJRBDA, KRIS office, four communities around Tiga Dam and Sinohydro etc.

Cooperation received from these stakeholders helped in a long way in the identification of the primary and secondary stakeholders' as outlined in the subsequent chapter. The rest of the steps taken in the social impact assessment include:

- Identification and profiling of the stakeholder groups in the adjoining affected communities
- Focus Group Consultation
- Data design, collection and analysis

Type of Data and Techniques of Data Collection

Data collection included primary and secondary data.

Primary data was carried out in the project area using multi-level survey instruments including:

- Household structured questionnaire;
- Focus Group Discussion (FGD)
- In-Depth Interview
- Site Specific Community consultation

Each of the above stated methods of data collection was strategically applied and complementing to ensure that right processes was engendered to enhance robust and inclusive consultation and improve the quality of information received from the field. For example, household questionnaire instrument served the purpose of eliciting information relevant to the project at the household/farmers level. Envisaging the gaps that might result from this method, especially in collecting gender specific data due to cultural constraint in the northern Nigeria that often affects household data collection from women. The FGD method was considered plausible in reaching out to women, youths, farmers and fishermen. The women groups were pulled together in focus group discussions across four communities through the organized women WUA umbrella.

The essence of the technique of the In-depth Interview was to generate information that are within the custodian of experts and community leaders which may not be easily obtained via structured questionnaire instruments. These include data on the history and culture of a community as well as conflict antecedents and conflict resolution mechanisms available to the community. Such information can only be obtained from specific authorities (leaders/elders) and requires response probing or instant follow up questions.

Secondary data for the social assessment was obtained from TRIMING, the Engineering Consultant and Contractor.s including relevant agencies National Population Census, Kano State Ministry of Environment.

4.3.1.1 General Household Survey

Selection of Communities for Socio-economic Survey

A total of six (6) communities were selected for Tiga Dam assessment. The selection is low because communities within Tiga Dam are about 12-15km away from the dam and extensive socio-economics have already been covered by ESIA Hadejia 1.0. Information here is specific to these communities which represents 20% data of KRIS.

The selection of these communities was based on the following criteria:

- Proximity (nearness) of community to Tiga dam infrastructure (e.g. embankment, spill way);
- Viable potential of cumulative impacts;
- Communities with previous experiences of flooding induced by dam/irrigation operations.
- Social mapping of cultural and political structure in the project area;

Structured questionnaire was administered using electronic platform (ODK Collect on the open source Kobotoolbox platform) to 97 households/respondents showing 53.5% representation of the selected communities. The consultation took place at Tiga, Katsalle, Gwarmai, Ranian, Kuki and Anadariya all within Bebeji LGA. Respondents were mostly household heads and youths, which in

most cases were males. Due to cultural and/or religious reasons females (wives) of households are restricted from granting public audience. As discussed in the methodology, this challenge did not affect getting information peculiar to women as the use of focus group discussion with women WUA groups was sufficient for engagement of women.

Demographic Characteristics of the Project Area

Socio-economic features such as gender, age, marital status and the education profile of household members were investigated. The population of Bebeji LGA is

- Male 160,516 (50.7%)
- Female 156,084 (48.3%)

Other socioeconomic condition of the project area is summarized in table 6 below while the specific data is described in Annex 17

Table 6: Summary of Socio-economics at Bebeji LGA

Parameter	Percent	Remark
Age Distribution		The age distribution indicates the presence of local workforce for unskilled labour, and a small percentage of age vulnerability due to presence of the elderly.
18 - 30	18%	
31 - 45	44%	
46 - 55	25%	
Above 55	13%	
Marital Status		This indicates that the communities are mainly family-based communities, with few percentages of singles.
Married	81%	
Single	18%	
Divorced	0.7%	
Household size		This shows that the communities are primarily characterized by large family sizes (dependents). It points to the labour capacity of households especially in farming production, and secondly, it is indicative of the real per capita household income and poverty rate in the project area
Small (1 – 3)	18%	
Medium (4 – 6)	22%	
Large (More than 6)	60%	
Educational level		This shows a high percentage of children are out of school, indicative of child labour for farming and fishing activities. Furthermore, it indicates that some level of skilled labour may be sourced from the communities.
Islamiya (Islamic School)	41%	
Primary School	30%	
Secondary School	25%	
Tertiary	4%	
Occupation		This information indicates farming is the predominant occupation while fishing seems to the next preferred. Indicative that the presence of the dam encourage fishing activitites especially for communities at upstream and downstream of Tiga Dam. Consequently, that any major impact on farming or fishing activities during remedial works implementation may significantly distort the livelihood balance within the communities.
Trading	18%	
Farming	41%	
Fishing	26%	
Livestock Production	12%	
Civil Servants	3%	
Ethnicity (Languages)		The lingua franca of the communities is Hausa language. The Fulani groups also exist.
Fulani only	4%	
Hausa only	9%	
Hausa & Fulani	6%	
Income Earners		Although most of the families are large, the number of income earners are not commensurate in the families. This is indicative of financial strain and possible increase in poverty level.
1	32%	
2	18%	
3 and above	27%	
None	23%	
Average Monthly Income		Most of the respondents earn above the minimum wage (N70,000) possible due to high inflation rate and cost of goods. Even with this rate most people are experiencing economic hardship Hence, any adverse impact on economic sources and sources of livelihood may be significant.
More than N70,000	32%	
N30,000 – N70,000	17%	
N30,000 – N15,000	28%	
Less than N15,000	23%	

Parameter	Percent	Remark
Land Ownership Inherited Own by lease Gift	 63% 32% 5%	Most lands are owned under the traditional individual ownership, which is still very popular in the area with each landowner recognized by members of the community
Water Supply Commercial Borehole Private Borehole Wells Natural Water Bodies	 68% 3% 25% 4%	Most communities depend on boreholes as their primary source of water. The major water source is borehole, though in many locations the water is not sufficient or dry. This is indicative of government presence within the communities.
Waste Management Collective Dumpsite Open Burning Open Dumping	 18% 34% 48%	Construction works may increase generated solid waste. The Contractor.s will have to liaise with the State EPA to manage construction wastes.
Healthcare Facilities Primary Healthcare Centres Secondary Healthcare Private Hospitals	 81% 9% 1%	Primary Healthcare Centres are predominant within the communities and the presence of secondary hospitals for treating admission of patients where applicable. The common illness within the community is typhoid and malaria
Source of Energy National grid Generator Kerosene lantern	 68% 8% 25%	Electricity is available from national grid but is not stable, this is supplemented by use of kerosene lanterns and generator. Energy for cooking is primarily sourced from firewood and charcoal.

Source: Field Survey Assessment, September 2024

Vulnerability Status in Tiga Town

Vulnerable persons are those that the remedial works will affect adversely in more ways than others due to certain disadvantaged conditions. People identified, as vulnerable groups in the project areas are persons above sixty (60) years old, and those that are physically challenged or handicapped. In summary, about 27 vulnerable persons were identified within Tiga Town since other communities are about 18km away from the project site. Among the vulnerable persons are seventeen (17) females and ten (10) males. Table 7 below shows the categories of vulnerable groups and description in terms of gender, project area and number.

Table 7: Summary of Vulnerable Groups in Tiga Town

Categories of Vulnerable Groups	Tiga Town	
	Male	Female
Persons above 60 years	2	8
Those with Physical disability	1	4
Orphans	7	5
Sub-Totals	10	17
Total	*27*	

Perception of Community about the project

Over 82% of the adjoining and host communities are aware about the Tiga Dam but less than 17% are aware of the proposed remedial works. Although, they are excited about the new development and hold optimistic views about the itemized activities. They believe if implemented, the problem of movement of farm produce will reduce thereby improving farming business.

4.3.1.2 Water User Association

WUAs are groups that coordinate the farmers and/or those that are served by the irrigation schemes. The objectives of the association are to empower the farmers to take over the responsibility for the operation and maintenance of their schemes and to encourage and support the formation of WUAs, so as to institutionalize Participatory Irrigation Management (PIM).

The group constitute the apex body and the constituent sector WUAs (farmers, fishermen) that make up the apex WUA. The apex body is registered with the Corporate Affairs Commission in Abuja. It acts as the main organ that oversees, coordinates and champions the processes, activities and interests of the subsidiary WUA groups in the entire sectors in the command. These also include the Women WUAs.

The WUAs are critical stakeholder groups whose roles can be leveraged to enhance irrigation service management, coordination and control. The existing roles of the WUAs in the project areas include the following:

- Mobilization of farmers/members for community works and maintenance of irrigation infrastructure such as the field canals, de-siltation of the drains and cutting of aquatic grasses growing in the canals.
- Assist the management of the Schemes in collection of Irrigation Service fees
- Help in the area of communication feedback between KRIS/ and the farmers. This includes informing the Schemes of the challenges and issues the farmers want the management to know or act upon and at the same time serve as a channel to informing and responding to the farmers about various policy and management decisions.
- Organization of farmers for easy allocation/renting of irrigation farm land from the Schemes
- Organization and mobilization of farmers during fertilizer/inputs distribution and sales.

WUA and Land ownership

About 65% of the WUAs membership along the dam own their lands while the rest are on lease. No fee is charged to become a member of the WUA but the person must be a recognized farmer in any of the field sectors. The Tiga Dam WUA is headed by Seriki and assisted by two vice and secretary. Members are also meant to abide by the decisions of the body or as engendered by the apex body. The rights of the members include:

- Right to irrigation/water services at moderate rate as agreed between the Scheme management and WUA;
- Right to irrigation and farming enlightenment and benefits from government;
- Right to be part of the process of irrigation services management through feedback mechanism and inputs; and
- Right to buying or renting of irrigation farmland from the scheme subject to expression of interest and application.

Operational Strategy of Tiga Dam WUA and challenges

Tiga Dam WUA meets three (3) times per farming season and also convene extraordinary meeting when necessary. The three (3) scheduled meetings take place at:

- *Pre-farming season*: to deliberate on issues of irrigation services charges and expectations in the new farming season
- *At the mid of farm season:* to review their activities and progress in the implementation of measures agreed upon during pre-season meeting and
- *Post farming season:* to review the outcome of the season's activities of the WUA in terms of the challenges and progress of farmers and on its effectiveness on the discharge of its delegated functions by the HJRBDA.

The body is faced with more challenging issues other than water needs, such as:

- Communication gap with HJRBDA in particular with respect to closure and opening of main canal
- Typha grass infestation of borrow pits, molders in canals and drainages
- Cracks on the walls of their houses due to rock blasting by the hydropower component

4.4 Physio-chemical Analysis of Environmental Baseline Data

4.4.1 Sampling Methodology

Baseline data was acquired during field visits within the boundaries of Tiga Dam as the remedial activities are site-specific and any envisaged impacts or risks would be minimal or moderate.

An overall assessment of the study area was done through reconnaissance survey. During this survey, familiarization, boundaries and key features were established. Air quality parameters were measured through a direct mechanism based on in-built gas sensors from the chosen equipment. The equipment was chosen based on simplicity, accuracy, specificity and stability.

Soil and Water samples were collected from different locations around the dam, main canal, site storage area and nearest communities. The sampling design for groundwater was based on availability of groundwater sources (borehole) within Tiga Town. A total number of twelve (12) samples were analyzed: four (4) samples for topsoil; four (4) for sub-soil; two (2)) for surface water and two (2) for groundwater (borehole water). The soil samples were subjected to composite analyses i.e in-situ sampling and ex-situ (Samples analysed by Ministry of Environment, Kano State). Annex 5-8 provides information on the results of surface water, soil, groundwater and air quality analyses while the summaries of these results are discussed in table below

Ground water samples were collected from Borehole using sterile dark coloured100ml bijou bottles. Samples for heavy metals and physico-chemical studies were also collected in their respective coded plastic containers and stored in ice-packed coolers. Samples were preserved in refrigerators at 4°C prior to laboratory analyses. Fast changing physico-chemical parameters such as Temperature, pH, Dissolved Oxygen (DO), Conductivity, Total Dissolved Solids (TDS) etc. were measured in-situ using an in-situ water analyze.

4.4.2 Result Discussion

Air Quality Assessment

The air quality analysis of the project area indicates that the air quality within Tiga Dam is generally good as parameters were within the FMEnv permissible limit[6]. Probably due to inactive scenario, the hydropower component is yet to commence and limited vehicular movement.

Surface Water Assessment: two surface water samples were collected, one from the main canal and the other from the edge of the dam. The project corridor has no available river or streams. Table 8 gives the summary result of surface water analysis

Table 8: Assessment of Surface Water

Parameters	Analysis	Recommendation
Temperature, pH, Conductivity, Total Dissolved Solids (TDS)	Concentration levels were within FMEnv permissible limits	Any practice such as disposal of solid waste should be discouraged through penalty fees
Nitrate	The Nitrate concentration levels for the sampled points were all above the FMEnv permissible limits (20 mg/l).	The extensive use of agro-chemicals should be replaced with organic fertilizers. Elaborate and constant sensitization on proper application and disposal should be done
Phosphate	Most sample points recorded high concentration level of Phosphate..	
Chloride	The concentration levels for chloride were all within the FMEnv permissible limits of 250 mg/l.	Nil
Dissolved Oxygen	Result of analysed sample is within FMEnv permissible limits .	The current agricultural practice should be sustained
Chromium	Concentration level for agricultural practices are within FMEnv limit of 1.5 mg/l	
Biochemical Oxygen Demand5 (BOD5)	The values for the surface water were all within the FMEnv range of 30 mg/l.	To sustain this level, continuous efforts should be made on proper agro-chemical application including its disposal.
Microorganisms	The coliform group of bacteria in the analyzed water samples shows the presence of *Total Coliform (T. Coliform), Escherichia Coli (E. Coli)* and *Salmonella*. *T.Coliform*,	Dumping of organic waste along main-canal or rivers should be discouraged. Proper sensitization in Hausa should be carried out on the dangers of improper waste (excretes, domestic etc.) on the river body and proper waste disposal model

Table 9: Assessment of Groundwater

Parameters	Analysis	Recommendation
Temperature, pH, Conductivity, Total Dissolved Solids (TDS)	Concentration levels were within FMEnv permissible limits	Any practice such as disposal of solid waste should be discouraged through penalty fees
Nitrate	The Nitrate concentration levels for the sampled points varied a bit above the FMEnv permissible limits (10 mg/l).	The extensive use of agro-chemicals should be replaced with organic fertilizers. Elaborate and constant sensitization on proper application and disposal should be done

[6] National Environmental (Air Quality Control) Regulations, 2014

Parameters	Analysis	Recommendation
Phosphate	Concentration recorded were below FMEnv prescribed limits	The current agricultural practice should be sustained
Sulphate	Concentration levels were all within FMEnv permissible benchmark.	
Chloride	The concentration levels for chloride were all within the FMEnv permissible limits of 250 mg/l.	
Dissolved Oxygen, BOD and COD	All sampled points were within the FMEnv range	
Salinity	The salinity for all the sampled points were high 121 and 154% as against FMEnv standard of 0%. Factors attributing to this high value are many but it can be attributed to the consistent usage of agro-chemicals for farming activities around the communities. As identified by a farmer, regular flooding within KRIS washes away their pesticides downstream and they intend to frequently apply after flooding stops. This adversely can increase salinity levels.	Proper communication should be established and sustained. More importantly, drainage system should be constructed and trainings on proper use of agrochemicals should be carried out if possible
Total Hardness	Concentration level of Calcium and Magnesium ions were within the FMEnv limits.	The level of TH (Mg and Ca) in the project area should be sustained
Alkalinity	The alkalinity (bicarbonate and carbonates) levels were within limits.	So far, the alkalinity level should be maintained.
Microorganisms	The coliform group of bacteria in the analyzed water samples shows the presence of *Total Coliform (T. Coliform) and absence of Escherichia Coli (E. Coli)*	Boreholes should be sited at least 18m away from septic tanks

CHAPTER 5: STAKEHOLDERS CONSULTATION

5.1 Introduction

Extensive consultations were held at two different levels (General Consultation and Focus Group) with stakeholders between 24th and 28th September 2024. This sub-section gives an account of the stakeholder profiling, the engagement process and summary of focus group consultation meetings held at Tiga Dam, Bebeji LGA.

5.2 Stakeholders Profile and Engagement

The stakeholder mapping identified all potentially directly affected parties (primary stakeholders) and those to be indirectly affected including organizations that may have interest or influence on the project (secondary stakeholders).

The profiling of the stakeholders is as follows:

1. Primary Stakeholders
2. Secondary Stakeholders

1. Primary Stakeholders

- **Upstream and Downstream Farmers**: These farmers are located at upstream and downstream of Tiga Dam that benefit from availability of water in the main-canal. There are about 75 farmers along this path. The main issue with the farmers is communication gap between these farmers and Hadejia RBDA Also, the blockage of the main-canal by molders due to rock blasting from the Hydropower Plant and inaccessibility to move their crops along the edge of the dam embankment.

- **Fishermen:** fieldwork showed that many of the residents in Tiga Town rely on the fishes from the rivers and dams in the project area for their daily protein and livelihood. About 103 fisherman are carry out their fishing activities along the dam and rivers. In addition, communication gap is causing economic loss to them due to dam over-flood. Engagement with the group commenced from 25th - 26th September 2024, it revealed that the type of fishes found in the area includes *Latis*, *Clarias* (cat fish), *Heterobranchus*, libios Calaglausis, Tiger fish, Tilapia and Bagridi. Instruments used in fishing include Arrow (Marsh), Calabash (Gora) and Nets. Income per head from fishing ranges from N2, 500 – N4,000 per day. The group is constrained by lack of storage facility which compels them to sell off their catch at low prices.

- **Vulnerable groups**: These are persons and groups that will be more adversely affected than others by the project activities as a result of physical disability, gender or age. In this case, mitigation measures tailored in addressing adverse impacts at broad level may either not adequately restore their livelihood or they may be denied of the mitigation measures due to their state of vulnerability.

2. Secondary Stakeholders
This constitutes groups and agencies that will be affected or may have interest in the project. The following secondary stakeholders were identified:

a. Federal Ministry of Water Resources
b. River Basin Development Authority

c. Kano River Irrigation Project Office
d. Contractor
e. Ministry of Environment at State and Federal levels
f. NGOs,
g. Tiga Town and communities (Kuku, Wasila Tiga, Kwana Uku Tiga, Durmawa) Kano State.
h. Kano Water Supply

5.3 General Stakeholder Consultations

Two general stakeholder consultations were held from 24-25th September 2024 at different locations namely: Tiga Town and KRIS Project office. The consultation at Tiga Town was with Farmers and Fishermen while consultation at KRIS Management Office was at KRIS Office and Tiga Dam. Table 10&11 outline the major issues, concerns and outcomes from the Stakeholder consultation with various stakeholders.

Table 10: Consultation with KRIS Project Office

Date	25th September 2024		
Venue	Tiga Dam Project Office, KRIS project office open field, along Zaria-Kano road		
Participation	E&S Safeguard Officers at KRIS, Tiga Dam Project Manager, Representative of HJRBDA		
S/No	**Name of Stakeholder**	**Remark/Response from Stakeholders**	**Response from ESIA Team**
1	E&S Officers	They affirmed that they are aware of the cracks and they had informed the relevant stakeholders of the project intention to fix these problems before official handing-over of the scheme. They also informed the team of the make-shift solutions presently done by Contractor. To reduce the width and depth of the cracks	The team elucidated the scope of works and the aim of the addendum. The team also emphazied the need to consult with the engineers and key relevant stakeholders especially along Tiga Dam
2	Tiga Dam Project Manager (Engr. Salisu)	He welcomed the team and all the attendees of the event. He stated that remedial works have started along some chainages and the Contractor. is already on-site. He also explained the extent of the remedial works and thanked the Project for ensuring the dam is in good shape before the official handing over.	The team appreciated their time and efforts. Furthermore, the proposed potential impacts were discussed and the team requested that the Project Manager provide oversight functions for the implementation of the proposed mitigations plans to ensure sustainability
3	Contractor.	The personnel of the company could not communicate with the consultant due to language barrier. However, the Site Contract Coordinator Engr. Sabiu explained the remedial works and the different stages involved. He further explained that the time available is short as the project draws to a close in January 2025. He also itemized the process of getting materials from vendors and clay from owned borrow pits through payment agreement.	

Table 11: Consultation with Primary Stakeholders

Date	**25th of September 2024**		
Venue	GSS Tiga Town, Bebeji LGA		
Participation	In attendance were representatives of various farmers along the downstream and upstream of Tiga Dam, fishermen, Representatives from KRIS Project Office, TRIMING PMU		
S/No	**Group/Organization**	**Details**	**Response**
1	TRIMING Project Safeguard Unit	Mr Oyebankole Agbelusi (TRIMING Environmental Safeguard Specialist)	

		encouraged the stakeholders to own the project once TRIMING hands over as they are the beneficiaries of the project and also part of the decision makers based on their concerns in terms of Environmental and Social Impacts, which should be made known to the ESIA team.	
2	Fishermen Association	The first concern was from Seriki who spoke about the cracks and the genesis of these issues. He also itemized some concerns that will be of great benefit for RBDA (i). The issue of blasting caused the boulders to be displaced and thus enter the dam causing slight water pollution (ii). Barriers inserted did not prevent the cracks (iii). Rehabilitation of the cracks need to be done to aid movement of goods for the fishermen (iv) RBDA should open proper channel of communication with fishermen group	The consultant assured the group that their concerns will be brought to the appropriate office and channel of communication will be drafted in the updated ESIA for consideration by the RBDA.
3	Downstream and Upstream Farmers	Their representative also reiterated the issues raised by the fishermen with regard to the cracks and main-canal, (i) the main canal needs to be repaired and such information regarding the repairs should be communicated early for the farmers to take precautions against flooding (ii). RBDA needs to respond to early warning signs such as seepage of water into observation wells and movement of weeds along the dam	Some of these concerns will be itemized under recommendations where applicable

5.4 Focus Group Consultations

There are about nine communities around the Tiga Dam and its environments. The closet community to the dam is about 2-3km, Tiga Town. Based on nearest to the dam, six communities were selected for the FGC. However, impacts arising from the proposed remedial works are not likely to negatively impacts but rather positively enhance their livelihood.

5.4.1 Summary of Open Consultation

During the consultation, environmental issues were discussed of which the general assessments indicated good condition in terms of air and water quality.

Social issues such as the concept of Gender Based Violence (GBV) and traditional ways of resolving such issues. However, these discussions were held separately according to gender roles. The Women group within the WUA explained their procedures for addressing any GBV related issues. In extreme cases where violence against women or harassment had occurred, the community Head and Women leaders are used for these GBV cases. The Police could be invited in situations where injuries occur.

5.4.2 Summary of Participants Feedback

During the community meetings, several participants (WUA members) expressed their views, and made comments and suggestions relating to TRIMING Project. All the speakers expressed their appreciation and gratitude to TRIMING, the Kano State Government, the Federal Government and the World Bank for the activities of TRIMING in the past years, as this has improved their socioeconomic wellbeing. They promised to give full cooperation and support to the activities of the

Consultant assigned to carry out this assessment and sustainability of the various infrastructures. Table 12 provides summary of FGC carried in six communities (Tiga, Katsalle, Gwarmai, Ranian, Kuki and Anadariya)

Table 12: Summary of FGC in Communities

Date	**26 -27th September 2024**	
Venue	Community Halls in the six communities	
Agenda	Focus of the meeting was the objective of the remedial works, inform the communities about the possible impacts, listen to their concerns and together fashion mitigation measures where possible	
Participant	**Details**	**Response**
Women Group (Tiga Town)	They were happy about the new development. Most especially as their husbands farming along the dam had complained about the access roads in moving their produce. They also complained about the cracks in their houses, which happened during rock blasting. They also highlighted the presence of borrow pits which have become water-ponds and dumpsites. They also requested that the Contractor. should employ some of their youths as it is the practice of other Contractor.s.	The team thanked the group for the information provided to them. They assured that their concerns will be captured in the assessment report. Other requests made by the group will be captured for the necessary attention of relevant authorities in order to ensure mutual sustainability of their livelihood and the irrigation project
Youth	The youths wanted to know how they can be engaged in the construction works. They also inquired when the actual work will start as they have received several promises but are yet to see any structure on ground	The team encouraged the group that the potential Contractor. will look into their request and they usually hire unskilled labour.
WUAs	One of the lead farmer stated that the cracks have been there for a longtime but was exacerbated by the activities of the hydropower. The group informed the team that issues associated these cracks including seepage and movement of leaves along the canal were reported to the Dam Project Manager. They complained vigorously that the management of HJRBDA exclude their contribution during and before maintenance of the dam	All their concerns will be adequately related to the respective authorities. The team discussed all the possible mitigations measures with the group and few measures noted for possible documentation.

CHAPTER 6: POTENTIAL IMPACTS & RISKS

6.1 Introduction

The assessment process was conducted through the use of an environmental and social risk assessment checklist. (Annex 2 &3). The checklist was administered per community through observation and consultations. This was used to identified site-specific issues and potential impact of the proposed remedial works. To gain an understanding of the potential risks and impacts of the proposed works, rating of identified risks was conducted into high, substantial, medium and low risks as shown below. Broadly, the methodology adopted for the identification and rating of the potential impacts of the proposed works is presented in figure 10 below and discussed in detailed.

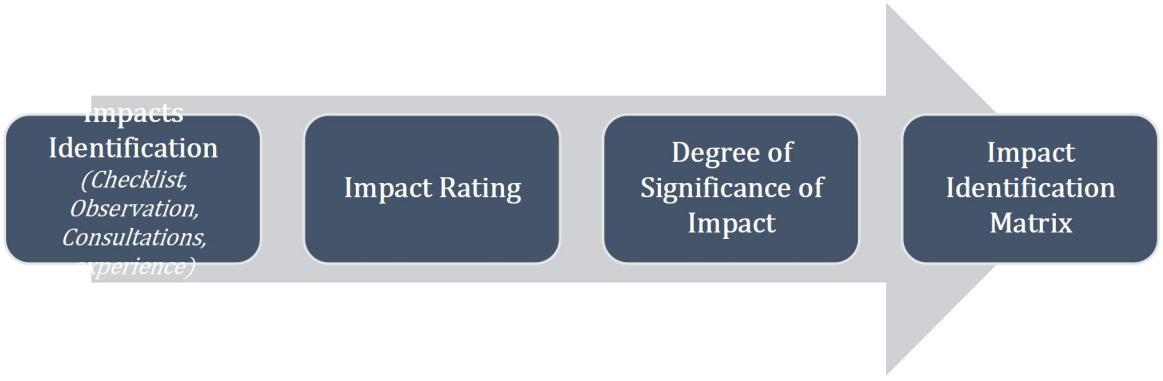


Figure 12: Impact Assessment Methodology

6.2 Impact Identification

The process involved the administration of developed checklist, site visits, observations, and consultations with stakeholders. The environmental and social sensitivities that may be impacted during the project works are presented below in Table 13.

Table 13: Impact Sensitivity

Environmental Sensitivities	Social Sensitivities
• Air • Noise (Vibrations and sound waves) • Surface water • Soil • Erosion Sites • Borrow Pits	• Economic and Agricultural activities • Employment • Public Health • Occupational Health and Safety • Community affairs

In order to understand the magnitude or severity of the potential impacts of the remedial works, rating of identified potential impacts was conducted. Table 14 below presents the magnitude or severity of the effect to the physical and social environment caused by the potential impact of an activity, and the level of sensitivity of the receiving environmental and/or social receptor. The rating was done using a Leopold Matrix.

Table 14: Potential Consequence Classification

	Magnitude of Effect		
Receptor Sensitivity	**Low change**	**Medium change**	**High change**
Low receptor sensitivity	Low	Medium	Substantial
Medium receptor sensitivity	Low	Medium	Substantial
High receptor sensitivity	Medium	Substantial	High

Degree of Significance

Table 15 below shows the impact significance with associated impact ratings.

Table 15: Degree of Impact Significance

Impact Significance	Impact Ratings
High significance	High Impact
Medium Significance	Medium Impact
Low Significance	Low Impact
Negligible Significance	Negligible Impact

Impact Table

The impact assessment matrix (Table 16) shows the magnitude or severity of the potential consequences. Only low - high impacts were considered for impact mitigation. Continuous improvement practices are expected to address low impacts. Furthermore, the positive impacts shall be monitored and enhanced when expedient.

Table 16 Impact Assessment Matrix

Nature of likely Impacts										
	Adverse						Beneficial			
Items	**ST**	**LT**	**R**	**IR**	**L**	**W**	**ST**	**LT**	**SI**	**N**
Air Quality	√									
Soil		√								
Groundwater					√					
Surface Water Quality		√								
Transportation					√					
Agriculture							√			
Fisheries							√			
Aquatic Life							√			
Socioeconomics				√						

6.2.2 Potential Positive Impacts

The proposed project is expected to be largely beneficial especially to the farmers and fishermen. The remedial works are site-specific in which the civil activities will entail the use of heavy equipment, materials and labour influx.

Positive Environmental & Socio-Economic Impacts

- Creation of Employment Opportunities: There are clear indications that the remedial works will have tremendous positive impacts on the lives and livelihood of people within the area as well as on the environment and ecosystem. For instance, increase in direct and indirect employment opportunities in compliance to a presidential directive allowing preference to local content in all employment opportunities. To avoid the negative impacts associated with labour influx to host or beneficiary communities, the TRIMING Project will promote local sources especially for unskilled and semi-skilled labour
- Optimization of Tiga Dam Performance: The works will avert risk of dam failure and further provide dam integrity which will to boost agricultural and animal production, fisheries, grazing and value chain enhancement.
- Improvements in dam infrastructure, dam safety, reservoir monitoring and overall dam operations, management and maintenance (OMM).
- De-silting of the field drains and removal of weeds which is expected to reduce flooding in the farm lands, and which in turn will reduce potential salinity problems
- During construction/rehabilitation works, there will be short-term job creation for the locals especially the unskilled labour force in the project area. In the event that the Contractor.s consider to use labour intensive approach in the removal of typha grass (which will be helpful in order not to destroy the canal wall and lining), there will be more jobs for unemployed unskilled youths.
- The influx of migrant workers, Contractor.s and visitors during construction phase of the project will stimulate demand and supply for cattle and agricultural produces, thereby, enhancing the income of the locals. Also, hawkers and vendors (example food vendors) will receive increase patronage from workers and visitors during the construction period.
- Agricultural and food security in the nation: Increases in other opportunities to develop agriculture, livestock farming and other businesses .The development of the irrigation sectors is a positive impact of the project that will improve the food security situation of the country. This is because irrigation will aid all year-round production. Agricultural lands in the northern zone of the country receives less than 1000 mm of annual rainfall which is a big short coming for good crop yield. Intensive irrigation is therefore expected to boost the effort directed at meeting the food demands of 180 million hungry peoplein the land.
- Increased internally generated revenue from irrigated agriculture for Tiga Dam
- Improved management of Aquatic weeds especially cat tail (Typha grass)

6.2.3 Potential Negative Impacts

Based on the proposed activities, the negative impacts will be predominantly Occupational Health and Safety due to movement of heavy equipment and site specificity. Furthermore, the remedial works will inevitably predispose the bio-physical and social components of the environment to varying degrees of negative impacts which range between low and medium. Table 17&18 provides summary of potential negative environmental, social and OHS impacts.

Table 17: Potential Environmental Impacts

Impacts	Significance of Risk	Mitigation
Environmental Impacts		
1. Temporary air pollution from particulate matter and gases due to the movement of vehicles and equipment on untarred access roads.	Medium	1. Sprinkle earth roads with water to reduce dust during movement of vehicles especially settlements and areas where public facilities are nearby.
2. Temporary noise pollution from movement of vehicles and machineries/equipment operations	Low	2. Install noise mufflers on heavy duty equipment
3. Temporary air pollution and noise due to drilling of trenches at downstream slope. Generation of particulate matter from dust and emission of gases with noise from drilling machines	Low	3. Schedule drilling activities during times when the impact on Tiga community is minimized, such as avoiding night time or early morning drilling sessions. Keep local communities informed about the drilling schedule and activities, providing advance notice of potentially noisy operations.
4. Waste generated from removal of top bituminous pavement on the dam crest, weeds, trees. Other waste materials from construction, including excess soil and concretes from excavation, used for packaging construction materials, could lead to environmental nuisance and public health concerns if poorly managed.	Medium	4. The Hazardous waste should be separated and risks handled to KSEPA with Waste Manifest. Management of other non-hazardous waste (see Annex 3). Ensure proper sorting; storage and final disposal of waste, liaise with registered KSEPA waste disposal outfit. Soil and rock cuttings can be properly channelled to flood embankments.
5. Materials sourcing such as sand, clay, laterite, gravels may lead to impacts related to sand mining and further extraction of laterite from abandoned borrow pits. And unlicensed quarries	High	5. Ensure compliance with all relevant local, regional, and national regulations governing sand mining and quarry operations. Obtain necessary permits and licenses to operate legally and Contractor.s should ensure all materials are sourced from registered vendors or quarries. Contractors must implement Borrow Pit Management Plan should strictly be adhered to, see Annex 5

There could be possible contamination of water with hydrocarbons, laterite and other debris (e.g. oil and diesel) and from greasing/lubrication of gates and equipment on the downstream slope	Low	Device feasible alternatives, in collecting sediment laden water runoff and ensure compaction period is short

Table 18: Potential Social & OHS Impacts

Social Impacts		
Impacts	**Significance of Risk**	**Mitigation**
1. Labour influx especially from skilled workers may induce conflicts and SEA/SH risks, risk of STIs/STDs for community members and staff. Influx of Camp Followers could also increase the presence of sex workers in the communities	Medium	1. Project managers must ensure that all engaged workers are sensitized and sign Code of Conduct (CoC); zero tolerance for sexual relation with community members; as much as possible workforce should be from the community; provide basic amenities for workers like water, health, toilets
2. Lack of understanding or disregard for local customs and traditions by the project workers can lead to cultural insensitivity. This may result in resistance from the local community and damage relationships.	Medium	2. Project team must provide project workers with comprehensive cultural awareness training before they engage with the local community. This training should include information about local customs, traditions, values, and etiquette. Establish open and regular communication channels between the project team and the local community.
3. The construction of temporary access roads may temporarily alter movement of goods and persons. This could disrupt the local economy and way of life	Low	3. Proper and adequate stakeholder consultation to address concerns around the project's impact on the way of life and movement of goods. In view of this, construction activities should be phased to reduce the impacts and avoid critical periods such as breeding or migration seasons.
4. Community health and safety at risk due to movement of equipment, earthwork and vehicle to project sites which could lead to accidents due to bad access roads, disturbance of	Medium	4. The project managers must ensure all drivers are trained on substance abuse and transport schedule plans. Vehicles should not be overloaded with materials, use of flagmen and safety cautions, in built up areas, avoid movement in market areas on market days, limit movement during

farmers and herders activities and religious activities		religious activities, restrict access to be placed at work sites
5. Sourcing for unskilled labour may lead to risks of child labour and increase dropout during rehabilitation activities. This could further predispose children to health & safety risks, Violence Against Children (VAC) etc.	Medium	5. Project managers must comply with the ESMP Matrix especially the LMP in the Annex by implementing fair wages, provision of PPEs and safe work conditions as approved by the WUA vis-à-vis the CONTRACTOR.'S
6. Poor labour and working conditions especially wages for community workers could lead to grievances	Medium	6. Establish transparent payment systems to ensure that workers understand how their wages are calculated. Establish a clear and accessible grievance mechanism for workers to voice their concerns.
7. Insecurity can worsen due to presence of strange workers including TRIMING, WUA, Consultants etc and they can become victims of kidnapping, banditry, insurgency, social conflicts etc.	Medium	7. Security Risk Assessment& Mitigation Measures can be seen in Annex 15. In addition, the WUA should work with the project security adviser to develop a robust security management plan for the project in conjunction with the state Government and the state security agencies including the police, Army, Nigerian Security and Civil Defence Corps (NSCDC)
Occupational Health & Safety (OHS)	**Significance of Risk**	**Mitigation**
1.OHS Risks from operation of equipment and civil works could lead to injuries, incidents and accidents for workers	High	1. Project management Units should implement the site specific Occupational Health and Safety Management Plan (see Annex 16)
2. Exposure of workers to security risks such as banditry, kidnapping etc.	Medium	2. Appropriate security measures as detailed in Annex 15 should be put in place
3. Poor labour and working conditions could lead to ill-health and grievances	Medium	3. Project management units should provide a safe and conducive work environment including basic amenities like portable drinking water, food, WASH facilities, rest area for workers

4. Unfair recruitment procedures could cause grievances, discrimination etc. poor or discriminatory wages could also lead to grievances and legal action	Low	4. Recruitment processes should be fair, non-discriminatory and the terms and conditions of employment including wages, work hours, rest hours, benefits, sanctions should be clearly indicated in the conditions and understood by all parties
Risk of equipment falling into the dam body.	High	The contractor should strictly follow the method statement and ensure the earth filling and compaction period is maximized.
Risk of humans falling in the dam reservoir - drowning	High	Emergency preparedness and rescue plan should be in place, Workers must be made aware of the risk and measures during tool box talk and strict adherence to OHS rules- no horse play ……

6.3 Labour Influx, GBV Risks and Management Measures

Labour Influx Risks

The project will involve at least 10 skilled and 35 unskilled workers for the civil works as it may be difficult to source especially skilled workers from the communities due to lack of technical skills and capacity. The influx of workers and followers can lead to adverse social and environmental impacts which may include increased demand and competition for local social and health services, as well as for goods and services, which can lead to price hikes and crowding out of local consumers, increased volume of traffic and higher risk of accidents, increased demands on the ecosystem and natural resources, social conflicts within and between communities, increased risk of spread of communicable diseases such as HIV/AIDS, COVID-19, increased rates of illicit behaviour and crime and risks of GBV/SEA/SH. See Annex 14 for Labour Influx Plan.

Actions to be taken:

- Harness local labour, such as through the WUAs
- Train project workers on Code of Conduct, and ensure workers understand and sign the code of conduct as part of engagement process for the workers.
- Establish structures such as work leave and holidays for workers to be with the family at intervals during the implementation duration of the proposed works.
- Install signage around the project areas to discourage such illicit practices.

Gender Based Violence (GBV) Risks

Gender-Based Violence (GBV) is an expression of unequal gender relations in any society. It is first a violation of human rights, then, a global issue that cuts across boundaries of economic wealth, culture, religion, age, and sexual orientation. While GBV disproportionately affects women and girls, it also affects men and boys. In social and infrastructural projects such as the Kano State TRIMING Project, GBV can easily result from, or existing GBV issues within the communities can further be exacerbated as a result of labour influx into the project corridor (communities) during civil works.

This can predispose girls within the community selected for the interventions to various forms of GBV including Sexual Exploitation and Abuse (SEA), rape, sexual assaults, among others. To address these issues, the following measures can be followed.

Existing Structures and Measures to Mitigate GBV/SEA/SH Risks by the TRIMING Project

The Kano State Ministry of Women Affairs and Social Development is the body responsible for the overall coordination of welfare and support for women and children in the state. It also champions/oversees from the state level, the interventions and efforts to address GBV related issues. Furthermore, Kano State have laws and policies in place to address GBV issues. These are presented in Table 19[7] below.

Table 19 Kano State laws & policies for GBV response

No.	Laws/Policies	Provisions
1	Kano State Fostering Edict of 1983 (as review in 2000 and 2013)	The Edict was established in 1983 and reviewed in the years 2000 and 2013, the edict bothers on the welfare of children and the process and procedures towards the adoption and fostering of children in Kano State.
2	Kano State Children and Young Persons Law	The law defines who a child is and who a young person is. It also states the welfare and care of a child, and also bothers on treatment and custody of a child when he commits a criminal offence.
3	Kano State Penal Code Law	The Penal Code of Kano State has considerable sections that bothers on a child in Kano State with provisions on offences committed against a child. The law criminalizes miscarriage of an unborn child, exposure of infants, cruelty to children, assault, force labour, unnatural offence, rape, and indecent assault.
4	Kano State Petty Trading Prohibitions of Females and Juvenile Law, 1984	The law prohibits street hawking, setting up of stalls, tables, and kiosk by female juveniles below the age of 16. Where a female juvenile is subjected to street hawking, setting up of stalls, tables and kiosk by a parent or guardian such juvenile shall be committed to the care of any other person fit to care for the juvenile whether a relative or not.
5	Kano State Shariah Penal Code Law	The law has considerable sections bothering on offences against a child in Kano State such as the offence of rape.
6	Kano State Prohibition of Child Labour and Street Begging Law	The law prohibits subjecting a child to child labour and street begging either by parents, guardians, relatives, or Quranic School teachers.

Measures/Actions to be taken

- Domestication of the Violence Against Persons Prohibition (VAPP) Act in Kano State by the state government.
- Implement activities provided in the GBV action plan.
- Prioritize community engagements and integrate outcomes into the GBV Action Plan.
- Conduct community training on sexual exploitation and abuse (SEA) and sexual harassment, reporting and accountability mechanisms
- Include information on SEA/SH prevention and mitigation considerations in all relevant documents such as ESMPs, ToRs, CONTRACTOR.'S

7 Source: **Laws Protecting Children against Gender-Based Violence (GBV) in Kano State** published by: Rule of Law & Empowerment Initiative –Partners West Africa-Nigeria

- Ensure the inclusion of qualified GBV Officer on the supervision consultant team and KRIS/HVIS PROJECT OFFICE's team respectively
- Production and provision of GBV Code of Conducts for all Contractor. staff and conduct training, GBV referral manuals will also be produced and distributed to all GBV focal persons in the communities.
- Liaise with the NPMU/World Bank on providing Third Party Monitors (TPM) for the project with experienced GBV staff to monitor implementation of the SEA/SH Prevention and Response Action Plan and ensure all parties are meeting their responsibilities.

CHAPTER 7: ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

7.1 Introduction

This chapter describe the Environmental and Social Management Plan (ESMP) for the remedial works which will contain only specific impacts with corresponding mitigation measures. The objective is to bring them to an acceptable level to guarantee economic, environmental and social sustainability of the project.

Specific objectives of this ESMP include the following:

- To examine the major activities and identify the aspects associated with the project implementation which generate environmental impacts,
- Identify the environmental issues associated with the major activities,
- Develop mitigation measures for the aspects identified as having environmental impacts,
- Incorporate environmental mitigation measures into activities and develop corrective actions and ensure monitoring.
- Define the specific actions required, roles and responsibilities for these actions, and associated costs and,
- Define a proposed institutional structure to govern the implementation of the ESMP.

The range of environmental, social and occupational health and safety issues associated with the remedial works are described in the m*atrix table format.* The matrix tables are described under 3 phases, the pre-construction phase, construction phase and operational phase.

7.2 Environmental and Social Management Organization & Institutional Arrangement

The successful implementation of the ESMP and the programs will depend on the combination of effort from the TRIMING Project Management Unit (PMU), Kano River Irrigation Scheme Management Office (KRISMO) especially the Dam Project Manager, procured Contractor.s, and the identified institutional leads relevant to the project. The roles and responsibilities of persons and institutions are discussed in the subsections below.

Environmental and Social Management Organization (ESMO)

The ESMP will be implemented effectively with the combination of efforts from the procured Contractors engaged by the TRIMING PMU, E&S KRIS Officers, Project Managers and Supervising Consultants to the Contractors

The Contractor shall be responsible for onsite implementation of the ESMP. They shall provide adequate human and financial resources on an on-going basis to achieve effective implementation of the ESMP and assure continuous improvement of environmental and social performance. The Project Manager (PM) of the Contractor will constitute members of the ESMO, in addition to a Health and Safety Managers, who will be responsible for the coordination of all Health Safety and Environment (HSE) activities of the Contractor. The HSE Managers shall ensure awareness creation exercises especially on HIV/AIDS, environmental protection and personal hygiene for all stakeholders (including skilled and unskilled labourers) involved in project implementation.

The Project Manager at Tiga Dam including the Supervising Consultants will also be part of the ESMO. They will be responsible for the implementation of project specific management plans as

described in the ESMP (e.g. monitoring program, site-specific safety management plans, site-specific waste management plans, health, safety and environmental management plans, etc.

7.2.3 Institutional Arrangement

The roles and responsibilities of the various institutions are highlighted in table 20 below.

Table 20: Institutional Responsibilities

No.	Institutions	Roles and Responsibilities
1	Federal Ministry of Water Resources (FMWR)	The Ministry is the lead institution for the overall project coordination and implementation of the ESMP. The FMWR hosts the TRIMING PMU.
	TRIMING PMU	The PMU will be in charge of the daily coordination, supervision and implementation of the project's components. The environmental and social management team from the PMU will comprise of the Project Coordinator, the Environmental, Social, Communication and Irrigation Specialist of the TRIMING PMU.
2	Federal Ministry of Environment (FMEnv)	For this ESMP, the FMEnv through the EA Department and relevant agencies will play the role of lead environmental regulator, overseeing compliance requirements, granting consent and also monitoring or providing supervisory oversight for the project.
3	Federal Ministry of Power, Housing and Works	The Ministry is a critical stakeholder due to the proposed hydropower component of the schemes. The ministry is responsible policy formulations and provides general direction in power, public works and housing sector.
4	Refuse Management and Sanitation Board (REMASAB)	REMASAB handles refuse and sanitation collection in Kano State
5	Hadejia Jama'are River Basin Development Authority (HJRBDA)	The RBDA will ensure that environmental and socio-economic concerns as elucidated in this addendum to the ESIA are integrated into all aspects of project implementation.
6	Kano River Irrigation Scheme Office Hadejia Valley Irrigation Scheme Office	They will be responsible for the implementation of project specific management plans as described in the ESMP (e.g. monitoring program, site-specific safety management plans, site-specific waste management plans, health, safety and environmental management plans, etc.
7	Transmission Company of Nigeria (TCN)	• Collaboration with Skippers Engineering and other EPC/O&M Contractor.s to ensure the implementation of the ESMP especially with regards to the transmission line component of the project. • Supervision of all HSE activities related to the transmission line during construction and operation phase.

No.	Institutions	Roles and Responsibilities
		• Coordination of electricity transmission and connection to grid.
8	Kano Electricity Distribution Company (KEDCO)	• Collaboration with Skippers Engineering and other EPC/O&M Contractor.s to ensure the implementation of the ESMP especially with regards to the electricity distribution
9	Federal Road Safety Corps (FRSC)	Ensure safety of all road users including highways
10	Local Government Area (LGA)	Provision of oversight function across project activities in LGAs for ESMP compliance. Various departments within the LGAs will play critical roles in the ESMP implementation.
11	PAPs/Communities	Provide comments and advice especially during consultation for the effective implementation of the ESMP
12	NGOs/CBOs	Assisting in their respective ways to ensure effective response actions, conducting scientific researches alongside Government groups to evolve and devise sustainable environmental strategies and techniques.
13	Nigerian Police Force (NPF)	Ensures safety and security of the general public

7.3 Overview of the ESMP Matrix

The ESMP Matrix as seen in Table 21 took cognizant of the work methodology proposed by the Contractor in section 3.5, in which the sub-activities are segmented into two phases: Phase 1 and Phase 2. Therefore, the potential impacts with corresponding mitigation measures would occur at different times during the sub-activities implementation period. Thus, the ESMP Matrix have been segmented into these phases: Phase 1 and Phase 2 in order to cover the two phases of sub-activities implementation periods with the appropriate responsible parties. Consequently, the total cost for mitigating these impacts are likely to double

7.3.1 ESMP Matrix Phase 1

PRE-CONSTRUCTION STAGE

Table 21 ESMP & Monitoring Plan for Phase 1

S/No	Activities	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (N)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location	Monitoring Frequency	Institutional Responsibility (Monitoring)	Cost (N)
ENVIRONMENTAL & OHS IMPACTS												
1A	**Movement of materials, vehicles and equipment to site through temporary access road**	Dust generation from untarred access roads; exhaust fumes of vehicles, equipment	Ensure that all vehicles are serviced; undergo vehicle emission testing (VET) and vehicle exhaust screening (VES). Limit number of vehicles and equipment to one or two Mark out access route within the area	HSE Personnel of CONTRACTOR.	850,000	SO2, NO_X, CO, VOC, $PM_{2.5}$, PM_{10} Number of vehicles/sites Access route marked out	In-situ measurement Site inspection	Air Quality Parameters are within permissible limits Evidence of VET and VES Evidence of compliance	Project area and within 1km Project area	Bi-monthly Weekly Before movement of vehicles	SCHEME E&S OFFICERS, Kano State Environmental & Protection Agency (KSEPA)	280,000
2A	**Site clearing, staging area and workers camp**	Removal of vegetation and shrubs Restriction of main access road to Tiga Dam Waste Generation	Limit land clearing to specific zone. Protect all vegetation not required to be removed against damage. Replant or revegetate trees/shrubs through tree planting Liaise with REMASAB or licenced private waste collectors	HSE Personnel of CONTRACTOR.	550,000	Amounts of vegetation cleared Area of Land Presence of seedlings Waste generation Sites	Site inspection No of complaints	CONTRACTOR. compliance Presence of seedlings Evidence of waste manifest	Project site and area	Before and during land clearing	SCHEME E&S OFFICERS, KSEPA, Refuse Management and Sanitation Board (REMASAB)	420,000
		Predisposition to soil erosion	Avoid eroded area Backfill eroded spots with construction	HSE Personnel of CONTRACTOR.	784,000	No of eroded spots	Site inspection	Backfilled spots	Project site	Before and after project completions	SCHEME E&S OFFICERS, KSEPA	

			waste and cover with rip-rap materials and available soil type									
3A	Stripping of asphalt pavement, Removal existing curbstone and excavation of very loose material and Transport	Temporary removal of topsoil, Oil leakages from stacked equipment and dis-colouration of topsoil	Segment a safe and specific area for equipment Service equipment and install a temporary container for collection	HSE Personnel of CONTRACTOR.	685,000	Soil Quality	Visual observation	Soil Quality parameters are within permissible limits	Equipment Storage Area	Bi-monthly	SCHEME E&S OFFICERS, KSEPA	290,000
		Minimal noise impacts	Retrofit vehicle exhausts with sound-control or sound -proofing devices Carry out activities during off-peak periods Provide PPEs for workers	HSE Personnel of CONTRACTOR.	310,000	No of Complaints from affected communities No of retrofitted vehicles; Vehicle movement frequency Usage of ear plugs/ muffs	Noise measurement	Evidence of Compliance	Project Area	Weekly	SCHEME E&S OFFICERS, KSEPA	450,000
4A	**Same as 1-3A**	Risk of accidents and injuries Respiratory diseases to Workers due to inhalation of exhaust fumes and dusts Noise Pollution Community Health and Safety both to pupils and residents	Implement site specific Occupational Health and Safety Management Plan (OHSMP) The OHSMP will entail: - Provision of Hazard Communication Procedures (HAZCOM); Job Hazard Analysis (JHA); OHS Training program; Accident Provision of adequate first aid, first aiders, use of PPE, signage (Hausa and English languages).	HSE Personnel of CONTRACTOR.	1,150,000	Compliance with OHSMP No of workers Trained No of accidents, incidents or injuries Noise level	Site inspection Consultation	Numbers and Minutes of OHS training /tool box meeting Evidence of Compliance through minutes of meetings	Project area	Weekly	Scheme E&S Officers	350,000

			Cordon off unauthorized areas such as staging area, work area etc Provision of specific personnel training on worksite OHS management Workers should get a daily induction/toolbox before work commences Use reflective tapes and signage integrated in all worksites for safety at night Appropriate security measures in place to prevent harassment or kidnapping of workers								
5A	**Borrow pit Preparation**	Risks of falls, accidents and other injuries to the body Respiratory diseases to Workers due to inhalation of exhaust fumes and dusts during excavation of materials Grievances from residents/communities over movement of equipment, flying materials from moving vehicles during excavation.	Implement site specific Occupational Health and Safety Management Plan (OHSMP) The OHSMP will entail: - Provision of Hazard Communication Procedures (HAZCOM); Job Hazard Analysis (JHA); OHS Training program; Accident Provision of adequate first aid, first aiders, use of PPE, signage (Hausa and	HSE Personnel of CONTRACTOR.	10,150,500	Compliance with OHSMP No of borrow pits No of accidents, incidents or injuries Noise level	Borrow Pit Site Consultation	Numbers and Minutes of OHS training /tool box meeting Evidence of BPMP	Borrow Pit Area	Bi-monthly	Supervision Consultant Scheme E&S Officers	1,350,000

		Increase in noise level above permissible noise level, (90dB) and fugitive dust during vehicular movement may create nuisance for locals Abandoned borrow pits resulting into community Health and Safety of residents, waste dumpsites, hotspots for multiplication of vector-borne diseases etc.	English languages). Ensure all vehicles and machines are serviced before being brought to site Select and use vehicles/ equipment with lower sound power levels. Ensure vehicles/ equipment not in use are turned off Implement BPP									
Sub-total					**14, 479,500**							**3,140,000**
SOCIAL IMPACTS												
1B	**Movement of earth materials ,equipment to staging area**	Obstruction to access route for farmers, herders and others Grievances from locals over movement of equipment and vehicles Conflicts between locals and workers	Movement of equipment and materials should be done when farming activities are minimal Find alternative access route and cordon it off Ensure CONTRACTOR.s employ locals Provide adequate sensitization	HSE Personnel of CONTRACTOR.	335,200 403,220	Evidence of cordoned area off access route No of locals recruited	Site inspection Recruitment records	No. of complaints CONTRACTOR.'s compliance	Project site	Weekly Monthly	SCHEME E&S OFFICERS Team	420,500
		Increase in noise level above permissible	Ensure all vehicles and	HSE Personnel of CONTRACTOR.	See 3A	Noise level	In-situ measurement of	Noise level (Not to exceed	Project Area	Daily	E&S Team E&S UNIT	378,000

		noise level, (90dB) during vehicular movement may create nuisance for locals	machines are serviced before being brought to site Select and use vehicles/ equipment with lower sound power levels. Ensure vehicles/ equipment not in use are turned off			Number and frequency of complaints in project area	noise level	90dB(A) for 8 hours working period				
2B	**Removal of weeds, identification of borrow pits, staging area and workers camp**	Grievances from residents, WUAs over movement of equipment, flying materials from moving vehicles and if equipment is not parked at designated location. Grievance from non-payment, unpaid or overdue land lease for setting up of workers camp. Conflicts amongst locals arising from purchase of borrow pit areas	Mobilization of equipment and machinery should be done at off-peak period Ensure caution signs at strategic locations in both English and Hausa languages to warn PAPs. Ensure vehicles and equipment are parked at Camp site and designated areas ONLY. Any incident/ accidents should be reported immediately to the CONTRACTOR. & E&S UNIT Cover truck conveying materials to site to prevent materials falling and causing injuries to pedestrians & motorists Ensure payment of land lease for workers camp in due time.	HSE Personnel of CONTRACTOR.	2,655,000	Appropriate signage in local languages Incident/ Accident Report	Visual observation Interview	No. of complaints received within the project area. Zero incident/accident report	Project Area	Weekly	SCHEME E&S OFFICERS Team	351,,000

3B	**Presence of foreign workers**	Anxiety from locals in terms of insecurity, competing for scarce resources may induce threats to life and safety	Provide sensitization training to improve awareness and sensitivity of workers Engage competent security personnel and train them regularly Implement GRM.	CONTRACTOR. with support from TA E&S UNIT	1,218,102	Number of trained Personnel	Attendance list / training report	Compliance to SEA/SH Accountability and Response Plan	Project Area	Prior to project implementation	E&S UNIT Gender/GBV Officer	630,000
		Labour Influx which could lead to Increase in sexual activities and potential spread of STDs/STIs within the project area May induce SEA/SH and other GBV Issues	Limit the number of migrant workers by engaging local workers. Awareness campaign on sexual diseases, and distribution of male and female condoms. Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: Respect for local residents. Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, GBV, purchase or use of illegal drugs, Disciplinary measures and	HSE Personnel of CONTRACTOR.	1,241,000 3,500,000 for the operationalization of GRM.	No of reported. cases Stakeholders concerns on risk of GBV. Workers manual, employment codes etc Level of awareness of local culture by migrant workers. Grievance Redress System Ratio of migrant to local workers Presence of security personnel Level of Awareness and Education	Visual observation and interviews Rapid health survey Consultations GBV Incident Report	Community perception and level of satisfaction. Level of awareness and knowledge of preventive measures. Signed CoCs with the PCU Conduct of sensitization campaigns	Project area	Once during pre-rehabilitation Once during rehabilitation	SSO, Gender & GBV Officers of the E&S UNIT	475,000

			sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence.									
Total for Pre-construction Stage					**20,077,022**							**5,394,500**

CONSTRUCTION STAGE

S/No	Activities	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (N)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location	Monitoring Frequency	Institutional Responsibility (Monitoring)	Cost (N)
ENVIRONMENT & OHS IMPACTS												
1A	Civil works on dam crest and embankment	Increase in cement and fugitive dusts from untarred routes	Implement activities during off-peak activities Use PPEs Ensure watering where applicable prior to and during civil works in order to reduce the release of dusts Implement Waste Management Plan (See Annex 9)	Contractor's HSE	900,610	Period of implementation	Site inspection	Reduction in onsite/work area dust levels	Project facilities; specifically work areas	Weekly	KRIS E&S Team, KSEPA	250,510
		Indiscriminate defecation or open defecation by construction workers	Provision of mobile toilets	Contractor's HSE	730,650	Evidence of useable toilets	Site Inspection	Contractor's compliance	Project Area	Weekly	KRIS E&S Team	300,210
	Civil works, movement of vehicles, materials and equipment	Noise disturbance in a serene environment Dust due to movement of vehicles on untarred roads	Hire and use only good vehicles; retrofit with sound proofing devices Implement activities when farming	Contractor's HSE	1,110,400	Noise level and air quality No of complaints	Site inspection Vehicle inspection	Number of complaints Contractor's compliance and document	Project Area	Weekly	KRIS E&S Team, KSEPA	495,100

		Flying objects/materials may get into eyes, lungs of locals or residents	activities are minimal Cover vehicles with tarpaulin			as regard farming and community disruptions Vehicle Movement Manifest Number of vehicles using tarpaulin		verification				
		Land degradation and increased susceptibility to erosion due to excavation of earth materials around and in borrow pits	Reuse excess stockpile to back fill pits during grading Revegetate with appropriate plant species Ensure sourcing of earth materials from registered quarries and licensed construction vendors with appropriate quarry lease to prevent illegal sand mining.	Contractor's HSE	1,368,500	Quarry Lease of quarry sites List of licensed vendors Developed site Reclamation Plan	Site inspection Pictures	Compliance Evidence of spoil management/ Spoil stockpiling for reclamation	Project site	Monthly	KRIS E&S Team KSEPA	550,100
2A	Civil works, Earthworks, drilling of trenches and sealing of cracks	Accidental spillage of lubricants and paints chemical Impact on structural integrity of Dam	Buy and use only required quantity Collect slurry into labelled container Ensure strict adherence to technical specification of works	Contractor's HSE	685,071	Number of waste collection containers	Site inspection	Contractor.'s compliance	Project Site	Weekly	KRIS E&S Team	306,103
		Accumulation of solid wastes including construction waste and debris	Ensure proper sorting; storage and final disposal by a licensed waste disposal agency Implement Waste Management Plan	Contractor's HSE	825,500	Waste Manifest Manifest for waste reuse	Site inspection Verification of documents	Reduction in visible waste site or debris	Project Area	Weekly	KRIS E&S Team, REMASAB	450,100

			(see annex 9) Ensure recycling of removed materials through approved recycling facilities to conserve resources. Ensure no waste is left behind on the farm after construction									
3A	Operation of equipment used during the construction phase	GHG Emission	Turn off engine when not in use Use or hire vehicles or equipment that are in good condition generally less than 5 years old.	Contractor's HSE	425,350	GHG Emissions	Air quality assessment	Compliance Card Report	Project Area	Weekly	KRIS E&S Team,	100,550
4A	Mechanical works (laying of geotextile materials and drilling trenches	Generation of hazardous waste,	Collection, segregation and sorting; Implement WMP; Sign agreement with a licensed waste	Contractor's HSE	861,920	Waste Manifest	Site inspection	Absence of e-waste on site	Project Area	Bi-monthly	KRISO E&S, REMASAB	497,200
5A	**Same as 1-4A**	Accidents such as Injuries, drowning, explosions, electrical fires, leakages, falls, slips, release of hazardous energy, deaths etc	OHS training and education i.e Conduct routine JHA Use of PPE;	Contractor's HSE	795,850	No of workers trained OHS Plan Compliance	Consultation with workers Site Observation	Number of accidents/incidents Minutes of Training /tool box talk	Project Area	Weekly	KRIS E&S Team	302,450
		Community health and safety	Implement the OHS within this report &: Develop SOP for all tasks	Contractor's HSE	850,830	Evidence of CONTRACTOR.'S	Documentation	No of Complaints from Community/WUAs/Youths	Project Area	Bi-monthly	KRIS E&S Team	420,000
		Soil & water contamination from spillages of oil and other petroleum products from leakages and/or improper handling during drilling	Ensure Task and Operation Schedules are reviewed before commencement of work. Ensure all vehicles and machines are serviced before being brought to site to avoid leaks of oil. Prevent unregulated dumping of fuel waste.	Contractor.'s HSE	610,000	Installation of impermeable platform at limit zone.	Visual observation	Soil quality	Project camp sites and equipment packing zones	Monthly	KRIS E&S Team, KSEPA	350,450

			Install impermeable surface at fuel storage areas, vehicle servicing & limit zone to contain potential leakages.									
		Generation of spoils and other excavated materials	Ensure stockpile and disposal areas are stable and protected against erosion and not interfere with run off or subsequent Construction activities. Stockpile to be covered and stored in a sealed and bonded area in order to divert storm water away. Reuse stockpile as fill materials	Contractor.'s HSE	959,320	Evidence of stockpile protection Evidence of spoil reuse	Visual observation	Compliance with Mitigation	Bridge location, along realigned section of the approach road	Monthly		301,500
	Sub-total				**8,364,681**							**2,138,273**
SOCIAL IMPACTS												
1B	Civil works, Earthworks Concrete and reinforcement survey	Risk of Child Labour which can lead to Violence Against Children	Ensure that children and minors are not employed directly or indirectly on the project Implement sensitization campaign against child labour Good work enforcement procedures Regular stakeholders' meetings All employees must sign code of conduct that stipulate zero tolerance to child labour either directly or indirectly Implement the LMP	Social Officer (KRIS) Gender/GBV Officer, NGO	978,300	Categories of employees Number and reports of campaigns and meetings Signed Code of Conduct Compliance to LMP	Documentation Consultations	CONTRACTOR.'S Compliance Absence of under-aged children Number of complaints	Project Corridor	Bi-monthly	State Ministry of Women Affairs and Social development KRIS E&S Team	304,900

			which addresses Child labour									
2B	**Staging Area**	Obstruction to movement of farmers, residents and herders	Select and cordon-off areas off access route	Contractor's HSE TRIMING E&S Team KRISO	403,500	Area selected	Site inspection	Contractor's Compliance No of complaints	Project site	Bi-monthly	KRIS E&S Team Community actors	186,350
3B	**Civil works on the downstream slope** **Same as 1-2B**	Fugitive Dust may likely affect the community health & safety especially areas with earth-based roads Noise: disturbance in a serene environment may affect their daily work schedule, psychology and peace of mind of both residents and workers Equipment falling into the dam body	Works should be done during off-seasons or less farming activities Vehicles conveying materials should be covered with tarpaulin Wet earth roads and civil works areas daily Minimize speed of movement of vehicles on earth roads to reduce the amount of dust released Ensure all vehicles and machines undergo service before being brought to site with continuous regular maintenance. Select and use vehicles/ equipment with lower sound power levels. Ensure vehicles/ equipment not in use are turned off Fit vehicles with sound proof devices and use good vehicles Provide PPEs for workers The approved	Contractor's HSE	1,359,850	Air quality Vehicles with tarpaulin Water is sprinkled daily Speed limit Noise level	In-situ measurement Vehicle inspection Inspection Inspection Consultation with residents	Air quality is within permissible limits Contractor's compliance Compliance Compliance Number of complaints	Project Area and its corridor	Weekly Daily Daily Daily	KRIS E&S Team, KSEPA	559,210

		and OHS accidents such as drowning, falls, near-miss	design should be strictly followed and compaction period should be phased									
4B	**Civil works**	Labour Influx; which may lead to conflicts amongst locals and employees; competition for limited resources such as water, light, materials etc.	Engage local workforce in the appropriate skills Incorporate social environmental measures into the civil works contract Implement the LMP within this report	Contractor's HSE	718,400	Number of local work-force Evidence of social and environmental measures in civil works contract Compliance to LMP	Contract Verification Site inspection Document verification	Contractor.'s compliance to E&S Measures Number of local employees	Project Corridor	One-off Monthly	WUA, Component Lead KRIS E&S Team	240,100
5B	**Replace vegetative soil, fill and compact the downstream slope and restore drainage channels and stairs**	Occurrence of onsite/off-site, social vices (Fights, rape, harassments, theft, vandalization, drug use etc.) Threat to health and safety of locals Increase in SH/SEA due to presence of foreign workers near local residents Abuse of cultural	Mandatory and regular training for workers on required lawful conduct in host community and legal consequences for failure to comply with laws. Sensitization on the working GRM to receive complaints Engage local residents as part of employees and train them on code of conduct, GBV (SEA/SH) Training program for project personnel to include GBV(SEA/SH) issues. Project workers should enjoy the privilege of retreating to visit their families before returning to site. Provision of gender-based awareness	Contractor's HSE	2,160,610	No of Training Conducted and attendance list	Consultation Records Site inspection and observation	Contractor.'s Compliance Level of awareness	Project Area	Monthly	KRIS E&S Team	350,102

		norms	campaign within the communities. Partnering with NGOs/CBOs in the project area who are actively involved in gender-based issues. Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: Respect for local residents; No hunting or unauthorized taking of products or livestock. Provide cultural sensitization training to improve awareness of and sensitivity of workers to local cultures, traditions, and lifestyles.									
6B	**Movement of laterite, clay and other geo-textile materials** **On-going civil works**	Temporary disruption of farming activities and social changes	Construction should be done during off-peal periods	Contractor's HSE	503,650	Construction period Staff time-in and time out	Site inspection	No of complaint	Project Area	Weekly	KRIS E&S Team	650,980
		Risk of communicable diseases such as sexually transmitted diseases (STDs) including HIV/AIDS from interaction among construction workers	Provide opportunities for workers to regularly return to their families. Institute HIV prevention programs (peer education etc.) Liaise with appropriate health focused NGOs to undertaking health awareness and	Contractor's HSE	1,475,650	Number of trainings, awareness and attendance list	Consultations Interviews	Number of complaints/incidents	Project Area	Monthly		

		Increase risk of transmission of COVID-19 , Lassa Fever	education initiatives on STDs amongst workers and in nearby communities. Sensitization and awareness for employees on COVID-19, Lassa Fever and the use of non-pharmaceutical preventive measures Ensure compliance to guidelines prepared by the NCDC and WHO			Sensitization record sheets COVID-19 Sensitization reporting						
7B	**Ongoing civil works**	Grievances from non-payment of staff which can lead to delay in job completion, social vices and other conflicts	Engage only personnel you can adequately pay Engage more casual workers to reduce financial cost Prepare payment schedule alongside materials BOQ	Contractor's HSE	Nil	Record of payment schedule Number of permanent/ casual workers	Document Inspection	No of complaints	Project Site	Monthly	KRIS E&S Team, CONTRACTOR.'S	450,150
		Use of illicit drugs	Prohibition of drug and alcohol use by workers while on the job through awareness & sensitization on side effects of drug abuse	Contractor's HSE	Nil	Records of awareness	Visual and random observation Discussions	Number of workers fully educated on the side effects	Project Area	Bi-monthly	KRIS E&S Team	
8B	**Conveying and lifting heavy equipment** **Same as 1-3B**	Collapse, injuries, falls, cuts, abrasions, deaths which can lead to delay in completion of daily tasks and project timeline	Develop and implement site specific Occupational Health and Safety Plan which will include JHA/PHA, Safe work Practice, Use of PPE Provision of adequate first aid, first aiders, PPE, signages (English and Hausa languages),	Contractor's HSE	2,931,670	No of trained workers, first Aiders Usage of appropriate PPE Usage of signages and demarcations	Visual observation Records	Zero incident/accident report	Project Site	Weekly	KRIS E&S Team	670,320

			engineering barriers Restrict unauthorized access to all areas of high-risk activities. Implementation of specific personnel training on worksite OHS management. Ensure that staging areas for equipment are adequately delineated and cordoned off with reflective tapes and barriers. Any uncovered work pits should have appropriate signage and protection around them. Workers should get a daily induction/toolbox before going on the site and a refresher of what happened on site a day before. Adequate safety signage within construction sites should be installed to alert community/ drivers/pedestrians. Lighting and reflective tapes and signages should be worn by all workers.			Accident/ Incident Report						
		Security risks to workers. kidnapping, hostage taking and armed attacks in view of the prevailing insecurity in the country	Appropriate security measures in place to prevent harassment or kidnapping. Consult the local residents on present security measures	WUA's	1,821,750	Security personnel engaged. Level of SRMP implementation	Records of consultation and Interviews	No of security incidents	Project Area	Bi-monthly	Supervision Consultant KRIS E&S Team WUA's Police	650,100

			Employ local vigilantes as security personnel and inform Police and Civil Defence about the project work. Reduce working hours, road travel and exposure to security threats. Engage local workers to reduce the number of migrant workers. Implement project security risk management plan									
Total for Construction Stage					**N17,602,951**							**N6,431,527**

OPERATION PHASE

S/No	Activities	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (NGN)	Parameters to be measured	Method of measurement	Performance indicator	Sampling Location	Monitoring Frequency	Institutional Responsibility (Monitoring)	Costs (NGN)
	A. Environmental & OHS Impacts											
1A	Usage of embankment Drainage and downslope	Generation of different types of wastes – solid waste due to movement of people around intervention area	Provide waste bins that are immovable but can be easily tipped off from down or up KSEPA/ WASH Depts in LGAs to ensure periodic waste disposal Drainage to be evacuated periodically	Dam Project Manager KSEPA/ WASH Depts, LGAs	Part of Tiga Dam Operational cost	Waste management practices Waste Manifest	Document inspection Site inspection/ Observation	Good housekeeping	Dam Area	Monthly	KRIS E&S Team	N3,560,850 for monitoring during months of start of operations of the facilities before the project hands over to the HJRBDA
		Poor maintenance of mains and drainage may lead to damage of dam facilities	Prepare a maintenance schedule	Dam Project Manager	Part of Tiga Dam Operational cost	Maintenance schedule	Physical inspection	Good waste management practices Good housekeeping Routine maintenance	Main Canal	Quarterly	KRISO E&S Team	

				Ministry of Education								
2A	Operation of heavy machineries for regular maintenance	Exhaust fumes from equipment and diesel generator plants	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	1,150,000	Complaints	Review of reports	Compliance to	Project Area	One -off	KSEPA, NESREA (state) KRISO E&S Team Supervision Consultant	Covered as part of monitoring costs
3A	Increased farming activities	Change in soil profile Increase in soil salinity Possible water logging and leaching	Training on Sustainable Land Management (SLM) practices	E&S KRIS Office HJRBDA	TBD	Trainings are conducted	Training Manual	Absence of	Upstream and downstream farming arae	Quarterly	E&S Unit	
	B. Social Impacts											
1B	Temporary closure of main-canal or drainage due to maintenance (or other reasons), and subsequent	Disruption of socio-economic activities Livelihood	Ensure routine maintenance practices Inform Upstream and downstream farmers Water Users and Local Communities beforehand when sudden shut down occurs or is envisaged.	Dam Project Manager, Compliance Officer	2,560,320	Number of complaints	Maintenance Records	Frequency of shut-down periods	Tiga Dam and Main Canal	TBD	HJRBDA, Scheme officers,	956,230
2B	Lack of capacity to implement safeguards	Social crises and environmental degradation will cause project	Recruit/regular training for E&S Officers of the HJRBDA	HJRBDA, SMWR,	6,469,301	Number of new staff employed and date	Documentation of safeguard training and number of staff	Frequency & Quality of Safeguard Report	Scheme	Annually	FMWR, Dam Unit	850,104

		failure					trained					
3B	Negligence of the Dam	Increased presence of termite mounds, weeds on downstream and upstream slope, main-canal Use of herbicides, aerial and ground spraying with insecticides, rodenticides and anti-bird sprays	Implement IPM Plan Manual removal of grasses Regular cleaning and dredging of sediments in canals	IPM Consultant	6,340,102	Optimization of facility	Documentation of regular maintenance	**Good house-keeping**	Tiga Dam and project area	Monthly	HJRBDA,	860,210
4B	Operations of Dam	Security issues:	Ensure implementation of security plan Install and secure tall flood lights and CCTV cameras with tamper proof screws as part of security measures to capture movement in and around project area	E&S Unit HJRBDA Ministry of Education in collaboration with security agencies and local communities	Part of Project Design/ Security costs Part of state budget	Security plans Incidents	Review security plan and Incident records	Availability of security strategy	Schemes	Continuous	HJRBDA,	2,413,520
Total for Operation Stage					**N16,519,723**							**N5,150,000**
Total for ESMP MATRIX PHASE 1					**N44,199,694**							**N13,976,027**

7.3.2 ESMP Matrix Phase 2

Table 22: ESMP & Monitoring Plan for Phase 2

S/No	Activities	Potential Impact	Mitigation Measures	Responsibility for Mitigation	Mitigation Cost (N)	Parameters to be Measured	Method of Measurement	Performance Indicator	Sampling Location	Monitoring Frequency	Institutional Responsibility (Monitoring)	Cost (N)
ENVIRONMENTAL , SOCIAL & OHS IMPACTS												
1B	SAME AS PRE-CONSTRUCTION STAGE EXCLUDING BORROW PIT PREPARATION											
2B	SAME AS CONSTRUCTION STAGE											
3B	SAME AS OPERATION STAGE											
Total for ESMP MATRIX PHASE 1			**N32,049,194**									**N11,025,527**

All impacts and corresponding mitigation measures for Phase 2 will be implemented as indicated in the ESMP Matrix Table 21 excluding Borrow Pit Preparation (5A). Thus, the total mitigation cost for Phase 2 ESMP Matrix is N32,049,194 while monitoring cost N11,025,527

7.4 ESMP Implementation Schedule

According to the Contractor's work-plan for Tiga Dam, it is expected that the activities related to the ESMP Matrix as seen above should be integrated into the overall Contract Agreement. The project implementation is estimated to be completed within 8 months which is segmented into 2 phases.

- **Phase One – 3 months Completion Period**
- **Phase Two – 6 months Completion Period**

Therefore, the ESMP Matrix implementation schedule is segmented into two phases and should be implemented across the estimated within 8 or beyond as the case maybe. Table 23 provides only the 8 month completion period as advised by the Project.

Table 23 ESMP Implementation Schedule

S/No	Activity	Responsibility	Before pre-construction		Pre-construction (2024)		Construction (2025)				Operation Phase	
			Sep	Oct	Nov	Dec	Jan	Feb - Mar	Apr-May	Jun	Feb-Jun	Jun-Dec 2025
Phase One (Nov 2024 -Jan 2025)												
1	Drafting, Clearance and Formal Disclosure of Addendum ESIA	TRIMING E&S Team										
2	Inclusion of Environmental & Social Requirements into the Bidding document	TRIMING E&S Team										
3	Finalization of Engineering Designs	In-house Engineer and Procurement										
4	Review and Approval of Contractor's ESMP	TRIMING E&S Team/ Supervision Consultant										
5	Environmental and Social Training for Contractor workers	Technical Consultant										
6	Mobilization to site	Contractor										
7	Site Clearing											
8a.	Construction Activities											
Phase Two			**(Feb – Jun 2025)**									
8b	Construction Activities											
9	Implementation of E & Mitigation	Contractor										
10	Supervising ESMP Implementation	Supervising Consultant										
11	Monitoring & Reporting on ESMP Implementation Post Remedial works	KRIS E&S Team /Relevant MDAs										

7.5 Monitoring and Evaluation Plan

The monitoring and evaluation plan will be the responsibility of the KRIS Safeguard Team for all measures outlined in the ESMP matrix but will delegate certain responsibilities to the Contractor (in this case is responsible for the civil works) and Supervising Consultant. Such delegation of responsibility shall be documented as part of contractual agreements to guarantee compliance and commitment on the part of the supervising consultant to supervise and on the part of the contractors to implement the ESMP Matrix. As most of the mitigation measures are the obligations of the Contractor during project implementation, the contractor shall prepare the Contractor's ESMP (C-ESMP) considering the measures in this ESMP Matrix and other E&S Plans especially the Borrow Pit Management Plan including the GBV Action Plan, Labour Management Plan, Project GRM

The monitoring plan (Internal and External Monitoring) for the ESMP Matrix is presented in Table 24 below. Monitoring results shall be documented with preventive/corrective actions to be implemented.

Table 24 Monitoring Plan

Monitoring	Action	Responsibility	Period	Performance Indicator
Internal Monitoring	Regular site visit to ensure that the mitigation measures and actions specified in the ESMP Matrix are implemented and as bound by the contract is satisfactorily implemented.	Supervising Contractor, Contractor's HSE, KRIS Safeguard Team	During Pre-construction, construction and Operation Phases	Monitoring Reports and documentation as described below
	Site visit for monitoring and inspection to ensure CONTRACTOR adhere strictly to the engineering designs and specifications for the project		During construction Phase	Observations and Monitoring Reports presented to the KRISO.
External Monitoring	Regular site visit to ensure project is implemented in an environmentally & socially sustainable manner using the monitoring indicators specified in the ESMP Matrix and other national and international environmental & social requirements	KSEPA, FMEnv and other relevant MDAs.	During Pre-remedial works Construction and Operation Phases	Inspect monitoring reports from Safeguard units Provide feedback on observations. Enforce corrective actions where necessary.

7.5.1 Reporting Plan

The reporting procedures presented in Table 25 below have been developed in order to ensure that KRIS Safeguard Team is able to receive feedback from the implementation of the ESMP Matrix as an on-going basis and to take rapid corrective actions if there are issues of non-conformance.

Table 25 Reporting Plan

Phase	Responsibility	Deliverables	Frequency	Accountability
Preconstruction	E&S Unit	Report of monitoring activities including any specific events	Bi-weekly	Project Manager of Tiga Dam, TRIMING, KSEPA on request
Construction	E&S Unit Supervision Consultant WUA	Monitoring Reports of E&S Compliance from all project sites Quarterly, half-yearly and annual reports for the attention of the TRIMING Safeguard/WB	Monthly/ Quarterly/ Half yearly/ annual	Project Manager of Tiga Dam, TRIMING, State MDAs including KSEPA, Water Resources, Women Affairs, World Bank
	E&S Unit Supervision Consultant Contractor	Additional Reports according to specific conditions e.g. Accidents, serious environmental/social impacts, grievances	As required	Project Manager of Tiga Dam National TRIMING, World Bank
	Third Party Monitors	Reports on effective implementation of E&S activities	Quarterly/ Annual	Project Manager of Tiga Dam National TRIMING, World Bank
Operaion	E&S Unit WUA	Monitoring Report especially on Borrow Pit Reclamation including all monitoring activities throughout project implementation	Once	Tiga Sector Head of WUA, Project Manager of Tiga Dam, National TRIMING, Ministry of Water Resources. Report to be archived and made available on request

7.5.2 Record Keeping

The contractor is required to keep records providing evidence of ongoing mitigation activities. Such records may include site monitoring plan, Site Specific HSE Plan, Waste Management Plan, Traffic Control Plan, signed Code of Conducts, Emergency response and preparedness procedures, site instructions, training records, complaints records, incident report, Inspection, maintenance and equipment calibration records. These documents should be made available to the E&S Team of the KRISO upon request.

The supervision consultants to the Contractor are required to keep records of non-compliance and corrective actions taken. These documents should be made available to the E&S Team of KRIS upon request.

The E&S team of KRIS is also required to keep records to provide evidence of monitoring activities and effectiveness of the monitoring plan. The site monitoring plan will identify problems/corrective actions and monitoring reports. These documents shall be made available to the National TRIMING, World Bank and other relevant regulators upon request. In addition, all significant communications with MDAs should be documented and kept. These documents are required to track performance in order to achieve and demonstrate compliance with the monitoring plan and applicable regulatory requirements

7.6 Cost of Implementing the ESMP

In view of the work methodology outlined by the Contractor in implementing the sub-activities in two phases, the overall total estimated cost to effectively implement the mitigation and monitoring measures recommended in the ESMP Matrix for both Phases is N98, 250,442 as seen in table 26 below. The cost of mitigation for Phase 1 is N41, 199,694 while Phase 2 is N32, 049,194, these costs should be included in the contract as part of the implementation cost by the Contractor

Table 26 Cost for the Implementation of ESMP

Item	Responsibility	Cost Estimate in Naira (N)
Phase 1		
Mitigation	Contractor	41,199,694
Monitoring	KRIS E&S Team	11,976,027
Sub-total for Phase 1		**53,175,721**
Phase 2		
Mitigation	Contractor	32,049,194
Monitoring	KRIS E&S Team	11,025,527
Sub-total for Phase 2		**43,074,721**
GRM Operation	State Safeguard Team, WUAs	2,000,000
OVERALL ESTIMATED COST		**98,250,442**

CHAPTER EIGHT: CONCLUSION AND RECOMMENDATION

8.1 Conclusion

The project is envisaged to have a largely positive impact on the benefitting farmers, herders and recipient communities. The potential negative environmental and social impacts which were identified can be mitigated with strict compliance to the mitigation measures stated in the ESMP Matrix. The ESMP and the mitigation costs will need to be embedded in the Bidding Document to ensure implementation costs are adequately budgeted for by the KRIS and HVIS Project Offices

8.2 Recommendation

The following recommendations are provided for the effective implementation and sustainability of the ESMP:

- Proper handing over of completed projects to the WUA leadership, to increase acceptance and enhance sustainability
- Construction activities should be scheduled during off-peak periods and residents within and around Tiga town should be notified about potential impacts
- The E&S UNIT/KRIS PROJECT OFFICE/MDAs involved in monitoring of the ESMP implementation will need to be adequately trained in line with the capacity building plan in the report
- The E&S UNIT should endeavour to establish the GRM in all project locations timely to enable stakeholders channel enquiries to the project. This includes installing complaint boxes, setting up GRCs amongst others
- Considering the security situation across locations in the Country, it is advised that the KRIS PROJECT OFFICE workers and any other team engaged by the project make adequate security arrangements for site work. The E&S UNIT should also keep abreast of the security situation in the various project LGAs and inform all relevant parties accordingly
- With respect to GBV, it is important for the E&S UNIT to conduct sensitization program for staff, KRIS PROJECT OFFICE, and community members especially women and girls on prevention strategies and the available reporting and response mechanisms, as well as the grievance redress mechanism in place for the TRIMING project in Kano state.
- As earlier stated, in the course of rehabilitation works, there would be moderate to severe likelihood of the occurrence of workplace hazards. Personnel will be predisposed to hazards. “Unsafe behaviours” and “unsafe conditions”. Occupational disasters happen more due to “unsafe behaviours” compared to “unsafe conditions”. Hence, project/site workers should be trained on unsafe behaviours and be provided with necessary equipment to practice safe behaviours. Further, the necessary facilities to facilitate safe conditions and discourage unsafe behaviours should be made available to workers
- For effective waste management on site, the KRIS PROJECT OFFICE should sign an agreement with KSEPA. This would ensure control of proper collection and disposal of construction wastes Furthermore, the KRIS PROJECT OFFICE should implement the waste management plan during the period of project implementation

- Construction Safety signs and boards should be installed to protect workers and the public around the construction sites

REFERENCES

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The Federal Ministry of Environment, Social Impact Assessment, 2017

Royal Haskoning DHV (2014) Feasibility Studies and Design for Irrigation and Water Resources Management Investment in Kano River and Hadejia Valley Irrigation Projects in Northern Nigeria.

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ANNEX

Annex 1: Terms of Reference

FEDERAL MINISTRY OF WATER RESOURCES
TRANSFORMING IRRIGATION MANAGEMENT IN NIGERIA (TRIMING) PROJECT

FOR THE ENGAGEMENT OF A CONSULTANT FOR THE
ADDENDUM TO THE ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR HADEJIA JAMA'RE SUB-BASIN WITH KRIS AND HVIS INCLUDING SITE-SPECIFIC ESMPs
FOR

REMEDIAL WORKS ON DEVELOPING CRACKS ON TIGA DAM AND SUNDRY ADDITIONAL WORKS ON SELECTED IRRIGATON SECTORS AT KRIS

July 2024

1 Introduction

1.1 Background

The Federal Government of Nigeria through the Federal Ministry of Water Resources with support from the World Bank is implementing the TRIMING Project, a seven-year program with a credit of US$495.3 million from the International Development Association. The TRIMING Project is currently being implemented in five irrigation schemes located in three river basins in Northern Nigeria namely: Bakolori Irrigation Scheme; Middle Rima Valley Irrigation Scheme; Kano River Irrigation Scheme (KRIS); Hadejia Valley Irrigation Scheme (HVIS) and Dadin Kowa Irrigation Scheme.

In 2017, the project commenced the rehabilitation activities within KRIS, of which Tiga Dam had series of rehabilitation works in order to enhance the effectiveness of the dam. As the project draws to a close, Dam Operations Improvement and Safety have become utmost important. In particular, Tiga Dam rehabilitation works within KRIS, hence, the Project intends to apply part of the proceeds of this credit to payments under contracts for Consultancy service to ensure project sustainability.

1.2 Overview of TRIMING

The Project Development Objective is to improve access to irrigation and drainage services and to strengthen institutional arrangements for integrated water resources management and agriculture service delivery in selected large-scale public schemes in Northern Nigeria. The main thrust of the project is rehabilitating and improving large-scale public irrigations schemes for a total irrigation area of about 50,000 ha and concomitant activities in agriculture with approximately 140,000 farm families and over 1 million people beneficiaries. Moreover, the project is expected to strengthen five Water User Associations Federations (WUAF), comprising 550 multiple secondary and tertiary level water users associations (WUAs) servicing and representing the beneficiary farmers. This is complemented with improvements in dams/reservoirs to assure integrated water resources management and to improve safety for people downstream to benefit a population of about 10 million people. The project is also helping to increase agricultural productivity of the irrigated lands as well as the processing and marketing side of the increased output. Finally, it focuses on capacity building for institutional development and project management. The proposed project is a Category A project.

1.2.1 Project Components

The Project's objective will be achieved through the implementation of four components. The project components and main activities under each component are tabulated as follows.

Table 1: TRIMING Project Components

Project Components	Main Activities
Component 1: Water Resources Management and Dam Operation Improvement	
Subcomponent 1.1: Support to Integrated Water Resources Management	The *piloting* of anticipated provisions for separation of government regulatory and operational powers and responsibilities for integrated water resources management (IWRM) of basin-wide allocation, control, and river channel maintenance for sustainable public irrigation scheme functioning.
Subcomponent 1.2: Dam Operations Improvement and Safety	Investments for sustainable operational safety, improved operational practices, and increased dam safety of selected dams and reservoirs including Bakolori, Zobe, Goronyo, Tiga, and Ruwan Kanya operational reservoir and Hadejia Barrage.
Component 2: Irrigation Development and Management	
Subcomponent 2.1: Irrigation Infrastructure Investments	Rehabilitation of 27,000 ha to improve the performance of a total of 50,000 ha irrigation area in five schemes downstream of the existing storage reservoirs and major investment in irrigation civil works and related studies.
Subcomponent 2.2: Improving Irrigation Management at Scheme Level	Aims to ensure the long-term viability of the irrigation and drainage services delivered on public irrigation schemes by implementing a progressive management transfer to Water Users Associations (WUAs) and to autonomous professional operators, either public or private.
Component 3: Enhancing Agricultural Productivity and Support to Value Chain Development	
Subcomponent 3.1: Support to agricultural productivity and market linkages	Provide resources to enhance farmers' productivity in the rehabilitated schemes and improve their participation in value chains through a matching grant mechanism; and the establishment of Farmers' Management and Service Delivery Centers on each scheme, supported by extension and marketing agribusiness professionals.
Subcomponent 3.2: Support to Innovation and R&D	Technical assistance for farmers, water schools, applied research such as improving irrigated agronomy, and introduction of innovations such as new crops or production techniques as part of emerging commercial partnerships.
Component 4: Institutional Development and Project Management	
Subcomponent 4.1: Institutional Development and Governance	This subcomponent includes five activities: capacity building and training of FMWR staff; support to RBDAs; consensus building and supporting the change process; generation, feedback, and dissemination of data, and strengthening supervision and accountability in the sector.
Subcomponent 4.2: Project Management and M&E	The activities here will support the establishment of the Project Management Unit and other key coordination institutions within Government, and will provide guidance on change management processes. The M&E activities will develop an Information System for project purposes, studies and analytical work and a records and document management system.

2. Overview of Project Site Works

2.1 Kano River Irrigation Scheme (KRIS)

KRIS is located in Rano, Bunkure, Kura, and Garun Malam Local Government Areas of Kano State. The entire scheme lies within Latitudes 11036'10.89" and 11050'30.10" North; and Longitudes 8023'33.33" and 8037'08.68" East. It is located downstream of Tiga Dam. The Tiga dam serves the KRIS via the Ruwan Kanya operation reservoir downstream of a feeder canal from Tiga Dam. The area is of hilly/rocky and undulating topography. As such the irrigated areas are essentially made of selected fairly landforms on which gravity irrigation is practicable, scattered within the mass location. The scheme is operated by the Hadejia-Jama'are River Basin Development Authority with head office in Kano and zonal offices in Kura and Bunkure. The scheme is divided into two phases; Phase 1 was originally designed with a capacity of 22,000 ha of land, out of which 13,890 ha have been fully developed: Phase 2 was shelved after feasibility study established that irrigation water

supply by pumping from the Hadejia River was not feasible. An additional 1,087 ha has also been developed covering only 42 sectors out of 50 sectors under Phase 1 with the incorporation and construction of livestock crossing along canals at maximum intervals of 2km.

Main Irrigation Infrastructures in KRIS consist:
Tiga Dam and reservoir
Main canal (MC) system – including the Ruwan Kanya Dam and Reservoir.
East Branch Canal (EBC) system with 3 sectors
West Branch Canal (WBC) system with 29 sectors (27 constructed)
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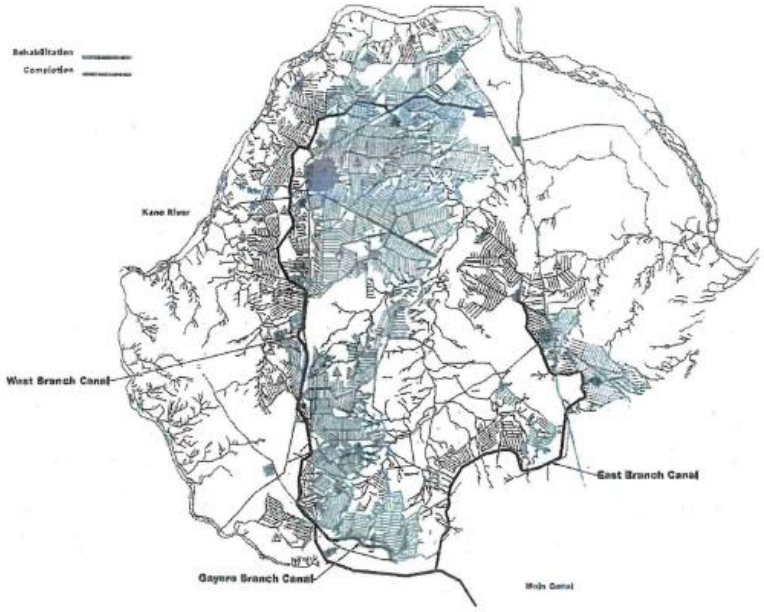


General layout of KRIS irrigation infrastructure and showing rehabilitation and completion sectors in Lot 1

2.1.1 Tiga Dam

The Tiga Dam is a zone-filled earth dam, which was designed and built between1970 to 1974. The dam reservoir surface area as originally designed is about 18,900 ha with a structural height of 48m, hydraulic height of 42.68m and an active storage capacity of 1,845 million m^3 at full supply level. It lies across the Kano River, the main tributary of the Hadejia River. Water from the dam supplies KRIS. The loss of reservoir capacity due to sedimentation since its construction has not been assessed. However, since the outlet pipes have not been blocked by the accumulated sediment in the reservoir, it is believed that the sediment level may still be within the dead storage zone. The outlet works of the dam have a maximum capacity of $47m^3/s$, which is achieved at full reservoir level. In 1988, in order to contain the threat of overtopping and seepage through the dam, it was deemed necessary to reduce the spillway crest elevation by 2.00m, thereby effectively reduce the active storage capacity to 1,283 million m^3 - about 68% of its original full capacity. This exercise also reduced the outlet discharge capacity. There is a bypass gate located at the very beginning of the supply canal. This delivers water back to Kano River as a recharge

Rehabilitation Works done on Tiga Dam in 2017
Main Inlet
Refurbishment of bulkhead gate valve and seals
Construction of concrete access ramp, platform, access ladders and safety rails at gallery entrance
Replacement of butterfly valve
Gallery works: Refurbishment of the forced ventilation system to the gallery.
Install safety rails & ladders at access gallery end

Refurbishment of all electrical circuits & switchgear
Construct new building with workshop, store room, office and room for generator
Refurbish and extend the forced ventilation system to the gallery
Tunnel lining treated against further corrosion

Main Outlet
Installation of branch pipe
Installation of wedge gate valve manually operated
Installation of sleeve valve- hydraulic and manually operated
Construction of additional reinforced concrete outlet structure and tie-in adjacent existing structure
Construction of a new valve control room
Construction of new shut-off valve canopy
Install overhead gantry & lifting hoist
Refurbishment of all electrical circuits and switchgear
Installation of safety rails, grids and ladders

River and left outlets
Underwater survey of the two inlets
Manufacturing and installation of stop logs
Construction of coffer walls downstream to prevent return flow into the pipes
Draining of outlet pipes
Removal and refurbishment of all valves
Temporary arrangement for water supply to Tiga village when left outlet is out of commission
Additional civil works

Embankment
Repair to beach formed on upstream slope
Additional riprap protection (Erosion protection)
Filling of the embankment to attain a level of 220mm
New crest survey beacons
Spillway
Training embankment – earthworks, bedding and riprap
Sundry Items
General repairs and maintenance to items not specified

2.2 Justification for the Additional Works

Cracks on the Crest of Tiga Dam: On 6th September 2020, TRIMING Project was notified by Sinohydro Corporation Ltd of lateral cracks on the Embankment crest of Tiga Dam, which was also confirmed by the River Basin Staff. It was reported that the crack (measuring: length-30 meters, width- around 10 cm, visible depth-60cm) was observed 200 meters away from the left outlet of Tiga dam. This became the second crack observed since the retrofitting works of the Penstock by Messrs. Skipper Nigeria Ltd. Sequel to devastating flood incident witnessed in September-October 2022 especially within the Hadejia-Jama'are River Basin, new longitudinal cracks were reported by Department of Dams and Reservoir Operations in November 2022 and TRIMNG Projects in December 2022.

A technical committee was authorized to inspect the above concerns and report observations with the following objectives below

Identify the causes of the longitudinal cracks (analysis of Geophysical and Geotechnical reports, soil analyses, reports of remedial works from contractors). Considering factors such as dam material properties, foundation conditions, the entire dam drainage system, the embankment configuration, construction practices, and environmental factors including.

Assess the stability of the dam, existing condition, evaluate the risks posed by the cracks including potential failure modes and their consequences.

Propose appropriate rehabilitation measures to address the identified issues and mitigate risks associated with the longitudinal cracks.

Develop a comprehensive plan outlining the recommended rehabilitation works, including detailed design requirements, construction timeline, and estimated costs.

One of objectives above was to investigate the root causes of the dam cracks and to propose remedial works. About 11 typical crack development zones were identified using probe pit, geophysical and geotechnical surveys. In order to treat these cracks, a set of integrated remedial measures were proposed, including repair and sealing of existing cracks, restoration of the downstream slope ratio, improvement of the drainage system, and an optional addition of plastic concrete cut off walls

2.3 Proposed Remedial Works

The proposed remedial works to treat the longitudinal cracks on Tiga Dam Crest are categorized into rehabilitation and construction. There are currently many cracks on the dam crest, mainly distributed along 11 typical zones and between chainages. The proposed remedial plans are itemised into four as follows;

Repair and Seal Existing Cracks: The construction sequence is as follows:
Demolish the bituminous pavement on the dam crest (15cm thick) and remove shallow cracks on the surface (not exceeding 1m);
Inject the cracks with slurry without pressure;
Backfill clay and compact to the elevation of 530.95m, with a compactness of not less than 98%;
Lay geotextile, 200g/m^2;
Lay PE geo-membrane, 0.5mm thick, to prevent rain from entering;
Lay geotextile, 500g/m^2;
Lay crushed stones and compact them, 20cm thick;
Pave bituminous pavement, 5cm thick (option);

Restore the Downstream Slope Ratio: The construction sequence is as follows:
Clean the downstream face of the dam, remove weeds, trees, drainage channels, etc.
Backfill clay and compact to the design slope ratio (1:3.0), with a compactness of not less than 98%, and the material used for heightening of dam shall be consistent with the material used;
Plant grass on the compacted slope to prevent soil loss and restore facilities behind the dam

Improve the Downstream Slope Toe Drainage: construction sequence:
Dig trench at downstream slope toe, expose the horizontal drainage body in the dam body and connect to the collection well;
Lay geotextile in the trench, 200g/m2;
Lay crushed stones in the trench to divert seepage water from the dam to the collection well;
Top covered with 1m thick clay.

Add Plastic Concrete Cutoff Walls (Option): construction sequence:
Dig along the dam axis with a depth of not less than 12m and a width of 60cm;
Slurry supporting;
Pour C10 plastic concrete.

3. Rationale for Addendum to the ESIA

As earlier stated, in 2017 the project embarked on rehabilitation works within KRIS and HVIS including civil works on Tiga Dam and sundry. Procedurally, a full ESIA titled "*Environmental and Social Impact Assessment (ESIA) For the Hadejia Jama'are Sub-Basin with Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) and the Associated Cumulative Impacts*" was conducted to minimize risks and mitigate impacts including cumulative impacts. This report was comprehensive and also covered potential risks/impacts associated with works around Tiga Dam. Assessment conducted by Messrs. NESPAK and confirmed by the Project Technical Committee revealed additional works are required to protect the Scheme and avoid the emerging environmental degradation. In order to treat these cracks, a set of integrated remedial measures were proposed, including repair and sealing of existing cracks, restoration of the downstream slope ratio, improvement of the drainage system, and an optional addition of plastic concrete cut off walls. These risks associated with the remedial works spans about 420m within the scheme although the cracks do not affect the integrity of the dam (*Comments on Technical Proposal for Tiga Dam by Ximing Zhang, Senior Dams Specialist, July 10, 2024*).

In order to save time, cost and avoid unnecessary repetitive instruments, the project needs to review and update the previous ESIA conducted for both schemes to adequately include the risks and mitigation measures associated with these new remedial. In furtherance, according to EIA Act CAP LFN 2004, an assessment done within a span of seven years and within the project site requires an UPGRADE OF THE ASSESSMENT AND NOT A FRESH EIA.

4. Objective of the Consultancy

The consultant is expected to update the previous ESIA for KRIS and HVIS and painstakingly look at the risks and impacts associated with each of the proposed remedial works by including additional site specific ESMPs in the context of the proposed new activities.

4.2 Specific Objective of the Addendum to the ESIA

The addendum will evaluate additional potential environmental and social impacts associated with the new proposed activities (*Remedial Works on Developing Cracks on Tiga Dam such as repair and sealing of existing cracks, restoration of the downstream slope ratio, improvement of the drainage system, and an optional addition of plastic concrete cut off walls At KRIS and other sundry works)* in relation to the physical and social environment. It will further sets out measures to avoid and minimize adverse impacts potential cumulative impact of the remedial works that may occur even beyond the boundaries where civil works are to be carried out.

The addendum of the ESIA will utilize various reports prepared for TRIMING Project for the schemes which includes;

Justification for Contract Addendum

Draft Report on Emergency Repairs of Longitudinal Cracks on the Crest of Tiga Dam Embankment

Dam Safety report for Tiga, Ruwan Kanya, Challawa Gorge and the Hadejia Barrage

Feasibility studies for the schemes

Environmental and Social Management Framework (ESMF), etc., and the Project Appraisal Document prepared by the World Bank for the TRIMING Project.

Tiga Dam Longitudinal Crack Treatment

5. Scope of Work

The Consultant will work in close collaboration with the engineering design consultants or construction consultants as well as the TRIMING project team. S/he will have to consider the technical variants of the proposed remedial activities and in return, inform the technical design consultants of any major constraint and recommend his/her professional advice if any issues or challenges are observed due to the social and environmental situation on ground. The Consultant will consider the proposed civil works as mentioned in sub-section 2.3. The Consultant would also consider the institutional capacity and training needs, supervision measures and feedback mechanism.

The core tasks shall include:

Review, and update the Environmental and Social Impact Assessment (ESIA) For the Hadejia Jama'are Sub-Basin with Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS)

Describe the proposed project by providing a systematic description of the project relevant components and presenting plans, maps (proposed works, base camps, environmental and social sensitivities, staging areas, alternative routes etc with details of XY coordinates), figures and tables.

Identify and summarize the policy, legal and administrative framework relevant to the project.

Describe and analyse the environmental, social, physical, biological, and Safety conditions in the study area before project implementation. This analysis shall include a mapping of the project area of influence as well as discussions on the interrelations between environmental and social components and the importance that the society and local populations attach to these components.

Identify and assess the risk of labour influx and GBV/SEA/SH on the subproject as well as recommend mitigation measures in managing the risks and potential adverse impacts associated with labour influx and GBV.

Define the potential environmental and social impacts and risks resulting from proposed remedial works and appropriate measures to prevent, minimize, mitigate or ameliorate for adverse impacts or to enhance the project environmental and social benefits, including responsibilities and costs applicable to actual mitigation and subsequently to monitoring exercise.

Define community health broadly, and also as related to STDs such as HIV/AIDS and other STIs, VAC, child labour, and forced labour. Ensure that awareness creation on the aforementioned is captured to include responsibility for implementation such as prevention and mitigation as well as monitoring of progress.

Include specific ESMP matrix table that addresses the various proposed remedial works within the scheme. These matrices would include cells for activities, potential risks/impacts, mitigation measures, responsibility for mitigation, cost of mitigation, parameters to be measured, KPIs, monitoring frequency and responsibility and costs.

Consultations- the Consultant would carry out consultations with identified primary and secondary stakeholders to obtain their views/opinions about the proposed remedial works. These consultations shall occur before the update and the proposed mitigation measures will be discussed with relevant stakeholders directly involved with the civil works. Recommendations from this consultation will be included in the addendum ESIA report

Based on the outcome of the consultation with stakeholders, the consultant should provide a summary of key indicators of community support for the project, as well as perceived benefits from the project expressed by different stakeholder groups.

Update some mini-plans within the ESIA as follows: Borrow-pit management plan; Occupational health & Safety, Sexual Exploitation, and Abuse (SEA) prevention and response action plan; Traffic Management Plan to ensure safety of local communities from construction traffic; OHS Plan. Water Resource Protection Plan to prevent contamination of drinking water; Boundary Marking and Protection Strategy for mobilization and construction to prevent offsite adverse impacts; Strategy for obtaining Consents/Permits prior to the start of relevant works such as opening a quarry or borrow pit.

5.1 Socio-Economic Baseline Report

As part of diligent efforts to understand the current situation of inhabitants around Tiga Dam and within KRIS. It is important to identify the present estimated population of residents, what percentage are male and female, how much children are in this community (including vulnerable groups), what's their primary occupation, are there prevalent cultural beliefs that shape their way of life and so on? The consultant should carry out a socio-economic baseline study in order to report a detailed characteristic of the people, which will be relevant in developing plans as GRM, GBV/SEA/SH etc. Correct reportage of socio-economics is crucial as it will be used to make very important decisions, the consultant should take note of this.

In addition, baseline assessment and stakeholder consultations are very critical to the addendum process. Baseline assessment of all locations will be conducted to gain an understanding of the schemes, whilst comparing the ambient conditions (physical, biological and social) with the proposed rehabilitations works.

5.2 Stakeholders Identification and Engagement

This section shall summarize the actions undertaken to consult all the various groups that are likely to be affected by the remedial works interventions. The consultation here would be highly inclusive in getting the requisite feedbacks from the project beneficiaries about the Project, understanding their economic, social cultural life style [in assessing how these might affect the Project Intervention] and the Project Team responses so as to manage the expectations beneficiaries' might have for the Project. An in-depth stakeholders' analysis is required as part of this consulting. The analysis will include identification of all relevant persons, groups, organizations while zooming in on the vulnerable, women, girls and children, the elderly, persons with disabilities and project affected persons such as those whose livelihoods may be threatened or directly affected by the project etc. The detailed record of the consultation meetings shall be presented in the annex of the ESIA.

5.3 Uptake of In-depth Analysis of Gender Based Violence and Consultations

Prevention of GBV and related incidences such as SEA/SH/VAC is of utmost importance in the project. In a bid to reduce risks associated with daily work routine within project intervention areas and around the site as a result of the project implementation, the consultant should explore this concern exhaustively, especially by consulting with women groups so as to understand current realities of GBV and related cases as guided by inputs of women during consultations. These consultations should be carried out as necessary until satisfactory outputs are attained. Data such as frequency of occurrence, coping mechanisms, reportage and punishment systems etc can be discussed at a great depth. Relevant legal provisions for such cases in the Nigerian law and other relevant documents should be reviewed so as to aid design of incidence prevention, uptake, and resolution in the event of such incidence, although prevention is the most important factor here.

5.4 Ethical Requirements

Before undertaking any activity, the team will make sure that it understands all ethical considerations related to working on GRM, GBV, SEA, SH and VAC. The consultant should not collect any primary data or conduct interviews or research using GBV/SEA survivors as case studies; consultant will only make use of secondary data in this regard.

6 Outline of the Addendum to the ESIA

The outline will follow the approved and disclosed outline of the previous ESIA for Hadejia Jama're Sub-basin with KRIS and HVIS while taking into cognizant the various affected chapters (1, 3, 4, 5, 6, 7 and 9)

Annexes

Annex 1: Terms of Reference
Annex 2: List of Persons met with pictures
Annex 3: Summary of World Bank Safeguard Policies triggered by this project.
Annex 4: Records of Inter Agency and Public/NGO Communications including photos
Annex 5: List of participants in consultations and summaries of consultations
Annex 6: General Environmental and Social Management Conditions for Construction Contracts
Annex 7: Occupational Health and Safety (OHS) Plan
Annex 8: Sample of Questionnaire for socio-economics
Annex 9: Waste Management Plan
Annex 10: Environmental and Social Performance Monitoring Checklist
Annex 11: Annex 16: Sample Borrow pit management plan
Annex 12: Workers Code of Conduct for both contractors and supervision consultants
Annex 13: Labor Influx Management Plan to include salient aspects such as Gender Based Violence (GBV)/ Sexual Exploitation and Abuse (SEA)
Annex 14: Workers Camp Site Management Plan
Annex 15: Sample Content of Contractor Environmental and Social Management Plan
Annex 18: Pest Management Plan.

7. Qualification of Consultant

Selection will be done through the World Bank Direct Selection Method and be prepared by an individual consultant. The consultant will have at least 8 years' experience in environmental management and must have an advanced degree earned in relevant fields including but not limited to environmental sciences, environmental management or social sciences. Other requirements are:

The consultant must have a working knowledge of World Bank Environmental and Social Framework, Operational safeguards Policies gained through hands-on experience in the preparation and implementation of environmental and social management plans in an urban/rural area.

Experience in occupational Health and Safety / HSE and relevant certification

Excellent communication and report writing skills

Familiarity with the project area will be an added advantage

8. Duration of work

This assignment is expected to be completed within a period of six weeks (6 weeks) commencing immediately after contract signing. It should be noted that the success of the assignment during this period largely revolves around adequate consultations with all relevant stakeholders. The successful consultant is expected to spend considerable time in the project site to gather all necessary salient primary information.

9. Reporting

The consultant shall report to the National Project Coordinator through the Environmental and Social Safeguards Specialists.
9.1 Responsibilities of the Client
In addition to the project supervisory and other responsibilities contained in this assignment, the proponent shall provide the consultant with the following project documents:
Project Appraisal Document
Environmental and Social Management Framework (ESMF) for the TRIMING Project
Resettlement Policy Framework (RPF) for the TRIMING Project
Feasibility study report and subsequently, the Engineering designs

Disclosed Environmental and Social Impact Assessment report for Kano River Irrigation Scheme (KRIS) and Hadejia Valley Irrigation Scheme (HVIS) in kano and jigawa respectively.
Grievance Redress Mechanism report and Communication strategy report for the TRIMING Project
Reports on the TRIMING Project's Integrated Pest Management and safe use of chemicals approaches
Other relevant Safeguard instruments prepared for the TRIMING Project

10. Deliverables

The consultant at the end of the assignment must submit a comprehensive and fully referenced report including detailed ESMP matrix and implementation process.

Inception Report: Expected in one week after the date of contract signing. This should include methodology and work plan with clearly defined community entry strategy that ensures free prior and informed consent. Consultant shall submit (2) hard copies and a soft copy of the inception report.

Addendum Draft Report: Expected in four (4) weeks after contract signing, detailing out findings from desk reviews, fieldwork, environmental and socioeconomic characteristics and stakeholders' engagement/consultation, etc which will be circulated for comments and relevant recommendation. Consultant shall submit (4) hard copies and a soft copy of the draft report.

Addendum Final Report: Expected in six (6) weeks after contract signing, detailing all relevant information and addressed comments. Consultant shall submit (8) hard copies and a soft copy of the final draft report to the PMU.

11. Remuneration and Payment Schedule

The consultant shall be paid on a lump sum all-inclusive basis in three (3) instalments upon acceptance of deliverables of the reports as stipulated below

S/No	Description	Payment
1	Upon acceptance of Inception Report	20% of the Contract Sum
2	Upon acceptance of Draft Report	50% of the Contract Sum
3	Upon acceptance of Final report	30% of the Contract Sum

All Reports Shall Be in English and Presented in Hard and Soft Copies, however, for the purpose of final report submissions, the adviser is to produce the executive summary in English language and in the local language of the target community. All submission shall be made to the National Project Coordinator, TRIMING.

Except for the purpose of this assignment, all information pertaining to this programme as well as outputs produced under this contract shall remain the property of the FMWR who shall have exclusive rights over their use.

Annex 2- E&S Baseline Checklist

Checklist One

Environmental and Social Assessment checklist for Remedial works Tiga Dam in KRIS (TRIMING)

Type of work

Address: _____

LGA: _____

PROPOSED ACTIVITIES

No	Crack Activities	GPS Coordinate		Dimension	
		Latitude	Longitude	Length (m)	Breadth (m)

DESCRIPTION OF THE PROJECT ENVIRONMENT & DEMOGRAPHY

Tick the appropriate response

Socio-economic Type:

Gender:**:** _____ Female; _____ Male

Age Grade: 18-30 31-45 ◯ 46-55 ◯ Above 55 ◯ ◯

Marital Status: _____ Married; _____ Christianity**:** _____ Others

Religion:**:** _____ Muslims; _____ Single **::** _____ Divorced _____ Widowed

Household Type: _____ Nuclear; _____ Extended

Household Size: 1-4 4-7 ◯ Above 7 ◯ ◯

Ethnicity:**:** _____ Hausa; _____ Fulani:**:** _____Others

Occupation:: _____ Civil Servant _____ Trader:: _____Farmer _____Others

Literacy Level:: _____ Primary; _____ Secondary: _____OND/HND; _____ Islamiya _____Others

Average Monthly Income: Above N30,000 N20,000 – N30,000 N10,000 – N20,000

Environmental Aspect

Soil Type: Heavily silted Compact soil Lateritic soil

Topography: Even or Uneven

Estimated proximity of community to site: _____ m

Is there enough Access Road to the site for construction vehicles? YES or NO

Water Source: Borehole / Well / None

Are there farmlands within the site premises: Yes / No; If yes, do the farmers use fertilizers? **Yes or No**

Environment: Urban (Built-up) / Rural

Waste Management structures: Yes / No. If yes, specify: **Local incinerator / collective dumpsite or waste bin**

(Take GPS point of waste management structure: Lat: _____; Long: _____)

Is there visible erosion issues within the site? YES / NO

If yes, **Take pictures and GPS (Lat: _____; Long: _____)**

Flood prone: Yes / No; **Drainage System:** Yes / No; **Previous or observable erosion issues:** Yes / No

Is there a river or water body flowing nearby or through the site? YES or NO

If Yes; Name of River/stream: _____ Use of river: _____

(Take sample and GPS coordinate of the river/stream)

What types of vegetation are prominent within the community? List

_____

_____

Nearby Public facilities such as religious centres, public health facilities, markets? **YES or NO**

If Yes, provide details: (Proximity to site: _____m; Pictures: _____;

GPS: Lat:_____; Long:_____)

Is there envisaged traffic build-up? **YES or NO; if Yes, what is the reason:** _____

Removal/Clearing of vegetation: Yes / No; **Types & number of Affected vegetation (trees):**

_____

_____

Require mobilization of heavy-duty vehicles? Yes / No

Can the contractor's vehicle gain access easily to the proposed construction area? Yes / No

Will any structure such as building, drainage, water lines (pipes), walkways, electric poles, trees, etc. affect construction or movement of equipment to the proposed site? Yes / No *(if others, specify)*

_____

Are there any environmentally and culturally sensitive areas within 250m? Yes / No

If yes, specify: _____

Are there potential security issues within the community? Yes / No. If yes, give details: _____

How is grievance or complaints addressed within the community?

_____

_____

Other Items:

Item	**Address**	**Latitude**	**Longitude**
Proposed Borrow Pit			
Proposed Contractor's Campsite			

Name of Enumerator: _____

Phone Number: _____

Date: _____

CHECKLIST TWO: IMPACTs ASSESSMENT

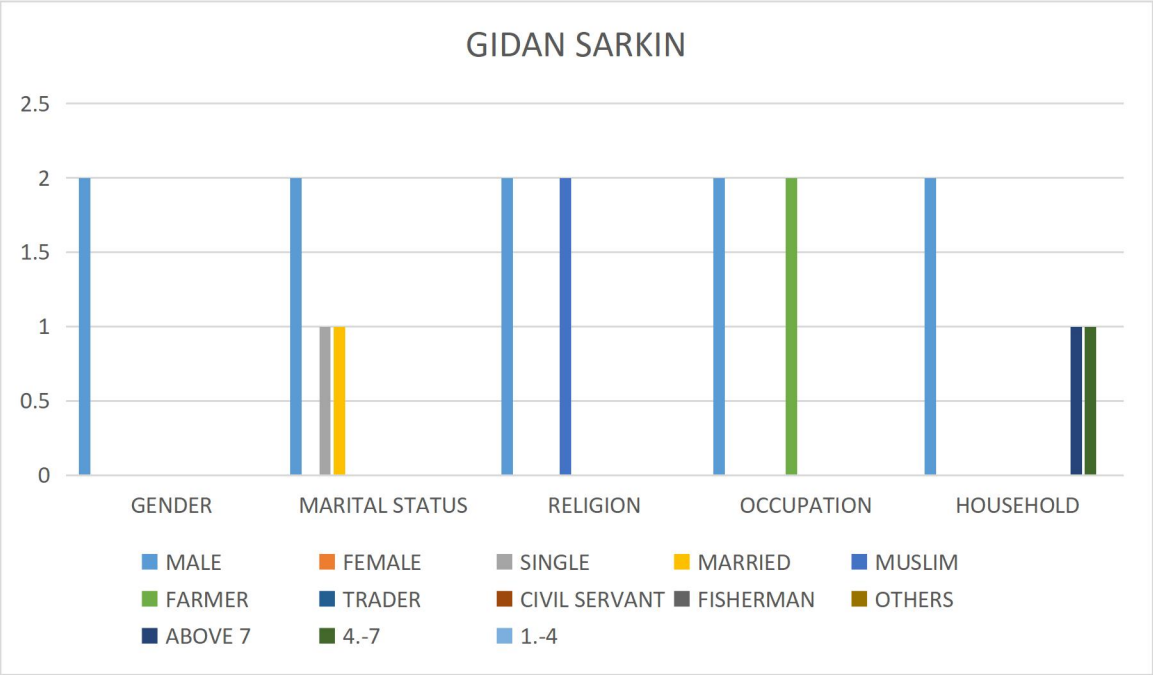
PARAMETERS	DESCRIPTION	ACTION	Remarks
Air Quality	Baseline - This is required where human activities/communities are in close proximity to the sampling sites. What is the existing situation and causes	Identify likely causes of noise and air pollution in the area	
Water Quality – surface	Baseline – This is required for streams/ rivers in the project location	Document name of river/stream, source, use & importance, seasonal/perennial, GPS. Biophysical sampling (if it is in used by the communities for domestic, agric etc.) GPS	
Soil Quality	Baseline – Note any irregularities to soil structure in the area such as previous pollution, agricultural activities with use of fertilizers etc.	Take note of any causes of existing soil pollution, use of fertilizer and the type etc.	
Vegetation	Baseline	Is there any notable vegetation of importance in the location? Is the project likely to impact this? How?	
Waste	What is the existing waste management structure in the location	How will this be linked to management of excavated soils and rocks during the project	
Land	Digging/ excavation, fill back/reclaim/ Existing erosion-prone issues	Document any existing issues – erosion sites that may be further worsened by the project. Pictures	
Public facilities – schools, religious centres, public utilities, health centres, markets etc.	Baseline – what are these facilities within the project corridor	Document the envisaged impacts of the project activities on these facilities. GPS coordinates Pictures	
Traffic assessment	Are there any notable areas of traffic interest	Document the potential impacts, location, GPS	
Communities in proximity	Identify the communities and GPS	Where relevant, conduct stakeholders' consultations. Cultural sensitivities etc.	
Consultation with community representatives	Awareness of the project Discuss likely impacts of the project to community (positive and negative) Understand issues around land ownership and possible land acquisition for the project in that area	Document their perspective, approach to land acquisition Identify their willingness to give land to the project either via voluntary of involuntary (refer to additional steps for ESS5)	
Major occupations in the area	Baseline – what type of occupations are prevalent? Men, women, youth	How will the project have any impact on these occupations	
Source of water to community	Baseline – what is the source of water in the communities	Document baseline info	
Are there schools, hospitals in the area	List them	Is it easily accessible to the schools	

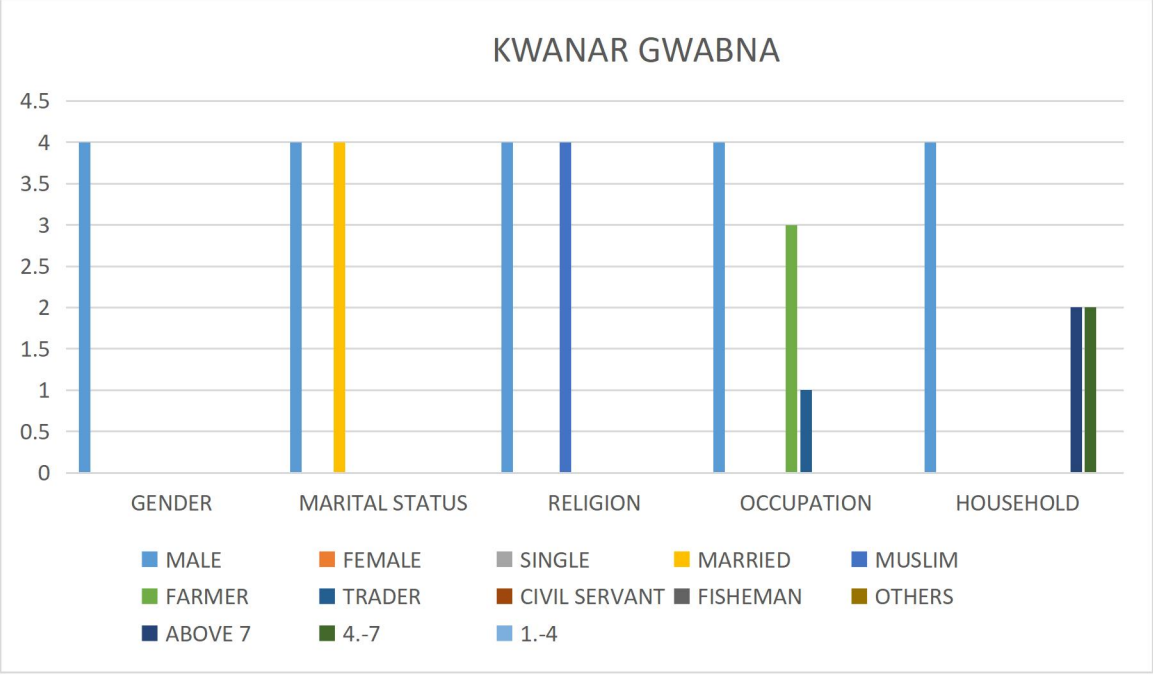
Security/conflict zone	Existing issues	Take note of conflict areas or security prone areas	
Identify access to the project site	Is the project site accessible easily? Are there any encumbrances along the route? will there be need to create another access route to the site	Identify all potential impacts, concerns, issues	
Community perception	What are likely concerns about the project and project works	Document information in consultation with residents alone	
Gender considerations	What role do women play in the community? Livelihoods? What role can women play in the project?	Document this information and additional concerns in a focus group discussion for women	

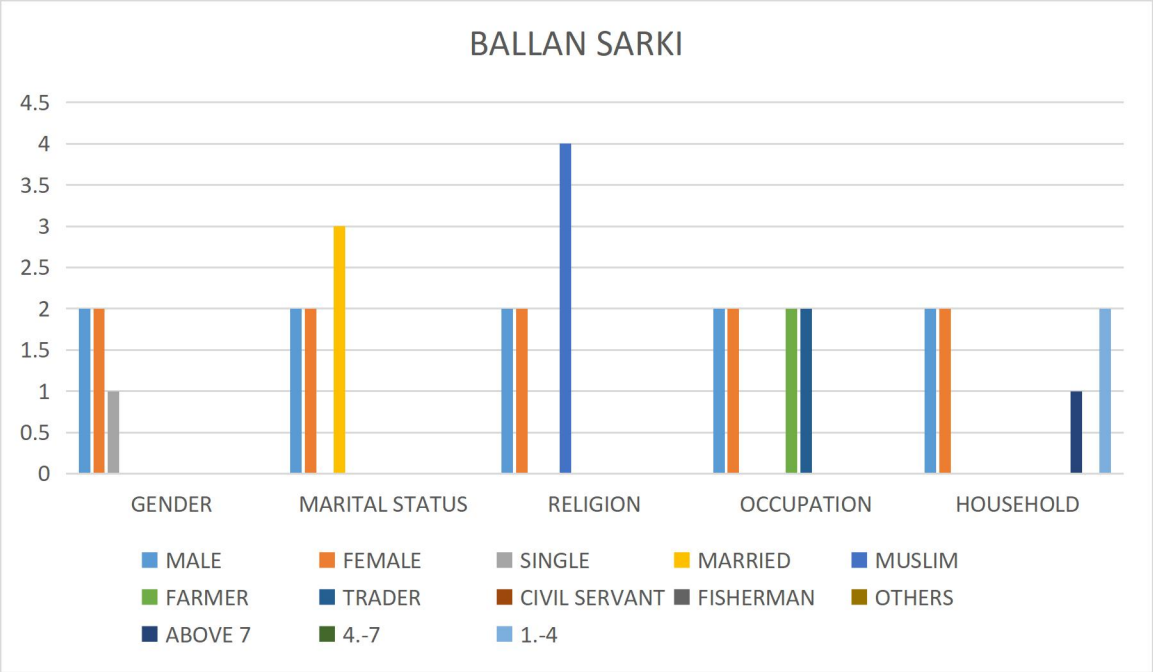
Annex 3a: Socio-economics Data

TOWN	LGA	SEX	AGE	MARITAL STATUS	RELIGION	HOUSEHOLD TYPE	HOUSEHOLD SIZE	ETHNICITY	OCCUPATION	LITERACY LEVEL	AVERAGE INCOME	SOIL TYPE	TOPOGRAPHY	PROXIMITY	ACCESS ROAD	WATER SOURCE	FARMLAND	FERTILIZERS	ENVIROMENT	WASTE MANAGEMENT	VISIBLE EROSION
GIDAN SARKIN	BEBEJI	MALE	18-30	SINGLE	MUSLIM	EXTENDED	ABOVE 7	FULANI	FARMER	OND/HND	20,000-30,000	COMPACT SOIL	UNEVEN	300	YES	WELL	YES	YES	RURAL	NO	NO
GIDAN SARKIN	BEBEJI	MALE	31-45	MARRIED	MUSLIM		4.-7	HAUSA	FARMER	SECONDARY	20,000-30,000	COMPACT SOIL	UNEVEN	300	YES	WELL			RURAL	NO	NO
KWANAR GWABNA	BOBEJI	MALE	31-45	MARRIED	MUSLIM	NUCLEAR	4.-7	HAUSA	FARMER	ISLAMIYA	ABOVE 30,000	COMPACT SOIL	UNEVEN	2500	YES	BOREHOLE	YES	YES	RURAL	NO	NO
KWANAR GWABNA	BOBEJI	MALE	18-30	MARRIED	MUSLIM	NUCLEAR	4.-7	FULANI	TRADER	SECONDARY	20,000-30,000	COMPACT SOIL	UNEVEN	2500	YES	BOREHOLE, WELL	YES	YES	RURAL	NO	YES
KUKI	BOBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	OND/HND	ABOVE 30,000	COMPACT SOIL	EVEN	2000	YES	BOREHOLE, WELL	YES	YES	RURAL	NO	YES
KUKI	BEBEJI	MALE	18-30	MARRIED	MUSLIM	NUCLEAR	1.-4	HAUSA	TRADER	SECONDARY	10,000 - 20,000	COMPACT SOIL	UNEVEN	2000	YES	WELL	YES	YES	RURAL	NO	YES
KUKI	BEBEJI	MALE	45-55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	PRIMARY	ABOVE 30,000	LATERITIC SOIL	EVEN	2000	YES	WELL			RURAL	YES	NO
KUKI	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	FULANI	FARMER	SECONDARY	ABOVE 30,000	LATERITIC SOIL	EVEN	2000	YES	WELL	YES	YES	RURAL	YES	NO
KWANAR GWABNA	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7		FARMER	PRIMARY	10,000 - 20,000	LATERITIC SOIL	EVEN	2500	YES	BOREHOLE	YES	YES	RURAL	NO	NO
KWANAR GWABNA	BEBEJI	MALE	45-55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	PRIMARY	ABOVE 30,000	LATERITIC SOIL	EVEN	2000	NO	WELL	YES	YES	RURAL	YES	YES
TIGA DAM	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA-FULANI	FISHERMAN	PRIMARY	ABOVE 30,000			20KM		DAM	YES	YES	RURAL	NO	NO
WASILA TIGA	BEBEJI	FEMALE	45-55	MARRIED	MUSLIM	NUCLEAR	ABOVE 7	HAUSA	OTHERS	PRIMARY	10,000 - 20,000	COMPACT SOIL	EVEN	6500	YES	WELL	YES	YES	RURAL	NO	NO
YADI TIGA	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	NUCLEAR	4.-7	HAUSA	CIVIL SERVANT	OND/HND	ABOVE 30,000	COMPACT SOIL	EVEN	5500	YES	BOREHOLE	YES	YES	RURAL	NO	NO
KWANA UKU TIGA	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	PRIMARY	ABOVE 30,000	COMPACT SOIL	EVEN	8600	YES	BOREHOLE	YES	YES	RURAL	NO	YES
DURMAWA TIGA	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	ISLAMIYA	ABOVE 30,000	COMPACT SOIL	EVEN	8000	YES	WELL	YES	YES	RURAL	NO	NO
BALLAN SARKI	BEBEJI	MALE	18-30	SINGLE	MUSLIM			HAUSA	FARMER	PRIMARY	10,000 - 20,000	LATERITIC SOIL	EVEN	3000	YES	WELL	YES	YES	RURAL	NO	YES
BALLAN SARKI	BEBEJI	MALE	ABOVE 55	MARRIED	MUSLIM	EXTENDED	ABOVE 7	HAUSA	FARMER	ISLAMIYA	10,000 - 20,000	LATERITIC SOIL	EVEN	3000	YES	WELL	YES	YES	RURAL	NO	YES
BALLAN SARKI	BEBEJI	FEMALE	18-30	MARRIED	MUSLIM	NUCLEAR	1.-4	HAUSA	TRADER	ISLAMIYA	20,000-30,000	LATERITIC SOIL	UNEVEN	3000	YES	WELL	YES	YES	RURAL	NO	YES
BALLAN SARKI	BEBEJI	FEMALE	31-45	MARRIED	MUSLIM	NUCLEAR	1.-4	HAUSA	TRADER	SECONDARY	10,000 - 20,000	LATERITIC SOIL	EVEN	3000	YES	WELL	YES	YES	RURAL	NO	YES
TIGA SARKIN KOGI	BEBEJI	FEMALE	45-55	SINGLE	MUSLIM		4.-7	HAUSA	FARMER	ISLAMIYA	10,000 - 20,000	LATERITIC SOIL		300		WELL	YES	YES	URBAN	NO	NO
TIGA SARKIN KOGI	BEBEJI	FEMALE	31-45	MARRIED	MUSLIM	NUCLEAR	1.-4	HAUSA	TRADER	ISLAMIYA	20,000-30,000	LATERITIC SOIL	EVEN	300		WELL			URBAN	NO	NO

Annex 3b: Graphical Analysis of Socio-economies Data



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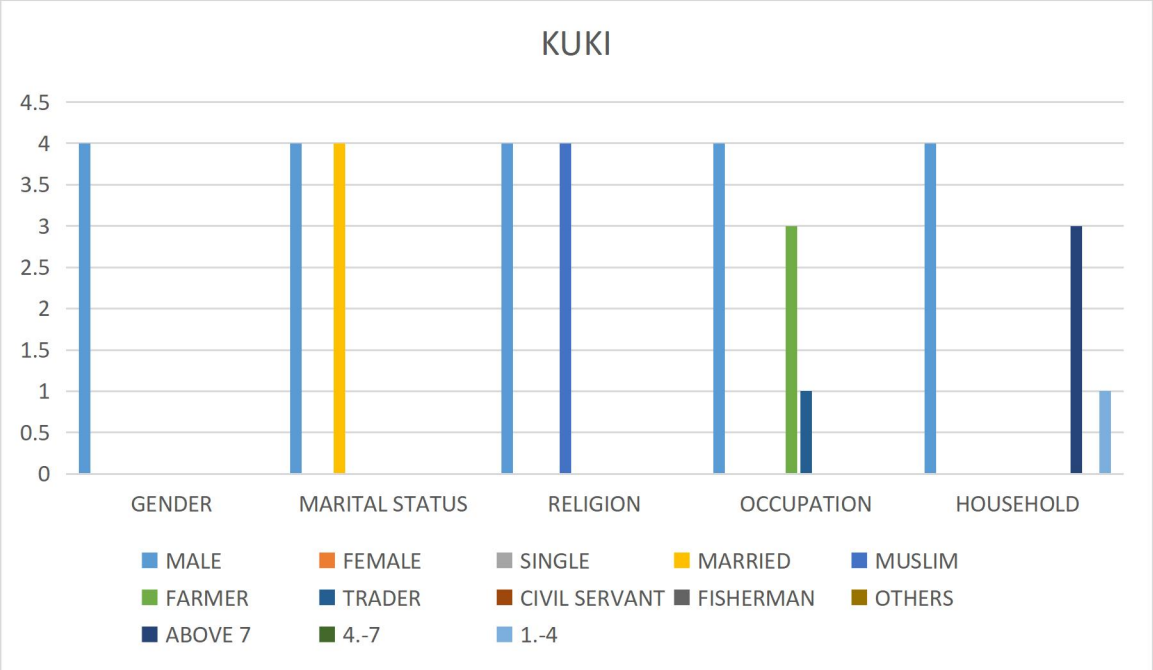
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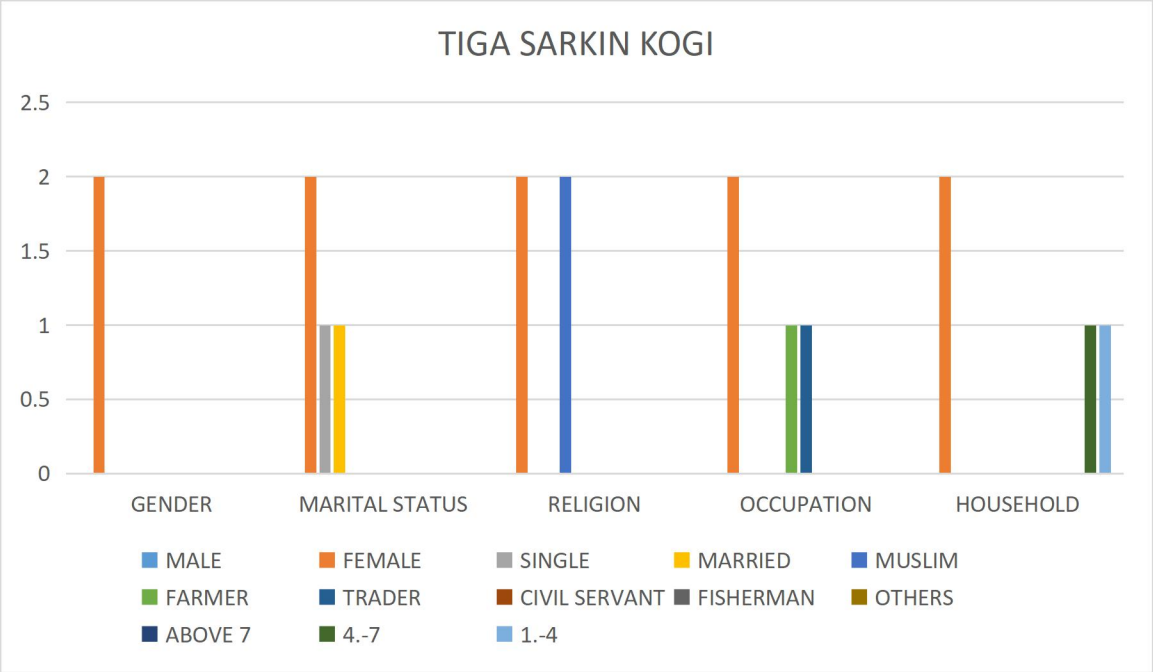
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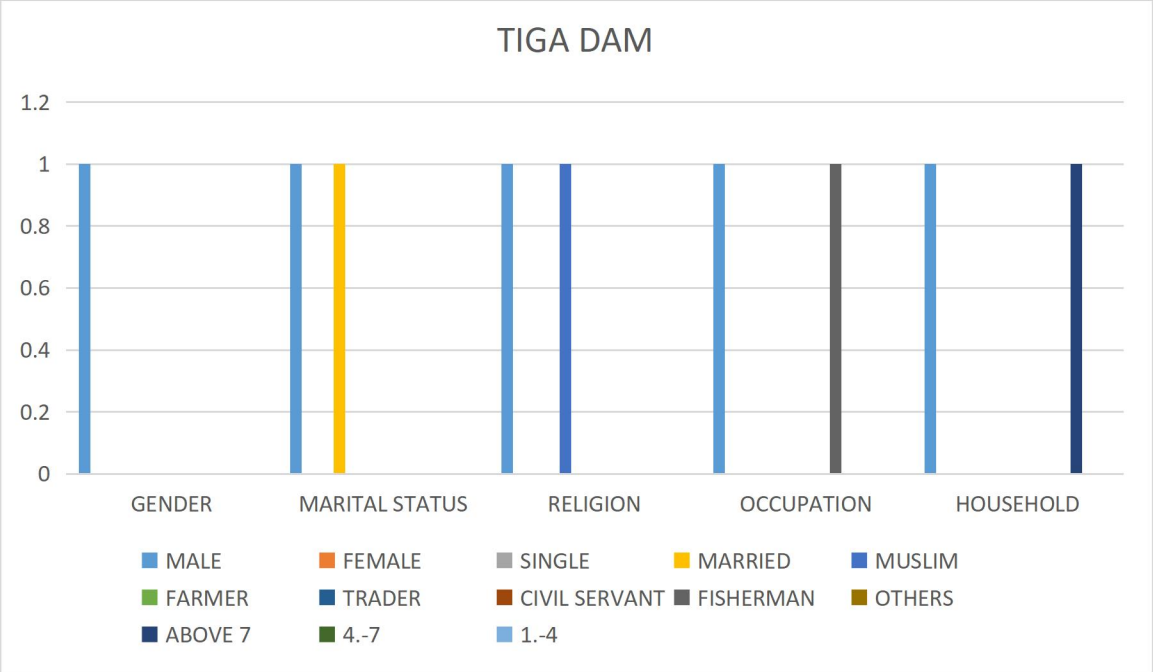
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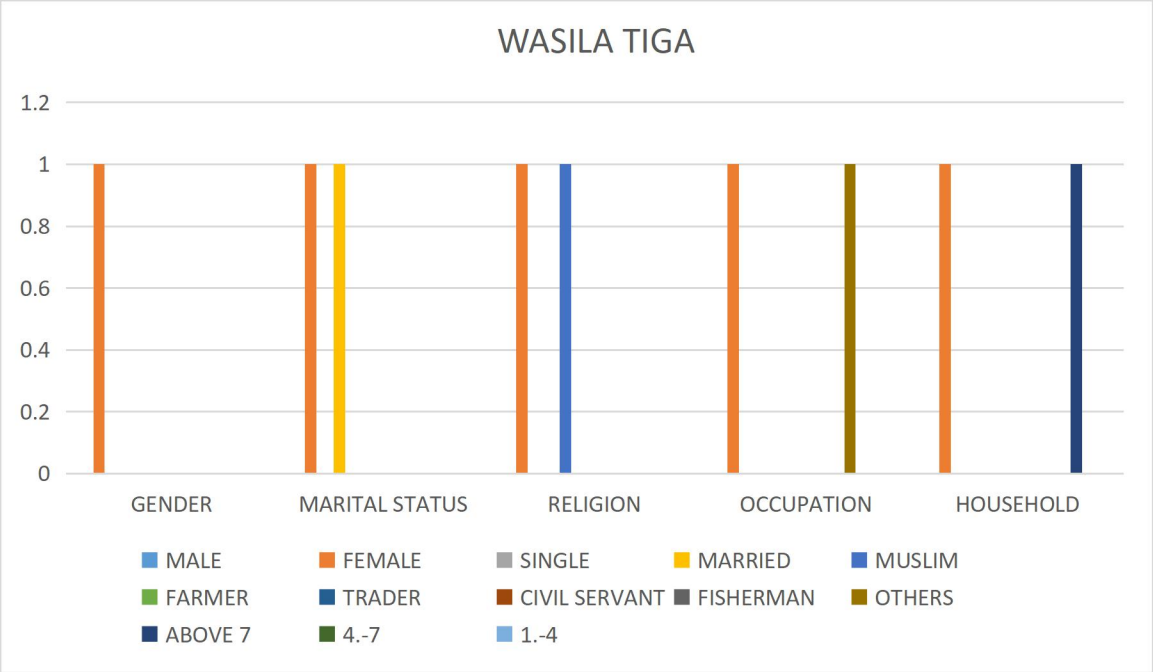
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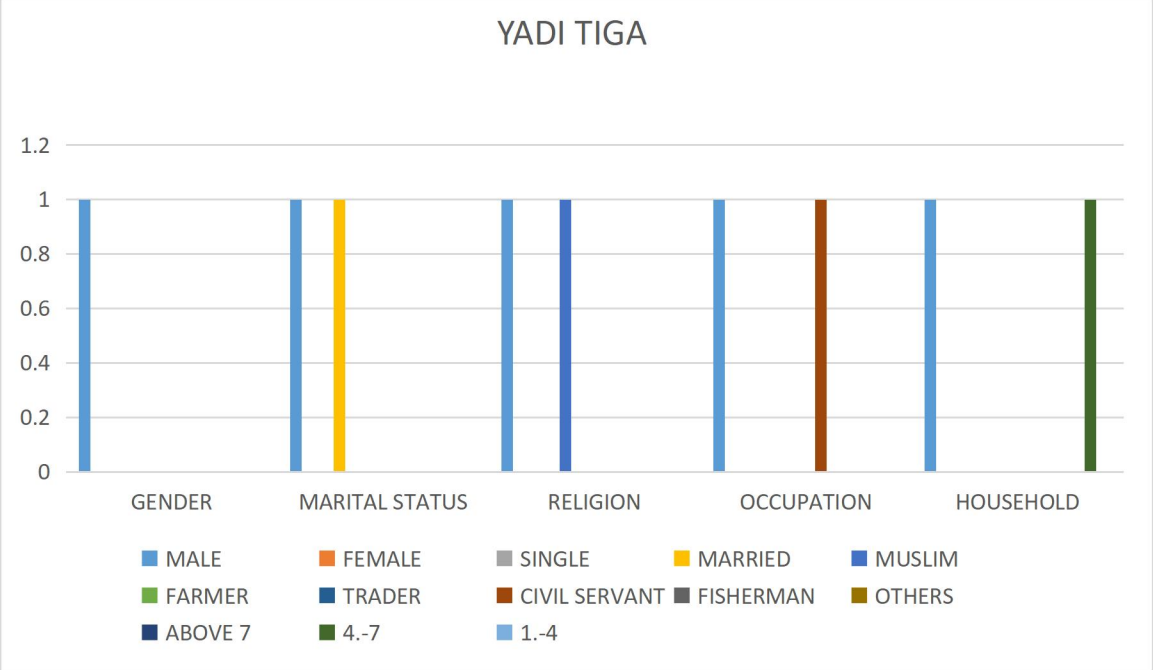
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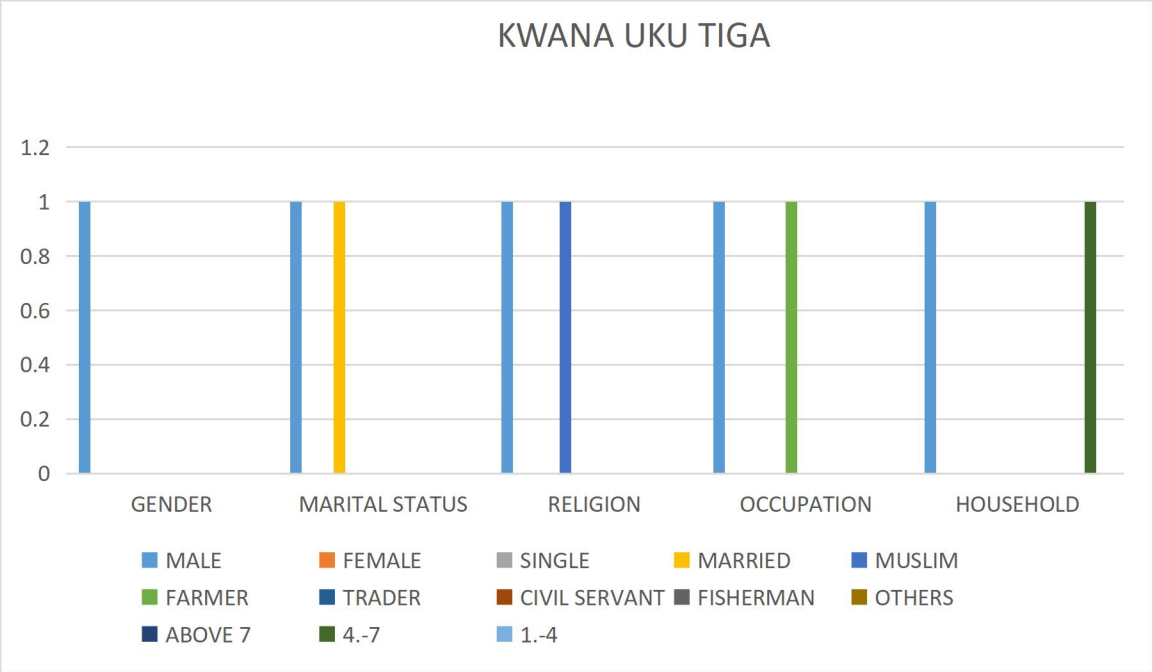
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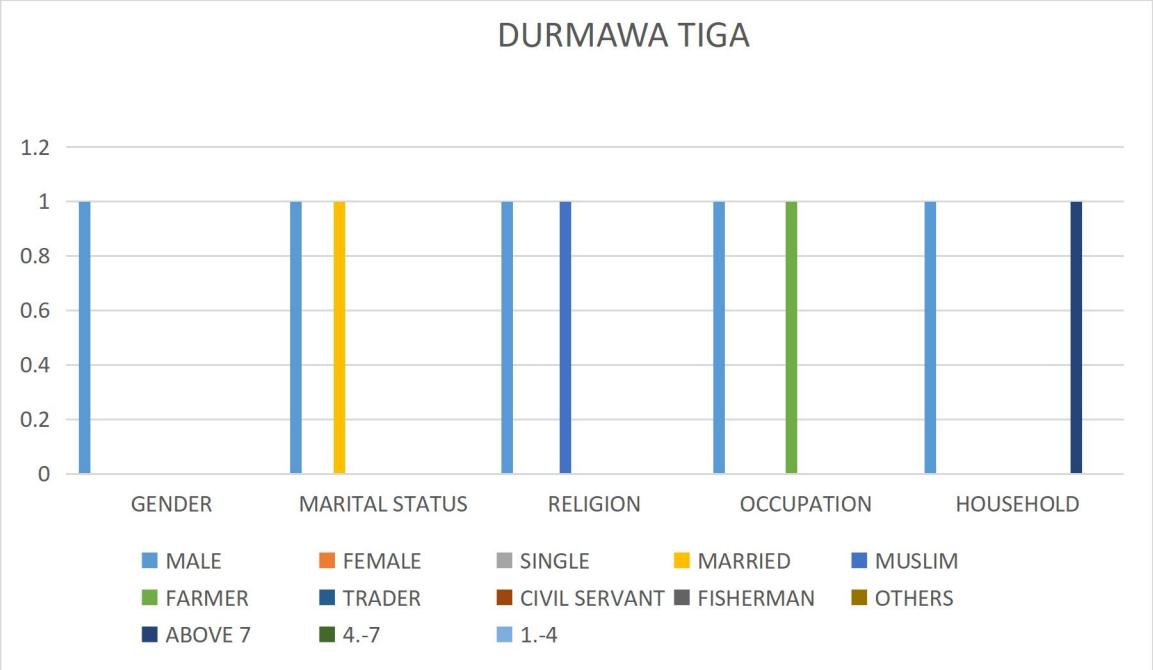
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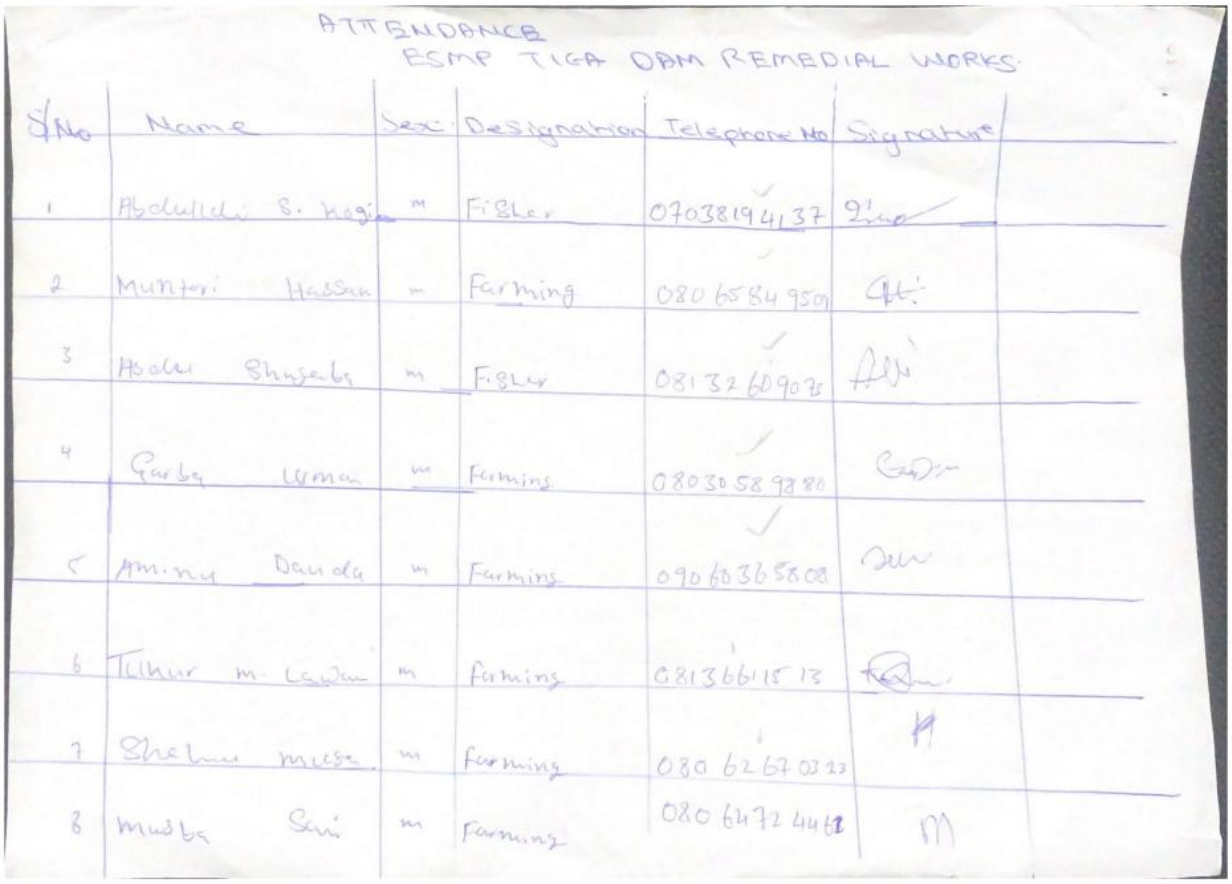
Annex 4: Pictures of Project Sites

Annex 5: Attendance Sheet



ATTENDANCE
ESMP TIGA DAM REMEDIAL WORKS

S/No	Name	Sex	Designation	Telephone No	Signature
1	Abdullahi S. Kagi	M	Fisher	07038194137	
2	Muntari Hassan	M	Farming	08065849509	
3	Abdu Shuaibu	M	Fisher	08132609078	
4	Garba Usman	M	Farming	08030589880	
5	Aminu Danda	M	Farming	09060365808	
6	Tukur M. Lawan	M	Farming	08136611513	
7	Shehu Musa	M	Farming	08062670323	
8	Musba Sani	M	Farming	08064724461	

26/9/2024

S/No	Name	Sex	Designation	Telephone	Signature
16	Auwalu Sa'idu	m	Fisher	081 6333 42 99	
17	Musa Muhammad	m	Fisher		
18	Abdullahi Ibrahim	m	farming	090 49 063739	

26/9/2024

S/No	Name	Sex	Designation	Telephone	Signature
16	Auwalu Sa'idu	m	Fisher	081 6333 42 99	
17	Musa Muhammad	m	Fisher		
18	Abdullahi Ibrahim	m	farming	090 49 063739	

(Stakeholders' Consultative Meeting)
Attendance

DATE:

Venue:

S/No	NAME	DESIGNATION	PHONE NUMBER	SIGN
1	GARBA SULEIMAN	APEX WUA CHAIRMAN	09045634429	
2	Musa Iliyasu	Apex Wua V. Chairman	08126649030	
3	Suleiman Ibrahim	Apex WUA Sec.	08120677512	
4	MUHD. ALHAJI. UMAR	APEX WUA. PRO	08085202883	
4	GARBA BAYARO	MEYETTIE ALLAH	08106101275	
5	SALIHU ZAKAR		08087872553	
6	DAHIRU BASHIR		07033640093	
7	FATIMA MUSA Isah	APEX WUG	07064503624	
8	Maryam Muhammed	APEX WUG	09138914313	
9	Taya Sulaiman	APEX WUG	09122647018	

Annex 6: Data on Water and Soil Analysis

Soil Samples

S/No	Parameters	S1 Kura,	S2 Garun	S3 Tiga Town	S4 Mallam	S5 Rano	FMEnv
1	Temperature	31.0	31.0	32.1	33.5	30.3	
2	pH	8.1	8.9	8.4	8.7	8.2	6.9
3	Conductivity	2110	2301.2	2108	1860	2510	N/A
4	Sulphate	32	61	65	28	34	N/A
5	Aluminium	0.12	0.19	0.21	0.11	0.28	N/A
6	Chloride	0	0	1	0	0	N/A
7.	Phosphate	42	31	30	28.1	28	N/A
8.	Nitrate	10.6	15.0	12.1	10.4	11.0	N/A
Heavy Metals							
9.	Chromium	0	0	1	1	0	1.0
10	Iron	3	2.10	1.67	1.01	1.07	N/A
11	Nickel	1.32	1.12	0	121	1.01	N/A
12	Copper	0.42	0.13	0.14	0.21	1.0	36.00
13	Manganese	0	0	0	0	0	N/A
14	Cadmium	0	0	0	0	1	N/A
Hydrocarbons							
15	THC	0	0	0	0	0	N/A
Microbiology							
16	Bacillus	0	0	0	0	0	N/A
17	E.Coli	0	0	0	0	0	N/A
18	Salmonella	0	0	0	0	0	N/A
19	Trichoderma	0	0	0	0	0	N/A
20	Pseudomonas	0	0	0	0	0	N/A

Surface Water & Ground Water

S/No	Parameters	SW1 Tiga Dam	SW2 Garun	GW1 Mallam	GW2 Rano	FMEnv Limits
1	Temperature	32.1	30.4	34.1	33.1	<40
2	pH	6.40	6.31	6.56	6.31	6.5-8.5
3	Conductivity (us/cm)	132.1	123.4	131.1	125.4	1000
4	Turbidity (NTU)	8	12.0	9.5	12.0	5
5	TDS	12.0	23.6	13.5	15.6	1000
6	TSS (mg/l)	2	6	3	5	37.3
7	Salinity (%)	154	216	145	151	0
8	Hardness	1.76	2.31	1.56	1.31	-
9	CO_3	143.0	105.5	108.0	140.5	-
10	Colour (TCU)	0.16	0.14	0.13	0.13	15
11	Chlorine (mg/l)	12	14.5	14	11.5	250
12	Nitrate (mg/l)	1.8	1.01	1.45	1.05	10
13	Sulphate (mg/l)	32.0	35.8	28.0	30.1	500
14	Phosphate(mg/l)	0.3	1.6	0.1	0.9	5
15	Calcium (mg/l)	13.1	18.3	12.5	14.1	150
16	Magnesium (mg/l)	1.5	2.4	1.8	2.0	50
17	Sodium	43.0	31.0	45.0	35.0	-
18	BOD (mg/l)	3	5.7	4	4.2	6
19	COD (mg/l)	0	0	0	0	30
20	DO (mg/l)	4.1	3.4	3.5	3.7	4
21	Cu	0	0	0	0	0.01
22	Fe	0.01	0.10	0.02	0.10	0.5
23	E. Coli	0	0	0	0	0
24	Coliform	3	1	4	2	0

Annex 7: Pictures of Consultation

Annex 8 – Waste Management Plan

The categories of waste envisaged under the sub-project are as follows:

Vegetal waste – This will be vegetation clearance during site preparation and mobilization of equipment to the site. However, vegetal waste is expected to be minimal considering.

Construction waste – This will include Cement, sands, Paints, Zincs, Metal Scraps, Woods etc.

Particulates Matter & Gases – from movement of vehicles, machine operations, site clearing activities, mixing of materials and chemicals such as paints

Liquid waste - Leakages from vehicles, oil containers, chemicals, adhesives, etc.

Sanitary waste – Waste generated by workers onsite, campsite. Such as, domestic sewage, faeces, urine, wastewater, food remnant, food packaging etc.

The table below shows how this waste generated will be managed.

S/N	Potential Source	Waste Type	Waste Streams	Management
A	**PREREHABILITATION**			
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	COx, SOx, NOx, CO, Dust	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission
2	Site Clearing and Installation of temporary workers camp and offices and workshops	Non-Hazardous	• Vegetal Waste • Industrial Waste: Metal scraps, packaging waste	• Vegetal waste shall be supplied to farmers for use as compost. • Woody vegetal shall be supplied to host communities for domestic uses including as fuel wood for cooking. • Segregated and stored on site to be collected at least once a week for reuse or recycle through the Kano State Environmental Planning and Protection Agency (KASEPPA)or licensed third party facilities.
3	Workers' camp	Domestic and Sanitary	• Food remnant, kitchen wastes. Food packaging etc • Domestic Sewage	• To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties or collected by refuse management and sanitation board (REMASAB} • Sewage will be collected in a properly closed constructed septic tank and will be evacuated in conjunction with (REMASAB) at least twice during the 18month period or as required.
B	**REMEDIAL Works**			
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	COx, SOx, NOx, CO, Dust	• Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission • Use of cleaner technologies and modern equipment
2	Civil works Workers' camp/offices	Non-Hazardous /Industrial	• Spoils • Waste Packaging and Dunnage such as scrap wood, scrap metal, steel, glass, plastic, paper and cardboard, empty metal containers**,** excess concrete, broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans	• Segregated and kept securely in closed containers on site. To be evacuated by (KASEPPA) or transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by (KASEPPA) or other approved waste CONTRACTOR by the state • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be evacuated by (KASEPPA) or recycled through licensed recycling third parties.
3	Civil Works	Hazardous Waste	**Solid Wastes:** used batteries, chemical containers, concrete etc	Store on site in closed and labelled containers with secondary containment to be evacuated by (KASEPPA) or registered waste CONTRACTOR with

			Liquid Waste: spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, chemical cleaning agents, paints, primers, thinners, and corrosion control coatings; sealants and adhesives etc	off-site permitted hazardous waste treatment, storage, or disposal facilities in accordance with (KASEPPA) policies
	Civil works	Waste Water	Wastewater from equipment washing and concrete production	Discharged to the ground as only very small quantity is envisaged at this stage.
	Civil works	Electrical and electronic waste (e-waste)	Electrical wirings, cables, damaged computers etc.	This will be sent to Material Recovery Facilities/ recycling facilities in the state for proper management
C	**OPERATION**			
1	Movement of vehicles	Emission	COx, SOx, NOx, CO, Dust	See A1
2	Operations	Solid waste Chemical waste Sewage E-waste	Maintenance of buildings, roofing sheets, iron sheets, paint. Sewage evacuation from constructed toilets	Segregated and kept securely in closed containers on site to be collected by (KASEPPA). Non-recyclable solid waste to be sent to approved (KASEPPA) dumpsites. Recyclable waste to be sent to MRF facilities and recycling facilities, this will be done in liaison with (KASEPPA). Liaise with WASH departments at the LGA and other WASH projects like SURWASH ON Sewage management and WASH facilities
Cost (Also captured the relevant section of ESMP Matrix Table)				

Annex 9 – Occupational Health and Safety Plan

Every project poses its own HSE risks. This plan is developed to meet up with OHS standards and to achieve the objectives set for the project. The project team shall undertake to ensure high performance standards and conformity with contract requirements by managing the works in a systematic and thorough manner.

- ***Competency***

All personnel required to operate or work with any equipment or machine must be competent, be tested for each equipment that he/she shall be operating. All personnel who as part of their profession require licensing or certification must obtain the necessary certification before he/she shall be allowed to work on the site.

- ***Fitness***

All personnel working on site shall be required to be certified medically fit to do so by an approved medical facility or Medical Doctor (pre-employment medical examination)

- ***HSE Training***
  - **Induction/Orientation**

Every new or rehired employee of CONTRACTORs employees must undergo mandatory OHS orientation / induction. The purpose of the Induction is to educate workers and make them aware of the major potential hazards he or she shall come into contact with while working on the site; also, it is one more opportunity to stress the importance of HSE being the first priority in the operations.

The content of the HSE orientation / induction shall cover the following subjects:

- Site safety rules.
- Personnel protective equipment requirements (PPE).
- Environmental sensitivity and protection.
- Preparation and planning of the job (Daily Pre-task talk).
- Emergency plan and muster points.
- SEA/SH and GBV prevention strategies
- COVID-19 prevention strategies

  - ***Project Specific HSE Training***

In addition to the HSE orientation /induction, there shall be specific site HSE trainings which shall cover the following topics:

- Manual handling.
- Electrical Safety
- Emergency Prevention, Preparedness and Response
- Work at height training
- First Aid training (for site First Aiders)
- Lifting and Rigging
- Safe Driving techniques (for drivers)

EMERGENCY PREPAREDNESS AND RESPONSE

Emergency procedures and evacuation plan shall be developed by the HSE Department and displayed on the notice board. These procedures shall be communicated to all staff. Also each section/department shall have at least a trained first aider at all times.

- **HSE IMPLEMENTATION AND PERFORMANCE MONITORING**
  - **HSE Meetings**

HSE management meetings shall be held once a month. The meeting is to help identify safety problems, develop solutions, review incident reports, provide training and evaluate the effectiveness of our safety program. Some of the meetings shall be:

- Project/Site Management HSE Meeting for management and supervision (Monthly).
- Tool box talk meetings for all workforce (Weekly).
- Pre-task briefing for all workforces (Daily).
- Special situation meeting (As required).

  - ***HSE Reporting***

All incidents and illnesses must be reported to site supervisor after which investigation shall commence and recorded so that appropriate corrective actions shall be implemented to prevent any re-occurrence and report findings shall be forwarded to management for review. Reporting requirements shall include notification of incident, investigation report, and monthly report. Notification of Incident form shall be developed which shall be filled and submitted to HSE department for investigation.

- **HSE Inspection and Audits**

For continual improvement of HSE management system, HSE inspection and audit shall be conducted. An inspection checklist shall be developed. This is to ensure that the HSE management system is being adhered to. The inspection shall be conducted by the HSE department together with site management.

Corrective and Preventive Actions and Non Conformities

During the cause of inspections, concerns raised shall be addressed and closed out. It is expected that in a period of two weeks, a close out inspection shall take place to verify that the corrective actions have been closed.

Project HSE Rules

The project HSE rules shall be developed and supervision shall develop specific rules and procedures when necessary. The following site rules shall be implemented at all times. The Site Manager shall draw these rules to the attention of their own workmen or staff. All sub-CONTRACTORs must ensure that these rules are drawn to the attention of their workmen and staff.

The Principal CONTRACTOR may implement additional site rules during the contract programme. Any such additional rules shall be notified to all personnel engaged on the project prior to their implementation. The HSE rules shall include but not limited to:

1. Personal Protective Equipment must be worn at all times.
2. All instructions issued by the Site Manager regarding the storage, handling or cleaning of materials, plant and equipment must be followed.
3. All vehicles must be parked in the designated areas.
4. Any workman suffering from a medical condition that might affect his work and/or that could require specific Medical treatment must inform the supervisor before commencing work.
5. All site tools shall either be battery operated or 110 volts.
6. No one shall be permitted on site if it is believed that they are under the influence of alcohol or drugs.
7. Vehicles must not reverse without a banksman in attendance.
8. All visitors to site must undergo a site-specific induction and operative Identity badges must be worn at all times.
9. All excavations must be secured.
10. Smoking and eating shall only be permitted in the designated area. This area shall be identified during induction.
11. No hot works operations are permitted without a hot work permit in place.
12. There shall be no radios or other music playing devices on site.
13. Good housekeeping practices to be adopted.
14. Compliance with all Ethical Power Permit to Work systems
15. The site keyed access procedure must be strictly adhered to.
16. All CONTRACTORs must comply with Site Health & Safety Guidelines / Site Safety Method Statement
17. No untrained worker shall be permitted to operate heavy machineries.
18. COVID-19 protocols to be adhered to including frequent handwashing, use of nose masks when in crowded spaces, timely reporting of any symptoms to HSE officer and immediate isolation

- **Safe Work Practices/Personal Protective Equipment (PPE)**

The basic PPE required for the project shall be Safety Glasses, Safety Boots, Hand Gloves, Hard Hat, ear plugs and Coverall. Any other PPE shall be used as applicable. Management is responsible for the provision of PPE and usage shall be enforced at all time.

PPE shall be provided in circumstances where exposure to hazards cannot be avoided by other means or to supplement existing control measures identified by a risk assessment. An assessment shall be made to ensure that the PPE is suitable for purpose and is appropriate to the risk involved.

Information, instruction & training shall be given to all employees on safe use, maintenance and storage of PPE. Employees shall, in accordance with instructions given, make full use of all PPE provided and maintain it in a serviceable condition and report its loss or defect immediately to the maintenance department where it shall be replaced.

PPE shall be replaced when it is no longer serviceable and returned on a new for old basis. Employees shall sign to state that they have received PPE when issued.

- **Welfare Facilities**

The provision of welfare facilities on the site shall be communicated to all operatives at site induction.

A cleaning regime shall be implemented and maintained for the duration of the construction phase to ensure the site welfare facilities remain in a clean and tidy condition.

If mains drinking water becomes unavailable during the construction phase bottled water shall be brought to site for all operatives for the necessary period.

- **Signage**

Adequate provision for warning and directional signs shall be made.

Annex 10 – Borrow Pit Management Plan (BPMP)

In general, the contractor will be expected to carry out the construction works in a manner that will minimize the need for the use of borrow materials where technically feasible.
The contractor is also required to prepare a borrow pit management plan which takes account of these activities and follows them through to handing over. These plans need to take account of the potential environmental & social impact and health & safety hazard; including drowning hazards, water-borne disease vectors, impact on local land holdings, land-use and visual impacts.

The borrow pit plan will include restoration measures for the site after decommissioning, such as removal and stockpiling of topsoil layers. Where borrow pits are to be left open, for their use in regular maintenance programs, the responsibility for their management should be assigned to the government entity / local authority in charge of road maintenance and compliance with the borrow pit management plan monitored.

Stage	Activities and features	Measures/mitigation	Responsibility
Site selection	Complete a preliminary site assessment prior to undertaking excavation	• Outreach to the community leadership (e.g. operation, hazards, restoration) • Written approval from community leadership for use of the proposed site • Liaise with the local community on the option of retaining quarry pits as water collection ponds for watering cattle, irrigating crops or similar uses. Highlight issues of disease transmission and the need to prohibit its use for drinking, bathing, and clothes washing	Contractor
		• When siting borrow pit areas, avoid using sensitive areas or sites that drain directly into a sensitive area • Borrow pits will not be located in wetland or densely vegetated areas	Contractor
		• Test pits/excavations to confirm the quantity and quality of material in the proposed site • Determine presence of any groundwater	Contractor
		• Map of the location and a plan of the site, including buffer zone, perimeter berm, stockpiles, operational area • Borrow pit design must comply with standards defined (above), • Photographic record of the site in its undisturbed state	Contractor
Excavation Operation	Excavation will consider the following measures	• Ensure that excavation is accompanied by well-engineered drainage • Topsoil is stripped and stockpiled away from other materials and is to be used only for reinstatement, once pit operations are complete • Overburden soil (layer between topsoil and material of interest) to be used as a perimeter berm	Contractor

Stage	Activities and features	Measures/mitigation	Responsibility
		to direct drainage or stockpiled separately to backfill the pit • Pit excavations maximum 6 metres in depth, with a vertical slope of 2:1 • Excavation below the water table is not permitted • Heavy machinery access and operation • Carry out necessary preliminary geotechnical investigation to confirm the quality and extent of materials. • Carry out hydrological assessment to determine the presence and depth of aquifer. • The contractor shall ensure that topsoil (150m-500m) is stripped and stockpiled at a separate location and preserved for future reclamation activities.	
	Site access and safety	• Barrier (e.g., warning tape, perimeter berms, fencing) to control or discourage public access to the pit • Install signposts warning of danger and no trespassing, at no more than 50 meters' distance from the pit • Community awareness and outreach on the dangers of borrow pits and that trespassing is prohibited.	Contractor
	Vegetation	• Avoid or reduce to a minimum vegetation clearance • Existing vegetation within the buffer area should provide some visual and physical screening of the pit operations	Contractor
	Water	• If water is required for borrow pit operation, a water extraction point (e.g. borehole) will be established within the site are and will be planned for use by the community once the site is reinstated • Drainage structures or pumping will remove any standing water in the borrow pit. Alternatively any pits with 0.75 metres or more of standing water will be fenced • Overburden soil can be used as a perimeter berm to direct water drainage away from the site • Use drainage features in flatter areas, such as mitre drains and sumps, to remove water from around the road ditches • Community members are not allowed to use water at an active borrow pit, for any purpose	Contractor

Stage	Activities and features	Measures/mitigation	Responsibility
	Erosion	• Erosion control measures undertaken in all aspects of the borrow-pit operation, including: reduced slopes, seeding, etc • Protect topsoil stockpiles from wind and water erosion by reducing slopes, using a cover, and/or spraying with water	Contractor
	Dust and noise	• If a rock crusher is used, dust control measures shall be put in place (water truck or sprinklers on crushing equipment) • Vegetation within the buffer area will screen noise of pit operations	Contractor
Reinstatement of Borrow Pits	Reinstatement of borrow pits will be completed prior to handover of the site	• Fill excavated site with suitable materials • Spread topsoil on top of the overburden	Contractor
		• Develop/construct suitable surface slopes, drainage ditches and conduits to prevent water from collecting at the sites • Scarify the borrow pit operational site to encourage vegetation cover • Establish a vegetation cover corresponding to at least 75% of the cover present prior to excavation (supporting photographs) and maintain following the first rains after reinstatement • Minimize erosion by focusing vegetation cover on side slopes of the excavated area • Any required seeding will make use of local plant varieties	Contractor
Review	Ensure the Borrow pit management plan implementation	• Review borrow pit management / monitoring reports • Review reinstated borrow pit areas prior to handover of completed road sections • Engage local community authorities to take responsibility for long-term borrow pits in their areas • Ensure that the responsibility for management of borrow pits left open is assigned to the government entity / local authority • Verify conformance with Borrow Pit Management Plan	KRISO/ NPCU

Annex 11 – Sample Code of Conducts

Individual Code of Conduct
Preventing Gender Based Violence and Violence Against Children
Definitions:
Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological and economic in nature, and includes acts, attempted or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.
Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexually exploitation of another
Sexual harassment (SH) is the unwanted behavior of a sexual nature
Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation and sexual abuse

I, _____, acknowledge that preventing gender-based violence (GBV) and violence against children (VAC) is important. The company considers that GBV or VAC activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of GBV or VAC are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit GBV or VAC may be pursued if appropriate.

I agree that while working on the project I will:

- Consent to police background check.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behaviour towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not participate in sexual contact or activity with children—including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defence. Consent from the child is also not a defence or excuse.
- Not engage in sexual favours—for instance, making promises or favourable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behaviour.
- Unless there is the full consent[8] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" within the scope of this Code.
- Attend and actively partake in training courses related to HIV/AIDS, GBV and VAC as requested by my employer.
- Consider reporting through the GRM or to my manager any suspected or actual GBV or VAC by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18:

- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not sleep close to unsupervised children unless absolutely necessary, in which case I must obtain my supervisor's permission, and ensure that another adult is present if possible.
- Use any computers, mobile phones, or video and digital cameras appropriately, and never to exploit or harass children or to access child pornography through any medium (see also "Use of children's images for work related purposes" below).
- Refrain from physical punishment or discipline of children.

8**Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even in the event that national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

- Refrain from hiring children for domestic or other labour which is inappropriate given their age or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.
- Comply with all relevant local legislation, including labour laws in relation to child labour.

Use of children's images for work related purposes
When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavour to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Sanctions
I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Loss of up to one week's salary.
- Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
- Termination of employment.
- Report to the police if warranted.

I understand that it is my responsibility to avoid actions or behaviors that could be construed as GBV or VAC or breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and VAC. I understand that any action inconsistent with this Individual Code of Conduct or failure to take action mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

CONTRACTOR's Code of Conduct

Preventing Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA)

Definitions:
Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological and economic in nature, and includes acts, attempted or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.
Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexually exploitation of another
Sexual harassment (SH) is the unwanted behavior of a sexual nature
Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation and sexual abuse

1. The company is obliged to create and maintain an environment which prevents Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA) issues. The company is also required to maintain an environment where the unacceptability of GBV and actions against children are clearly communicated to all those involved in the project. In order to prevent GBV and SEA, the following core principles and minimum standards of behaviour will apply to all employees without exception:
2. GBV/SEA constitutes acts of gross misconduct and are therefore grounds for sanctions, penalties and/or termination of employment. All forms of GBV/SEA including grooming are unacceptable, be it on the work site,

the work site surroundings, project neighbourhoods or at worker's camps. Prosecution of those who commit GBV or SEA will be followed.

3. Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
4. Do not use inappropriate language or behaviour towards women, children and men. This includes harassing, abusive, sexually provocative, derogatory, demeaning or culturally inappropriate words, gestures or actions.
5. Sexual activity with children under 18—including through digital media—is prohibited. Mistaken belief regarding the age of a child and consent from the child is not a defence.
6. Sexual favours or other forms of humiliating, degrading or exploitative behaviour are prohibited.
7. Sexual interactions between CONTRACTOR's and consultant's employees at any level and member of the communities surrounding the work place that are not agreed to with full consent by all parties involved in the sexual act are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex – such sexual activity is considered "non-consensual" within the scope of this Code.
8. All employees are required to attend an induction training course prior to commencing work on site to ensure they are familiar with the GBV/SEA Code of Conduct.
9. All employees must attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the institutional GBV and SEA Code of Conduct.
10. All employees will be required to sign an individual Code of Conduct confirming their agreement to support GBV and SEA activities.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and SEA. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action.

FOR THE COMPANY
Signed by _____
Title: _____
Date: _____

Manager's Code of Conduct

Preventing Gender Based Violence (GBV) and Sexual Exploitation & Abuse (SEA)

Definitions:

Gender Based Violence (GBV) - is an umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed (gender) differences between males and females. It can be sexual, physical, psychological and economic in nature, and includes acts, attempted or threatened, committed with force, manipulation, or coercion and without the informed consent of the survivor. A SURVIVOR is a person who has experienced GBV.

Sexual Exploitation and Abuse (SEA) is the actual or attempted abuse of a position of vulnerability, power, or trust for sexual purposes including but not limited to profiting monetarily or socially from sexually exploitation of another

Sexual harassment (SH) is the unwanted behaviour of a sexual nature

Violence Against Children (VAC) is both physical and non-physical forms including neglect, maltreatment, exploitation and sexual abuse

Managers at all levels have particular responsibilities to create and maintain an environment that prevents GBV and SEA. They need to support and promote the implementation of the Company Codes of Conduct. To that end, Project Managers are required to sign up to Codes of Conduct applicable to their managerial duties within the context and also sign the Individual Codes of Conduct. This commits them to support and develop systems that facilitate the implementation of this action plan and maintain a GBV-free, child-safe and conflict-free work environment. These responsibilities include but are not limited to:

Mobilization

1. Establish a GBV/SEA Compliance Team from the CONTRACTOR's and consultant's staff to write an Action Plan that will implement the GBV and SEA Codes of Conduct.
2. The Action Plan shall, as a minimum, include the

    i. Standard Reporting Procedure to report GBV and SEA issues through the project Grievance Redress Mechanism (GRM);
    ii. Accountability Measures to protect confidentiality of all involved; and,
    iii. Response Protocol applicable to GBV survivors/survivors (including access to support coping and post-trauma management strategies) and perpetrators.
    iv. Engagement of the services of social service providers (NGOs) with requisite skill in the prevention and management of GBV and SEA.

3. Coordinate and monitor the development of the Action Plan and submit for review to the RAMP-PIU safeguards teams, as well as the World Bank prior to mobilization.

4. Update the Action Plan to reflect feedback and ensure the Action Plan is carried out in its entirety.

5. Provide appropriate resources and training opportunities for capacity building so members of the compliance team will feel confident in performing their duties. Participation in the Compliance tame will be recognized in employee's scope of work and performance evaluations.

6. Ensure that CONTRACTOR, consultant and client staff are familiar with the TRIMING GRM and that they can use it to anonymously report concerns over GBV and SEA.

7. Hold quarterly update meetings with the compliance team to discuss ways to strengthen resources and GBV/SEA support for employees and community members.

8. In compliance with applicable laws and to the best of your abilities, prevent perpetrators of sexual exploitation and abuse from being hired, re-hired or deployed. Use background and criminal reference checks for all employees.

9. Ensure that when engaging in partnership, sub-grant or sub-recipient agreements, these agreements

   a) Incorporate this Code of Conduct as an attachment;
   b) Include the appropriate language requiring such contracting entities and individuals, and their employees and volunteers to comply with this Code of Conduct; and
   c) expressly state that the failure of those entities or individuals, as appropriate, to take preventive measures against GBV and SEA, to investigate allegations thereof, or to take corrective actions when GBV/SEA has occurred, shall constitute grounds for sanctions and penalties.

Training

1. All managers are required to attend an induction manager training course prior to commencing work on site to ensure that they are familiar with their roles and responsibilities in upholding the GBV/SEA Codes of Conduct.
2. Provide time during work hours to ensure that direct recruits attend the mandatory induction training which covers GBV/SEA training required of all employees prior to commencing work on site.
3. Managers are required to attend and assist with the NGO-facilitated monthly training courses for all employees. Managers will be required to introduce the trainings and announce results of consequential evaluations.
4. Collect satisfaction surveys to evaluate training experiences and provide advice on improving the effectiveness of training.
5. Prevention
6. All managers and employees shall receive a clear written statement of the company's requirements with regards to preventing GBV/SEA in addition to the training.
7. Managers must verbally and in writing explain the company and individual codes of conduct to all direct recruits.
8. All managers and employees must sign the individual 'Code of Conduct for GBV and SEA, including acknowledgment that they have read and agree with the code of conduct.
9. To ensure maximum effectiveness of the Codes of Conduct, managers are required to prominently display the Company and Individual Codes of Conduct in clear view in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
10. Managers will explain the GRM process to all employees and encourage them to report suspected or actual GBV/SEA
11. Mangers should also promote internal sensitization initiatives (e.g. workshops, campaigns, on-site demonstrations etc.) throughout the entire duration of their appointment in collaboration with the compliance team, service providers and in accordance to the Action Plan.
12. Managers must provide support and resources to the compliance tea and service provider NGOs to create and disseminate the internal sensitization initiatives through the Awareness-raising strategy under the Action Plan.

Response

1. Managers will be required to provide input, final decisions and sign off on the Standard Reporting Procedures and Response Protocol developed by the compliance team as part of the Action Plan.

2. Once signed off, managers will uphold the Accountability Measures set forth in the Action Plan to maintain the confidentiality of all employees who report or (allegedly) perpetrate incidences of GBV/SEA (unless a breach of confidentiality is required to protect persons or property from serious harm or where required by law).

3. Once a sanction has been determined, the relevant manager(s) is/are expected to be personally responsible for ensuring that the measure is effectively enforced, within a maximum timeframe of 14 days from the date on which the decision was made.

4. Managers failing to comply with such provision can be in turn subject to disciplinary measures, to be determined and enacted by the company's CEO, Managing Director or equivalent highest-ranking manager. Those measures may include:

i. Informal warning
ii. Formal warning
iii. Additional Training
iv. Loss of up to one week's salary.
v. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
vi. Termination of employment.

I do hereby acknowledge that I have read the foregoing Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and SEA. I understand that any action inconsistent with this Code of Conduct or failure to take action mandated by this Code of Conduct may result in disciplinary action.

FOR THE EMPLOYER
Signed by _____
Title: _____
Date: _____

Annex 12 – Campsite Management Plan (CMP)

The objectives of the Camp Management Plan are:

- Avoid or reduce negative impacts on the community and maintain constructive relationships between local communities and workers' camps; and
- Establish standards on worker welfare and living conditions at the camps that provide a healthy, safe and comfortable environment.

Legal Requirements and Grievances

The CONTRACTOR is required to operate within the parameters of the Nigeria Labour Law and the International Labour Organization guidelines. The World Bank Performance Standards are applicable to TRIMING and its sub projects. Furthermore, the Grievance Redress Mechanism contained in this ESMF is required to be adhered to by the CONTRACTOR.

CONTRACTOR personnel shall conduct regular safety walks and an HSE committee will track performance against requirements stipulated in this plan. The CONTRACTOR will also have its grievance mechanism developed for the project.

Additionally, CONTRACTOR would be required to sign and acknowledge the Code of Conduct and agree to abide by its provisions.

Management and Monitoring

Figure below presents a flow chart summarising key management step associated with implementation and review of this Plan, including steps to allow for continued improvement. Table 1 presents a summary of the potential impacts related to camp activities, together with mitigation and management measures to avoid or reduce these impacts, and the monitoring required to assess the performance of these measures.

The CONTRACTOR shall develop a CONTRACTOR Plan which shall, as a minimum, incorporate the camp management measures described in the Table below. The CONTRACTOR shall not be limited to these measures.

Monitoring to be undertaken as part of this Plan is described in the table below. .The CONTRACTOR is responsible for developing area or site-specific procedures for the monitoring program (where necessary) based upon the final design details of the infrastructure.

Annex 13- LMP

This plan identifies labour requirements and sets out the procedures for addressing labour conditions and risks associated with the proposed project, which is aimed at helping KRISO TRIMING to determine the resources necessary to address project labor issues. Although, the operational policy does not cover this plan, this plan will further ensure risks are minimized.

Introduction

A Labor Management Procedure is a framework which identifies labor requirements and sets out the procedures for addressing labor conditions and risks associated with the proposed project in line with the World Bank ESS 2: Labor and Working Conditions and National labor requirements.

This LMP covers contracted workers, community workers and primary suppliers for the construction works .However, the LMP excludes government workers/civil servants working in connection with this project who will be governed by a set of public service rules, except there is a legal transfer of their employment or engagement to this project, and technical consultants engaged for expertise contracts who will be governed by mutually agreed contracts with the KRISO/NPCU.

Objectives of the LMP: recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. The objectives are as follow:

- To promote safety and health at work
- To promote the fair treatment, non-discrimination, equal opportunity of project workers and decent work conditions
- To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate
- To prevent the use of all forms of forced Labour and child Labour.
- To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law
- To provide project workers with accessible means to raise workplace concerns

Labor Requirements and Associated Risks for the Subproject

Proposed categories of direct and indirect staff, and workers as follows:

Category	Description	Examples	Number
Direct Workers	Government Workers: • Civil servants from various relevant line ministries working at the NPCU and the KRISO • Principal, school staff and teachers deployed to work in the newly constructed schools	Officers serving on the project including environment, social, gender, procurement, engineer etc. Officers at RBDA	i) 80 (NPCU ii) 20 (KRISO)
	Technical consultants	Technical Assistants (TAs), ESMP/RAP/ GBV/Engineering consultants etc.	20
Contracted Workers	Workers engaged through third parties for the new construction civil works	Skilled and unskilled labor, sub-contractors, contractors drivers etc.	100
Primary Suppliers	Suppliers of construction materials, school equipment/supplies	Suppliers of gravel, sand, stone, roofing sheets etc.	30
Community Workers	People employed or engaged from the communities to provide labor and services to the project. This could be for civil works or to oversee the coordination and implementation of the project	Skilled & unskilled labor engaged from the project communities by the contractors (about 70% of required unskilled labor)	200

Labour Risks & Mitigation

Risk/Impact	Impact Analysis	Mitigation
Arbitrary decisions by contractors on terms and conditions of employment	• The duration of the contracts offered to contractor workers are short and may not allow employees adequate time and information for meaningful collective bargaining, leading to discontent of employees and disputes. • Project workers may not be provided with information and documentation that is clear and understandable regarding their terms and conditions of employment.	• The KRISO will closely supervise the Contractor Recruitment Plan and ensure fairness of Employment Terms and Conditions against the applicable and prevailing National stipulations • All information and documentation must be provided at the beginning of the working relationship and when any material changes to the terms or conditions of employment occur • Where applicable, project workers will receive written notice of termination of employment and details of severance payments in a timely manner
Poor working conditions (unsafe work environment, underpayment, lack of workers' rights, etc.)	• The Rights of workers under national labor and employment law (which will include any applicable collective agreements), may be abused • Workers payment may be delayed, irregular, or may be underpaid. • Campsites may be poorly managed, unconducive for workers, insecure, poor sleeping conditions, lack of access to basic amenities like water, toilets, healthcare etc.	• Project workers will be paid on a regular basis as required by national law and labor management with a principle of "equal pay for equal work" • In the case of subcontracting, the Borrower will require such third parties to include equivalent requirements and non-compliance remedies in their contractual agreements with subcontractors, as well as the necessary training and information about the Labor Management Procedures as stated in this ESMP • The KRISO shall inspect the campsites to ensure workers have appropriate living quarters with basic amenities provided and sanitation facilities separate for male and female. • All project workers will be provided with adequate periods of rest per week, annual holiday and sick leave, as required by national law. • Ensure that camp grounds and common areas are routinely cleaned and organized with appropriate signage in place, and that grounds are maintained (e.g., grassed areas are regularly mown).
Non-discrimination and equal opportunity	• Decisions relating to the employment or treatment of project workers may discriminate against certain classes of workers including women, vulnerable groups amongst others. • Payment of workers may be based on discrimination e.g. male may be paid higher than women even on the same level of job schedule. • Foreign workers may be treated better than local workers in terms of living conditions, unequal pay, varying closing time etc. even when they are on the same level of qualification and experience	• The employment of project workers will be based on the principle of equal opportunity and fair treatment, and there will be no discrimination with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, or disciplinary practices. • The KRISO is compelled to safeguard the interests of women and girls, including gender parity at the workspace, appropriate sanitation facilities at workplace and appropriate PPEs for women.
SEA/ Sexual Harassment of teachers and school staff and contract workers	• Risks of sexual harassment of teachers and other staff is possible • Workers engaged by the project may also be exposed to SEA/SH/GBV	• GBV GRM focal persons and process for reporting incidents will be set up in each school. • Training and sensitisation will be conducted for teachers & school staff on preventing & reporting SEA/SH incidents • Workers will be sensitised on Code of Conducts, prevention & reporting of such incidents • Contractor to ensure safe work environment: separate marked rooms and toilets for male and female workers, avoid work at night etc.
Child Labor	• There is a risk that children (below the age of 18) will be used as labor in the project. • Under-aged persons within the community may be disguised as above 18 to enable them to work and get paid	• The minimum age of eighteen (18) will be enforced at recruitment and in daily staff team talks by Contractors. The supervision consultant will monitor this compliance on site. • Contractors will liaise with community liaison officers/leaders to attest to the age and conduct of all local hires, and maintain a list of same • Hired project workers above 18 shall conduct his/her activities in ways that are not detrimental with respect to education or be harmful to the child's health or physical, mental, spiritual, moral or social development
Forced Labor	There is a risk that there could be involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements. This prohibition covers any of the aforementioned.	• Contractors will ensure that no forced labor exists in the project by gathering documents and appropriate proof. • A consent section will be part of the employee signed employment contract which will be reviewed by the KRISO Social officer. Contractors will ensure that if labor is sourced from any sub-contracting agency, the workers are not subject to coercion and forced labor conditions.
Labor Influx	• The project may face influx of labor to local communities especially where skilled laborers are not available in some project sites. This could lead to Increase in potential spread of STIs/STDs, HIV/AIDs due to workers on site, increase in GBV/SEA especially for Girls been exposed to contractors, sexual relations between contractors and minors and resulting pregnancies, encourage presence of sex workers in the project communities • This could also lead to competition for resources like water, health facilities, electricity in the project locations	• Encourage hiring of labor from the host communities. • Maintain labor relations with local communities through a code of conduct (CoC) • The Code of Conduct must be signed by all workers. Workers must be trained on the provisions of the CoC about refraining from unacceptable conduct toward local community members, specifically women and informed of the sanctions for non-compliance. Training must be conducted for all new hires including sub-contractors. • Contractors should make resources available for their workers especially where stated in the ESMP • Ensure there is a working GBV-GRM on site that people can lodge their complaints without fear of reprisal
Grievance Mechanism	• Workers may be aggrieved due to unfair treatment, poor working conditions, conflicts, poor pay, overstretched working hours amongst other things.	• A GRM has been designed for workers in section 6.8 to address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they understand, without any retribution, and will operate in an independent and objective manner

Risk/Impact	Impact Analysis	Mitigation
		• The workers will be sensitized on the use of the GRM by the contractor and the KRISO team upon recruitment and induction training • The KRISO shall provide oversight to ensure effective implementation of the GRM. • The grievance mechanism will not impede access to other judicial or administrative remedies that might be available under the law
Occupational Health and Safety	• Site workers will be exposed to risks of accidental collisions with moving vehicles, strains, and ergonomics from repeated movements or from lifting and heaving of heavy objects, slips and falls. Accidental cuts from tools and machines are also safety risks. • Dust and particulate emissions and welding works may cause respiratory and eye impairment health concerns for workers and the public • Movement of trucks carrying sand and materials, lack of road safety measures may also cause risk of accident, injury and death	• Contractors should provide HSE training for all workers before commencement of work and periodically • All contractors should have full time HSE officers on their team • Contractors should provide adequate PPEs for all their workers and the contractors HSE officers should enforce compliance First aid boxes should also be provided at construction site, staging area and mobile All sites and staging areas should be appropriately cordoned off to prevent unauthorised access • Contractors will prepare Occupational Health and Safety Plans • Contractors should report OHS accident/incidents to the KRISO promptly, and the KRISO/NPCU should report this to the Bank within 48hrs (in accordance with the Environmental and Social Commitment Plan (ESCP) • Contractors should ensure training for their drivers and liaise with the Kano Road Safety Traffic Agency to control traffic during project implementation
Right of Association and Collective Bargaining	• Workers have the right to freely form, join or not join a trade union for the promotion and protection of the economic interest of that worker • Workers have a right to organize and collective bargaining, and representation	• The KRISO will ensure that workers are informed of their right of association and collective bargaining • The KRISO should also inform workers of the workers GRM and their right to utilize the system
Contractor Management	• Lack of records and evidence could expose the contractors to litigation or accusation from workers or their representatives	• Records of workers engaged under the Project, including contracts must be kept • Records of all training attended by workers including CoC, HSE, STIs/STDs, GBV etc. • Accidents/ incidents and corresponding root cause analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (Corrective Action Register) • Records of strike actions, reasons and resolution reached • Records of grievances and how they were resolved • Records of all sanctions, punishments and terminations with reasons and follow-up actions taken • Documents should be kept at the site office with the site engineers and KRISO office • The NPCU team should check these records during monitoring visits
Primary Suppliers	• Primary suppliers could also have occupational injuries, incident/accidents while performing project related functions • They could also make use of child labor, forced labor in their operations	• Primary suppliers should maintain records related to occupational injuries, illness and lost time accident, which should be reviewed by the contractor quarterly • A checklist for primary suppliers has been included in this ESMP and will form part of the contractual agreement with contractors to ensure due diligence on E&S compliance. This will be part of the Standard bidding document.
Security risks	Project workers, primary suppliers could be exposed to security risks in the project areas such as kidnapping, banditry, theft etc.	• KRISO will engage a security adviser and also prepare & implement a security management plan in conjunction with the State Government, Police, NSCDC etc. • KRISO, Supervision Consultants, Contractors to develop security management plan in conjunction with the police and NSCDC. • The KRISO to ensure security coverage for all consultants engaged on the project
Unfair Discipline and Termination of Employment	Workers may be unfairly penalised or dismissed, coerced or blackmailed to avoid disciplinary measures or termination	• Disciplinary process should be laid out before commencement of work and explained to every worker • Termination of appointment should abide by the following principles: • Valid or reasonable; • Clear and unambiguous; • The employee is aware, or could reasonably be aware of the rule or standard; and • The supervision consultant and the KRISO social officer/ GRM officer should periodically review workers disciplinary and termination processes to ensure that they are executed fairly and without prejudice • Where unfair treatment is established the KRISO should put in place corrective action and follow up to ensure execution

The risks and impacts associated with project workers and the risk associated with labor impacts are moderate due to the nature of construction activities which are well understood and largely within existing schools. The potential impacts can largely be avoided, minimized or managed through specific actions set out in table 32 below. This section outlines specific actions to be implemented including responsibility and timeline. Additional measures are stipulated in the General environmental management conditions for construction contracts in annex 4 and a Labour Management & Influx Plan in annex 10. While most of the actions are the obligation of contractors, the Supervision consultants and KRISO E&S officers will monitor compliance to all the conditions stated in this LMP and include this in the monthly E&S reports to be sent to the NPCU.

Specific Actions on LMP

Area of Concern	Actions to be implemented	Responsibility	Timeline
Recruitment and Terms of Employment	• Ensure non-discrimination in recruitment processes and terms of engagement especially against women and PWD • Formal contracts should be issued and signed for all skilled labor • Documented agreements to be made with unskilled labor including community labor which should be understandable language and signed by the employee/community liaison officer • Contracts/agreements should stipulate position & work schedule, working hours, salary/wages, rest periods, penalties & sanctions,	Contractor Supervision Consultants KRISO Social Officer	Preconstruction and Construction Phase
Poor working conditions	• Minimum wage to be paid for workers should not be less than the National minimum wage of N30,000. Payment should also be regular as stipulated in the agreement • Campsites to have appropriate living quarters, sanitation facilities separate for male and female, basic amenities including water and food, electricity especially to lighten up dark areas and adequate security • Working hours will not be more than the hours of 8am – 6pm, with an hour break period. Sundays will also be observed as rest periods for workers. • Sick leave will be observed for workers and they will be paid during the sick/ injury period as long as it can be established that the ill-health is directly due to the work	Contractor Supervision Consultants KRISO Social Officer	Preconstruction and Construction Phase
Child Labor	• The minimum age of eighteen (18) will be enforced at recruitment and for adhoc/community workers to be engaged by contractors. The supervision consultant will monitor this compliance on site. • Contractors to liaise with community liaison officers/leaders to attest to the age and conduct of all local hires, and maintain a list of same • All workers to sign code of conducts to ensure their conduct is not detrimental, with respect to education or be harmful to the child's health or physical, mental, spiritual, moral or social development	Contractor Community Liaison Officers All workers	Preconstruction and Construction Phase
Forced Labor	• No forced labor is permitted on the project • A consent section will be part of the employee signed employment contract/ agreement • Contractors will ensure that if labor is sourced from any sub-contracting agency, the workers are not subject to coercion and forced labor conditions. A checklist has been included in the annex and will form part of the contractual agreement with contractors to ensure due diligence on E&S compliance for any subcontractors. This will be part of the Standard bidding document	Contractor Supervision Consultants KRISO Social Officer and Procurement	Preconstruction and Construction Phase
Labor Influx	• Contractors will maximise employment of unskilled labor from the project communities • Workers will sign Code of Conducts and ensure they maintain appropriate relations with local communities • Contractors will make resources available for their workers to avoid competition with communities including water, healthcare as as stipulated in the general conditions of contracts in annex 4 • Contractors will not have their campsites in the school premises or within the communities. Rather either they lodge in town or outskirts of the community in line with section 3.4.3 • Workers to abide by all SEA/SH/GBV code of conducts	Contractor All workers	Preconstruction and Construction Phase

SEA/SH/GBV	• Conduct sensitization & trainings for workers on Code of Conduct, SEA/SH/GBV prevention & response mechanisms including information on GBV focal persons and the GBV service providers • Ensure all workers sign Code of Conducts (sample provided in annex 8)	Contractor/ GBV experts Contractor/ Supervision Consultant	Preconstruction and Construction Phase Monthly Refresher
Occupational Health and Safety	• Submit company HSE Manual to the KRISO • Conduct HSE trainings and specialized job trainings for workers • Procure appropriate PPEs for all workers including adhoc workers, community workers • Ensure the day-to-day compliance with specified HSE measures including those in the OHS Plan in annex 6 • Conduct daily HSE PEP talks • Ensure availability of first aid boxes construction site, staging area and mobile kits, and well trained officers in first aid • Report HSE incidents and accidents to the contractor management	Contractor HSE Officer on every contractor team	Upon contract signing During Pre-construction/ Construction phase Daily
Grievance Management	• Sensitise workers on the available GRM channels and their rights to use them including complaint boxes, GRCs, phone lines as stated in section 6.8 • Ensure implementation of the GRM and ensure that all complaints by workers are resolved • Complaints related to GBV/SEA/SH should be channeled to the GBV GRM focal person who will implement the GBV GRM protocol stipulated in section 6.7 • KRISO will ensure that workers are informed of their right of association and collective bargaining. However, they will not be victimised for forming unions or associations • Beneficiaries/complainants would be assured that there will be no retribution of persons especially females or cultural restraints when cases are reported discretely	Contractor/KRISO GRM Officer GBV GRM Focal Person	During Preconstruction phase/ During site meetings. As required
Discipline and Termination of Appointment	• Penalties & sanctions should be explained to workers in an understandable language at the point of engagement • Termination of an appointment must be valid or reasonable, clear and unambiguous. • The supervision consultant and the KRISO social officer/ GRM officer should periodically review workers disciplinary and termination processes to ensure that they are executed fairly and without prejudice • Where unfair treatment is established the KRISO should put in place corrective action and follow up to ensure execution	Contractor Supervision consultant/ KRISO social officer/ GRM officer	Preconstruction and Construction Phase
Security	• Supervision Consultants, Contractors to develop security management plan in conjunction with the police and NSCDC. This will be reviewed by the KRISO	Contractor Supervision Consultant	Upon contract signing
Reporting	• Minor incidents and near misses will be reported to the KRISOs on a monthly basis • Major accidents, deaths, GBV/SEA/SH issues should be reported to the KRISO immediately and not later than 24hrs • The KRISO to flag major issues including major accidents, death, GBV/SEA/SH issues to the World Bank within 48hrs.	Contractor HSE Officer/ Supervision Consultant KRISO	Monthly As required
Record Keeping	• Site managers to keep records of workers engaged under the Project, including contracts must be kept, records of all training attended by workers including CoC, HSE, GBV etc. • Records of accidents/ incidents and corresponding root cause analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (Corrective Action Register) • Records of strike actions, reasons and resolution reached	Contractor Supervision Consultant KRISO	As Required

	• Records of grievances and how they were resolved • Records of all sanctions, punishments and terminations with reasons and follow-up actions taken • Documents should be kept at the site office with the site engineers and KRISO office		

While the risks and mitigation plan associated with recruitment/engagement of Labor has been detailed above, there is also the risk of Labor Influx (influx of foreign workers/non-indigenes) to the project communities. Table below highlights such risks, the accompanying mitigation and monitoring plan

Annex 14 –Outline for SMP

CHAPTER ONE: INTRODUCTION

- Introduction
- Objective of Security Management Plan (SMP)
- Guiding Principles

CHAPTER TWO: SECURITY POLICIES

- Federal Government
- State Government

CHAPTER THREE: GUIDELINES, STANDARDS AND GOOD INTERNATIONAL PRACTICES

CHAPTER FOUR: METHOD OF APPROACH FOR SMP

CHAPTER FIVE: OVERVIEW OF SECURITY SITUATION/ RISK ASSESSMENT

- Project Setting
- Security Risks
    1. Internal Risks
    2. External Risks
- Security Arrangements

CHAPTER SIX: SECURITY STRATEGY FOR STATE

- Planning and Preparedness
- Prevention
- Response

CHAPTER SEVEN: SECURITY OPERATING PROCEDURE FOR RAAMP STATE

- Boundary Security
- Access-Point Operations
- Incident Response and Reporting
- Security Patrols—what patrols check and how often.
- Security Clearance for Site Visits
- Materials Storage and Control
- Information and Communication—procedures for categorizing, handling, and controlling sensitive information.
- Firearms Security
- Special Situations

CHAPTER EIGHT: SECURITY SUPERVISION AND CONTROL

- Private Security Management

Public Security

Annex 15: Report on Emergency Repairs of Longitudinal Cracks on The Crest Of Tiga Dam Embankment In Kano State.

1.0 INTRODUCTION

Tiga Dam was constructed from 1971 to 1974. Design and construction were completed by the Water Resources Division of the Kano State Ministry of Works and Surveys after various feasibility and preliminary studies by, inter alia, the US Bureau of Reclamation and NEDECO Consultants. The dam was constructed by Kano State Government, while the designer and contractor of the dam was the Water Resources and Engineering Construction Agency (WRECA). The dam is owned by Federal Ministry of Water Resources (FMWR) and operated by Hadejia Jama 'are River Basin Development Authority.

Deficiencies in the design and construction of the embankment and outlet works were identified early in the life of the dam. It has remained a high-risk structure since.

Various investigations into possible improvements were completed by Nigerian and international engineering companies and organisations. In 1988, the Full Supply Level of the reservoir was lowered by about 3.40 m in view of immediate safety concerns. Extensive improvements to the drainage system of the embankment were implemented in the 1990s. This reduced the risk of potential internal erosion and consequent piping failure, which was deemed the highest risk factor of the dam.

The safety of the dam remains a major concern, however. Royal HaskoningDHV was appointed under the Transforming Irrigation Management in Nigeria (TRIMING) Project in 2014 to evaluate the then condition of the dam and propose further improvement and rehabilitation measures and to design these improvements. The dam was inspected by dam engineers of Royal HaskoningDHV a number of times between 2014 and 2015.

After Royal HaskoningDHV appointment, a contractor (Messrs. SKIPPER Nig Ltd.) commenced with the construction of a Hydroelectric Power Plant (HEP) at the dam. Royal HaskoningDHV first became aware of this project during the first reconnaissance inspection in March 2014. During the second site inspection the extent and methods of excavation for the HEP became apparent. The excavation was very deep and concern was raised about the possible impact of the works on the stability of the dam.

1.1 DESCRIPTION OF THE DAM

Tiga Dam is located on Latitude 11°26'14"N and Longitude 8°24'9"E along Kano River, a tributary of Hadejia River, in the Bebeji Local Government Area of Kano State, Nigeria. The dam is about 89.7km from the city of Kano.

Tiga Dam is a zoned Earthfill embankment dam on the Kano River. Its nominal height is 48 m from bottom of its cut-off trench: lowest foundation level (LFL) and embankment height of 33 m when measured from the downstream river level. The embankment is 6 km long. The original spillway is an uncontrolled concrete ogee spillway located on the left flank. The total length of the spillway is 447 m. It is divided in a central, lower section of 122 m. This was the original full supply level (FSL). The remaining 325 m of the spillway is 300 mm higher than the central section.

Due to several concerns about the safety of the dam since construction, embankment to the left of the spillway (north) was removed and the flank further excavated to form a new uncontrolled bywash spillway. This new channel is approximately 200 m wide and at a base level of 523.87 m, that is 3.43 m lower than the original full supply level.

Its original capacity was 1 974 x 10^6 m^3 and the surface area 189 km^2. After the lowering of the FSL the capacity was reduced to 1 374 x 10^6 m^3.

1.2 CHARACTERISTICS OF TIGA DAM

The Tiga dam is a zoned Earthfill embankment whose main characteristics are as follows:

Embankment height river bed level	48m
Embankment length	6000m
Crest elevation	530.96masl
Upstream slope	1:3
Downstream slope	1:2.5
Crest width	7.6m
Catchment	6,553 km^2
Average Annual rainfall	1,000mm
Average annual Inflow	1.11 x $10^9 m^3$
Average annual runoff	1.3 x 10^9 m^3
Annual evaporation losses	120 x 10^6 m^3
Full supply level	527.304m (lowered to around 524m)
Reservoir Volume at FSL	1.974 x $10^9 m^3$
Reservoir area at FSL	18,900 ha
Outlet capacity at FSL	65 m^3/s
Average Annual Spill	30.9 x $10^6 m^3$

Outlets:

Main	3.65m diameter (Penstock)
2.2m, 0.9m (Irrigation Canal)	
1.5m Open Channel from CBU	
River Bed	3no (0.9m diameter)

Spillway characteristics:

No.	Type		Elevation (m)	Length (m)
1.	Fixed crested ogee	527.304	122	
2.	Fixed crested ogee	527.609	325	
3.	Saddle embankment (Emergency)	529.133		1,000
4.	Bywash emergency Spillway	523.87	200	

The purpose of the reservoir is to store water for the Kano River Irrigation Project (Stages I – 15,000 ha and II – 7,000ha usually designated KRP I and KRP II), for Kano City water supply and for Hadejia Irrigation Project.

1.3 The Purpose of the Assignment: *On 6th September, 2020, TRIMING Project was notified by Sinohydro Corporation Ltd of lateral cracks on the Embankment crest of Tiga Dam, which was also confirmed by the River Basin Staff. It was reported that the crack (measuring: length-30 meters, width- around 10 cm, visible depth-60 cm) was observed 200 meters away from the left outlet of Tiga dam. This became the second crack observed since the retrofitting works of the Penstock by Messrs. Skipper Nigeria Ltd.*

Sequel to devastating flood incident witnessed in September-October 2022 especially within the Hadejia-Jama'are River Basin, new longitudinal cracks were reported by Department of Dams and Reservoir Operations in November 2022 and TRIMNG Projects in December 2022. Upon receiving the reports, the Honorable Minister for Water Resources directed the Director, Department of Dams and Reservoir Operations to invite TRIMING Projects for a Technical Meeting which was proceeded with a joint site assessment and report of findings for remediation and mitigation measures.

1.4 COMMITTEE MEMBERS

Engr	Sabiu Danmallam	TRIMING Project (SCC KRIS)	Chairman
Engr	Suleiman Sani	TRIMING Project (DMS)	Member

Engr	Mansur Ibrahim	FMWR/DRO	Member
Engr	Imo Ekpo	WBG	Member
Engr	Tajudeen A. Bukoye	WBG	Member
Engr	Taiwo Oyekan	DPoE	Member
Alh.	Lawan Turajo	Former PM Tiga	Member
Alh.	Abdulqadir Salisu	HJRBDA (PM- Tiga dam)	Member
Engr	Ibrahim.A.Abegye	TRIMING Project (DSS)	Secretary

2.0 OBJECTIVES OF THE ASSIGNMENT AND TERMS OF REFERENCE

Identify the causes of the longitudinal cracks (analysis of Geophysical and Geotechnical reports, soil analyses, reports of remedial works from contractors). Considering factors such as dam material properties, foundation conditions, the entire dam drainage system, the embankment configuration, construction practices, and environmental factors including.

Assess the stability of the dam, existing condition, evaluate the risks posed by the cracks including potential failure modes and their consequences.

Propose appropriate rehabilitation measures to address the identified issues and mitigate risks associated with the longitudinal cracks.

Develop a comprehensive plan outlining the recommended rehabilitation works, including detailed design requirements, construction timeline, and estimated costs.

2.1 SCOPE OF WORK:

Review of Previous Reports: Conduct a thorough review of relevant technical reports and existing documents related to embankment dam failures and rehabilitation methods to gain necessary insights into best practices and lessons learned.

Site Inspection: Perform detailed field assessment to validate the findings from the site visit and inspection. This may include reports of soil sampling, geotechnical and geological investigations, and structural assessments of the dam, spillway, and other ancillary structures.

Crack Identification, Mapping and Monitoring: Utilize non-destructive testing techniques to identify cracks within the embankment and monitor the longitudinal cracks in the dam structure, providing accurate measurements of their dimensions, orientations, and spatial distribution.

Rehabilitation Plan: Based on the findings from the site inspection and analyses, develop a detailed rehabilitation plan that includes the recommended remedial measures, work requirement and specifications, and maintenance protocols to ensure long-term dam safety and performance.

Cost Estimation: Provide a detailed cost estimate for the proposed rehabilitation works, including material costs, construction labour, equipment, and any required engineering services.

2.2 ITINERARY OF THE TECHNICAL COMMITTEE

Arrival at Kano on 8th and 9th of February, 2024
Site visits to Tiga Dam on Saturday, 10th and Sunday,11th of February, 2024.
Discussion on Site Inspection and report writing.

2.3 SITE INSPECTION

The Technical Committee inspected the following:

Entire embankment crest, upstream and downstream slopes;
The concrete spillway;
The emergency spillway/bywash and the return channel;
The standpipe piezometers;
The observation wells and their discharge chambers;
The toe drain structures;
The Penstock Gallery and the drainage structure; and
The Hydroelectricity Powerhouse.

2.4 OBSERVATIONS AND FINDINGS FROM THE SITE INSPECTIONS

2.4.1 THE EMBANKMENT CREST AND ITS SLOPES

Cracks were seen from chainage 0 +150 to 3+650 on the crest of the embankment. Some of these cracks which were previously sealed using bituminous materials resurfaced on the same spot.
The two (2) critical crack areas which were previously identified during 10th December 2023, are still the issue of concern during this visit. The chainages were these cracks are quite obvious are *0+850 to 0+900*, *chainage 1+500 and 1+550*.
THE UPSTREAM SLOPES: The upstream slope is visually stable, however, from chainage 350 to 2+ 950, it was observed that rip rap around this section were displaced. Also, trees and shrubs were seen in some few sections.

DOWNSTREAM SLOPES: The downstream slopes was covered with overgrown grasses, trees and shrubs with curvilinearly undulating surface from the crest edge to the concrete toe drain, which has no defined slope due to settlement. The curvilinear nature of the slope is pronounced when view from the edge of dam crest. The curvy slope is prominent from chainage 350 to 3 + 950.

2.4.2 THE CONCRETE SPILLWAY- OGEE TYPE:

No.	Type		Elevation (m)	Length (m)
1.	Fixed crested ogee	527.304	122	
2.	Fixed crested ogee	527.609	325	
3.	Saddle embankment (Emergency)	529.133	1,000	
4.	Emergency Spillway		523.904	200

In 1988, the full supply level of the reservoir was lowered by about 3.40 m in view of immediate safety concerns (USBR Report of 1987), since after the lowering, the concrete ogee remained unused. Excess flood is discharge through the 200m bywash section located at the southern end of the concrete ogee.

2.4.3 INSTRUMENTATION
Tiga Dam is equipped with 39 standpipe Piezometers. The 6km length of the embankment is classified into three (3) zones of 2km each for ease of discharge of seepage flow from the observation well.
During the site inspection, the Technical Committee identified 21 rectangular Observation Wells (A to U) which are located at the downstream of the dam. Also identified are the square shape Observation Well (7nos) numbers.
2.4.3.1 OBSERVATION WELLS
(45 Nos Observation Wells and 6Nos. V-Notches)

The Observation Well located at Chainage 3+900 to 6+000 designated as G to U is installed with a V- Notch, it commands 15 smaller rectangular Observation Wells which receives seepage flow from 15 piezometers which further discharges into observation well in zone 3 located 200m away from the edge of the downstream slope.

Observation Well located at chainage 0+000 to 3 + 900 designated as A to G is installed with a V-Notch, it commands 7 smaller square observation wells (24 piezometers), which further discharges into observation well in Zone 1 and 2.

There is a V-Notch located in the switch yard which collects flows from two (2) observation wells at chainage Ch. 2+880 and Ch. 2+950. The V-Notch receives flows from 6 piezometers and drains directly into the river channel about 50m away.

There are three (3) observation Wells located between chainage 0+000 and 2+150 designated as Zone 1 and equipped with 5 piezometers. These three (3) observations wells have no V-Notch. This lack of connectivity of piezometers to observation wells, contributes to dry observation wells and could be the source of excess pore water pressure in the embankment and possibly the cause of longitudinal cracks in this zone.

Tiga Dam is connected with concrete cylindrical Observation Wells (10 nos) whose depth are measure 9m from natural ground level, these wells are 50m apart and are found in chainage 3+100 to 3+200, there located 50m from the edge of the foot of the downstream slope. They are connected to the seepage flow of the dam foundation.

2.4.3.2 SURVEY BEACONS

120 Number Survey beacons 50m apart are installed on the embankment crest. The beacons measure the movement of the crest with respect to crest settlement. The survey beacons are not been used to check the horizontal and vertical movements of the crest.

2.4.4 EMERGENCY SPILLWAY AND RETURN CHANNEL

The downstream road was damaged by floods in 2022, because the existing bridge could not effectively convey the flood water from the emergency spillway. A training wall on the right bank of the return channel was washed away, destroying the watershed plantation and exposed the buried 4" steel pipeline: a transmission mains from the modular treatment plant from Tiga dam operated by Kano State Water Board the when pipe excavation through it was not properly backfilled.

The water washed a new channel to the right (east) and into a depression. From this area the water flows along the road to the bridge, causing erosion of the road embankment. The inspections revealed that water ran along the embankment even before the training embankment was breached. Re-constructing the embankment will therefore not contribute significantly to protecting the road. The road embankment even though currently being repaired may not be sustainable until a thorough hydrodynamic studies of the return channel flow is conducted using flow model tools.

The bridge is too small and an additional one is probably the most effective solution. During the site inspection, a four (4) cell culvert was seen been constructed at the breached section of the highway to Rano. Even with ongoing road rehabilitation works, the threat to the road and bridge by the floods remains.

2.4.5 THE TOE DRAIN STRUCTURES

There exists stable toe drain in downstream edge of the dam, which collects run off water. Also, between chainage 0+150 to 2+000, there are 12 piezometers, however, these piezometers are not connected to two (2) observation wells within zone 1 for proper discharges of pore water from the embankment. The two observation wells in this zone are not functioning and it appears that substantial number of the cracks seen on the crest of the embankment are found in this zone.

2.4.6 THE PENSTOCK GALLERY AND THE DRAINAGE STRUCTURE

The Technical Team were able to access the penstock gallery after successfully draining of the water which accumulated over time due to blockage of the drainage system, which hitherto flows effectively by gravity into the river channel. The Hydropower control room which houses the two Turbines (5.2MW- RBU and 2MW- CBU) is on the flow path of penstock drainage pipes (2 DN600 steel pipes and DN160 UPVC pipe) while the Switchyard is situated on the flow path of the V- Notch structure. These two-drainage systems originally flow into the river channel by gravity and freely until the construction of the HPP. The location of these structures creates blockages to the penstock drain pipes and free flow of discharges from the observation wells through the V- Notch structure. The blockage of the seepage water through the V-Notch constitute additional threat (uplift pressures) to the Dam embankment.

Penstock Drain pipes: There are a total of 3 pipelines in Tiga Dam Penstock gallery. During the Team's inspections, it was observed that these pipes: 2 Nos. DN600 steel pipes and DN160 UPVC pipe need to be repaired to restore their functions. The drain pipes each equipped with a knife valve for control. The main function is to drain the water in the diversion pipe. Existing pipes have been cut off of their functions due to the construction of the

hydropower station and cannot be drained normally and need to remain operative. In addition, the existing drainage pipe, a DN160 UPVC pipe, which is for draining accumulated water in the gallery has been blocked.
All these three (3) drainages pipes need to be rechanneled to enhance their functions.

2.4.7 THE HYDROELECTRICITY POWERHOUSE.

Tiga Dam is a multipurpose dam with 10MW Hydro Electric Power Plant (HEPP):
2MW horizontal Kaplan Turbine designated as Canal Bed Unit which requires 14m^3/s flow from the penstock into the turbine and a minimum load of 40% for effective power generation.
8MW vertical Kaplan Turbine designated as River Bed Unit which requires 26m^3/s flow from the penstock into the turbine and a minimum load of 40% for effective power generation.

On 11th February, 2024, the HEPP Project Manager was contacted for a brief meeting. During the meeting, the Technical Team questioned the Project Manager on the impact of the 10MW power generation to the stored water in the reservoir, bearing in mind what happened during the test run of the HEPP on 26th January, 2024. The water level in the reservoir dropped by 0.2m from stage during 3hrs test-run.
The Project Manager informed the Technical Team that the inlet flow into the turbine is been automated for 26m^3/s (8MW) and 14m^3/s (2MW), it's only the RBU of 26m^3/s that will be discharge into river system, 14m^3/s CBU will flow back into the main when the generation becomes fully operational.

2.5 RECOMMENDATION AND CONCLUSION

Having inspected the Dam Embankment and its Appurtenant structures thoroughly, the Technical Committee has presented the following recommendations:
The Longitudinal cracks on the crest of the embankment are a threat to the safety of the dam and should be immediately fixed and the curvilinear slopes of the downstream corrected to design slope of 1:2.5
Trees and shrubs should be removed and remnant roots treated with chemicals, similarly, overgrown grasses should be trimmed to desired level.
All the 39 standpipe piezometers should aremain function and to be monitored continually
Piezometer level, V-notch calculation for determination of flow rates should undertake weekly by the dam operators: training of Tiga Dam Operators is required.
All the Relief Wells and discharge chambers should be monitored and checked continually for free flow seepage water from piezometers.
Readings of pore water pressure from the piezometers should be conducted weekly by the Project Manager or Assistant Project Manager
Reading of the flows from V-Notches of the Relief Wells and Discharge Chambers should be conducted Weekly by the Dam Operators
2 Nos. DN600 steel pipes and DN160 UPVC pipe in the penstock gallery need to be repaired to restore their functions.
Standard Operation Manual of the Installed Instrumentation should be used by the Operators while in weekly or routine inspection.
The emergency spillway/bywash should be studied, designed and constructed to crest level of 526m amsl, for flood control and build up additional storage to compensate for HEPP when it becomes fully operational.
Provide alternative solar power system to power the gallery extractor fan and lighten.
Increase of manpower for the O&M and capacity building for technical staff generally.
IWRM for all the users of the dam Power and Irrigation and synergy between FMWR, RBDA and Kano State government.
Furthermore, the Medium-Term recommendations are:
The Need for a Hydroelectricity Power Plant expert to review the effect of any vibration that could result from the operation of the HEPP on the long term.
A Non-Destructive Testing (NDT) means of identifying the magnitude and spread of the cracks within the embankment should be conducted
The Need for failure mode analysis which should cover the impact of the vibration generated from the operation of Turbines and the construction of concrete weir at the section of auxiliary spillway: H=1.75m which will increase impoundment by over 300MCM.

2.6 CONCLUSION:

The Embankment is structurally stable, however, cracks seen on the crest of the embankment corresponded to CH 0+150 to 2+950), in this area, especially, Zone 1 (CH 0 + 00 to CH 2+ 000) where all the Observation Wells are dried and are not working remains the greatest area of interest for the rehabilitation work. This is an indication of unhealthy embankment, and a disaster in waiting. There is therefore the immediate need to ensure that the Piezometers in this zone are well connected to the Relief Wells and effectively discharging seepage to the V – Notches, before the launch of campaign of rehabilitation works on the embankment. Achieving this sequence of rehabilitation program will enhance the safety of the dam, the community around the dam and infrastructure downstream.