

**NIGER BASIN WATER RESOURCES DEVELOPMENT
AND SUSTAINABLE ECOSYSTEMS MANAGEMENT
PROGRAM: REHABILITATION OF KAINJI & JEBBA
HYDROELECTRIC POWER PLANTS**

**Update of the Environmental and Social Management
Plan (ESMP)**

Final Report



In association with Enplan Group Nigeria



February 2012

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CONTENTS

SUMMARY	XIII
RESUME	XXV
TAKAITAWAR GUDANARA	XXXIII
SECTION 1: FACTORS COMMON TO BOTH DAMS.....	1
1. INTRODUCTION.....	2
1.1 Location and Description of the Existing Power Plants.....	2
1.2 Niger Basin Authority	7
1.3 The WRD-SEM Project.....	7
1.4 Kainji and Jebba Dams' Contribution to Nigeria's Power Supply.....	8
1.5 Previous Environmental Studies	8
1.6 Early Flood Warning System	9
1.7 ESMP Study Area.....	9
1.8 ESMP Focus and Structure.....	9
1.8.1 Report Layout	9
1.8.2 Protocol Documents	10
2. POLICY AND LEGAL FRAMEWORK	11
2.1 International Framework.....	11
2.1.1 Equator Principles	11
2.1.2 World Bank and IFC Principles	11
2.2 Policies and Legislation.....	12
2.2.1 International	12
2.2.2 National	12
2.2.3 State Level	13
Table 2.1: Relevant State Level Ministries and their Roles.....	13
2.2.4 Local Government Level	14
3. PHCN INSTITUTIONAL ARRANGEMENTS	15
3.1 Kainji Hydroelectric Plc (KHEPLC).....	15
3.1.1 Organisation.....	15
3.1.2 Staff Numbers.....	15
3.1.3 In-House Training.....	16
3.1.4 Data Gaps	17
3.2 Jebba Hydroelectric Plc (JHEPLC).....	17
3.2.1 Organisation.....	17

3.2.2	Staffing.....	18
3.2.3	Data Gaps	19
3.3	Institutional Arrangement for Environmental and Social Management	19
3.3.1	Social and Environmental Audit Reports Observations and Present General Situation	19
3.3.2	Environment, Resettlement and Social Units (ERSUs)	20
3.4	Environmental Management System.....	21
3.5	Carbon Credit Financing	22
SECTION 2: KAINJI DAM		23
4.	MANAGEMENT OF THE DAM	24
4.1	Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation	24
4.2	Present Operational Condition of Kainji Dam	25
4.2.1	General Description	25
4.3	Condition and Maintenance of Structures	25
4.3.1	Introduction	25
4.3.2	The Dam.....	28
4.3.3	The Spillway.....	28
4.3.4	The Lock.....	29
4.3.5	Powerhouse	29
4.3.6	Trash Screens	30
4.3.7	Instrumentation.....	30
4.3.8	Storage of Documentation	33
4.4	Power Generation.....	33
4.4.1	Introduction	33
4.4.2	Use of Rule Curves.....	34
4.4.3	Power Generation	35
4.4.4	Operation and Maintenance	35
4.4.5	Workshop Requirements	36
4.4.6	Control Room.....	39
4.5	Flood Management	40
4.5.1	Management of an Extreme Flood Event	40
4.5.2	Recommendations	41
4.6	Water Weed	41
4.6.1	Impact	41
4.6.2	Mitigation	41
4.7	Flood Warning Communications.....	41
4.7.1	Current System	41
4.7.2	Mitigation Measures.....	42
5.	IMPACTS AND MITIGATION PROPOSALS	45
5.1	Hydrology and Sedimentation.....	45
5.1.1	Hydrology	45
5.1.2	Downstream Hydrological Impacts	46
5.1.3	Hydrology Recommendations	47
5.1.4	Sedimentation.....	47
5.1.5	Recommendations	47

5.2	Soil Erosion and Catchment Degradation.....	48
5.2.1	<i>Impacts</i>	48
5.2.2	<i>Mitigation</i>	48
5.3	Water Quality	48
5.3.1	<i>Introduction</i>	48
5.3.2	<i>Monitoring.....</i>	49
5.3.3	<i>Operational Impacts.....</i>	50
5.3.4	<i>Conclusion and Recommendations on Operational Impacts</i>	50
5.3.5	<i>WRD-SEM Impacts.....</i>	51
5.4	Terrestrial and Aquatic Flora and Fauna	51
5.4.1	<i>Social and Environmental Audit Reports (2006 and 2007) Observations and Present General Situation.....</i>	51
5.4.2	<i>Impacts</i>	52
5.4.3	<i>Mitigation</i>	54
5.5	Public Health.....	54
5.5.1	<i>Social and Environmental Audit Reports (2006 and 2007) Observations and Present General Situation.....</i>	54
5.5.2	<i>Approach</i>	55
5.5.3	<i>Existing Conditions</i>	55
5.5.4	<i>Mitigation</i>	57
5.6	Cultural and Historic Sites	58
5.7	Construction of WRD-SEM Components	59
5.7.1	<i>Traffic</i>	59
5.7.2	<i>Contractor's EMP</i>	59
6.	WASTE MANAGEMENT	60
6.1	Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation	60
6.2	Solid Waste	60
6.2.1	<i>Current Situation</i>	60
6.2.2	<i>WRD-SEM Project Impacts</i>	61
6.3	Liquid Waste.....	62
6.3.1	<i>Present Situation</i>	62
6.4	Conclusions and Recommendations	63
7.	HEALTH AND SAFETY	64
7.1	Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation	64
7.2	Approach	65
7.3	Policy, Organisation and Responsibilities	65
7.4	Health and Safety Issues	65
7.5	Existing Safety Procedures.....	69
7.6	Risk Control	69

7.7	Existing Training and Safety Records.....	70
7.8	Communications.....	70
7.9	Inspections.....	71
7.10	Health.....	72
7.11	Proposals for Change.....	72
7.11.1	Occupational Health and Safety.....	72
7.11.2	Audits	73
7.11.3	Equipment Requirements and Additional Work	73
7.11.4	Short-Term Training	74
8.	COMMUNITY RELATIONS AND MANAGEMENT	75
8.1	Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation	75
8.2	Methodology	75
8.3	Current Situation	76
8.3.1	History since Construction	76
8.3.2	Current Problems	78
8.3.3	Role of CBOs, NGOs and Local Institutions	80
8.4	Mitigation.....	80
8.4.1	Public Consultation	80
8.4.2	Social Survey.....	81
8.4.3	Floodplain Mapping.....	81
8.4.4	Corporate Social Responsibility (CSR)	81
8.4.5	Grievance Mechanisms.....	82
SECTION 3:	JEBBA DAM	84
9.	MANAGEMENT OF THE DAM	85
9.1	Social and Environmental Audit Report (2006) Observations and Present Situation.....	85
9.2	Condition and Maintenance of Structures	86
9.2.1	Introduction	86
9.2.2	The Dam.....	88
9.2.3	The Spillway.....	88
9.2.4	The Lock.....	89
9.2.5	Powerhouse	89
9.2.6	Trash Screens & Gates.....	90
9.2.7	Instrumentation.....	91
9.2.8	Flows through the Dam	93
9.2.9	Storage of Documentation	95
9.3	Power Generation.....	96
9.3.1	Introduction	96
9.3.2	Joint Operation and Kainji's Use of Rule Curves.....	96
9.3.3	Power Generation	97
9.3.4	Operation and Maintenance	99
9.3.5	Workshop Requirements	99
9.3.6	Control Room.....	101
9.4	Flood Management	101

9.5	Flood Warning Communications.....	103
9.5.1	Current System	103
9.5.2	Mitigation Measures.....	103
10.	IMPACTS AND MITIGATION PROPOSALS.....	107
10.1	Hydrology and Sedimentation.....	107
10.2	Soil Erosion and Catchment Degradation.....	107
10.2.1	Impacts	107
10.2.2	Mitigation	108
10.3	Water Quality	108
10.3.1	Impacts	108
10.3.2	Monitoring.....	109
10.3.3	Operational Impacts.....	110
10.3.4	Conclusions and Recommendations on Operational Impacts	110
10.3.5	WRD-SEM Impacts.....	110
10.4	Terrestrial and Aquatic Flora and Fauna	111
10.4.1	Impacts	111
10.4.2	Mitigation	111
10.5	Public Health.....	112
10.5.1	Social and Environmental Audit Report (2006) Observations and Present Situation	112
10.5.2	Present Approach.....	112
10.5.3	Existing Conditions.....	112
10.5.4	Mitigation	115
10.6	Cultural and Historic Sites	117
10.7	Construction of WRD-SEM Components	117
10.7.1	Traffic	117
10.7.2	Contractor's EMP	117
11.	WASTE MANAGEMENT	118
11.1	Social and Environmental Audit Report (2006) Observations and Present Situation....	118
11.2	Solid Waste	118
11.2.1	Current Situation.....	118
11.2.2	ERD-SEM Project Impacts.....	121
11.3	Liquid Waste.....	123
11.4	Conclusions and Recommendations	123
12.	HEALTH AND SAFETY	124
12.1	Social and Environmental Audit Report (2006) Observations and Present Situation....	124
12.2	Our Approach	125
12.3	Policy, Organisation and Responsibilities	125
12.4	Existing Safety Equipment.....	125
12.5	Existing Safety Procedures.....	127

12.6	Risk Control	127
12.7	Existing Training and Safety Records.....	127
12.8	Communications and Inspections	128
12.9	Health.....	128
12.10	Other Issues.....	128
12.11	Proposals for Change.....	129
12.11.1	Occupational Health and Safety.....	129
12.11.2	Audits	129
12.11.3	Equipment Requirements and Additional Work	130
12.11.4	Short-Term Training.....	130
13.	COMMUNITY RELATIONS AND MANAGEMENT.....	131
13.1	Social and Environmental Audit Report (2006) Observations and Present Situation....	131
	Methodology	131
13.2	Current Situation	132
13.2.1	History since Construction	132
13.3	Mitigation.....	134
13.3.1	Public Consultation	134
13.3.2	Floodplain Mapping.....	135
13.3.3	Corporate Social Responsibility (CSR)	135
13.3.4	Grievance Mechanism	136
SECTION 4: ENVIRONMENTAL MANAGEMENT PLAN FOR KAINJI AND JEBBA POWER PLANTS		138
14.	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN	139
14.1	Hydrology	139
14.2	Catchment Management.....	141
14.3	Dam Management.....	142
14.4	Water Quality	145
14.4.1	Management	145
14.4.2	Sampling Design and Process	145
14.4.3	Target Areas for Monitoring	147
14.5	Terrestrial and Aquatic Ecology	148
14.6	Public Health.....	149
14.7	Community Development and Social Survey.....	150
14.8	Waste Management.....	151
14.9	Health and Safety.....	152
14.10	Development of an ESU	153

14.10.1	<i>Proposed Structure</i>	153
14.10.2	<i>Functions</i>	154
14.10.3	<i>Management</i>	154
14.10.4	<i>Office Requirements</i>	155
14.10.5	<i>Training of Existing Staff</i>	155
14.10.6	<i>Institutional Arrangements at Head Office</i>	156
14.11	EMS 14001	156
14.12	Summary	156
15.	PROCUREMENT PLAN FOR THE ESMP	158
	REFERENCES	164
	REFERENCES	164
	APPENDICES	168
A)	ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)	169
B)	CARBON FINANCING	182
C)	OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM	185
D)	WASTE MANAGEMENT PROTOCOL AND PLAN	190
E)	SOCIAL SURVEY RAPID ASSESSMENT	205
F)	TRAINING CONDUCTED	209
G)	OPERATION AND MAINTENANCE PLAN PREPARATION GUIDELINES	214
H)	DRAFT EMERGENCY PREPAREDNESS PLAN	217
I)	INSTRUMENTATION PLAN PREPARATION GUIDELINES	243
J)	CONTRACTOR'S EMP	244
K)	PUBLIC CONSULTATION AUGUST 2010	253
L)	TERMS OF REFERENCE FOR THE ESMP UPDATE	268
TABLES		
1.1	Report Layout	
2.1	Relevant State Level Ministries and their Roles	

- 3.1 Training Courses Organised in 2008
- 3.2 Summary of Staff Distribution by Cadre
- 4.1 Minimum Inspection Frequency and Dam Safety Review Requirements
- 4.2 Kainji Hydroelectric Power Station – Technical Details
- 4.3 Kainji HEP Power Generation 2006, 2007 & 2008 (MWh)
- 4.4 Kainji HEP Nominal Installed Capacity (MW)
- 5.1 Fish Production and Number of Boats in Kainji Lake - Statistics
- 5.2 Water Related Disease Incidence for PHCN Hospital (June 2009-May 2010)
- 5.3 Major Public Health Issues in the Communities around Kainji
- 7.1 Health and Safety Requirements of KHEPLC
- 8.1 Community Issues at some of the villages near Kainji Reservoir
- 9.1 Minimum Inspection Frequency and Dam Safety Review Requirements
- 9.2 Jebba HEP Plant – Technical Details
- 9.3 Jebba HEP Power Generation 2009 (MWh)
- 9.4 Jebba HEP Plant Nominal Installed Capacity (MW)
- 10.1 Staff Hospital Statistic of common illness from June, 2009 to June 2010
- 10.2 Major Public Health Issues in the Communities around Jebba dam
- 12.1 Health and Safety Requirements of JHEPLC
- 13.1 Community Issues at some of the villages near JHEPLC
- 14.1 ESMP Summary of Budget Requirements

FIGURES

- 1.1 Kainji and Jebba Lakes
- 1.2 River Niger Basin
- 1.3 Major Administrative Unit Map for the Kanji-Jebba Systems
- 1.4 Local Government Areas in the Kainji-Jebba Area
- 3.1 KHEPLC Organisation
- 3.2 JHEPLC Organisation
- 3.3 Proposed ESU Organisation under KHEPLC
- 3.4 Proposed ESU Organisation under JHEPLC
- 4.1 Kainji Dam Site Plan
- 4.2 Existing Flood Warning Communication System at Kainji
- 4.3 Recommended Flood Warning Communication System at Kainji Dam
- 5.1 Air injection into the Turbine Flow (Courtesy: INPG)
- 8.1 Flow Chart of the Recommended Grievance Mechanism
- 9.1 Jebba Dam Site Plan
- 9.2 Diagrammatic section of the Jebba Powerhouse
- 9.3 Cross section of the Jebba Spillway

- 9.4 Jebba Inflow Data
- 9.5 Existing Flood Warning Communication System at Jebba
- 9.6 Recommended Flood Warning Communication System at Jebba Dam
- 13.1 Flow chart of the Recommended Grievance Mechanism

PHOTOS

- 4.1 Discharge from the Kainji Dam Spillway on 6th October 2010
- 4.2 Artistic Section of the Kainji Power House
- 4.3 Continuation of the previous Photo
- 4.4 Inverted Plumb Line – Float disconnected with bath visible, and corroded vertical metal measuring bar
- 4.5 Damaged Headworks to Piezometer
- 4.6 Terminal Board for Pneumatic Piezometers
- 4.7 Poor Access Road to Totalising Weir
- 4.8 Documents thrown in the open near Kainji Data Store House
- 4.9 Kainji Reservoir Rule Curve
- 4.10 Kainji Hydro Power Plant Workshop Area
- 4.11 Lathe in the Workshop
- 4.12 Power Drill in the Workshop
- 4.13 Workshop Floor
- 4.14 Storage of Equipments
- 4.15 Storage of Instruments and the Office Working Area
- 4.16 Old Siemens ‘Sequence of Event Recorder’
- 5.1 Oil spill in the open well of Turbine 4 location
- 5.2 Stakeholder Meeting with NIFFR
- 5.3 HIV/Aids Awareness Poster at the Clinic
- 7.1 Old Fire Engine at Kainji Power Station
- 7.2 Hose Reel Box without Hose Reel
- 7.3 Poorly kept Fire Fighting System
- 7.4 Exposed Wiring
- 7.5 Dumping of Hazardous Wastes
- 7.6 Rudimentary steps to cordon off Uncovered Chutes
- 7.7 Safety Awareness Poster
- 8.1 Discussion with the Awuru Villagers

- 8.2 Discussion with the Fakun Villagers
- 8.3 Dilapidated house at Awuru Village
- 8.4 Meeting with Monnai Village Chief
- 9.1 Flood Discharge through the Spillway at Jebba Dam on 7th Oct 2010
- 9.2 Instrument Workshop
- 9.3 Remote-controlled Piezometers Terminals
- 9.4 Headworks of Inclinator
- 9.5 Level area downstream of Drain AD53 with spring
- 9.6 Side wall excavation to the level area downstream of Drain AD53 showing heavily jointed material
- 9.7 Vehicle Workshop
- 9.8 60 tonne Mobile Crane
- 9.9 30 tonne Mobile Crane
- 10.1 River bank erosion at Gungu Village
- 10.2 HIV/Aids Awareness Poster
- 10.3 Primary Health Care Centre at Gungu Village
- 11.1 Waste bin at Jebba HEP
- 11.2 Unprotected open Oil Drum
- 11.3 Oil Spills into Gutter which drains into River Niger
- 11.4 Oil Spill into Apron which drains into Gutter
- 12.1 New Fire Engine at Jebba
- 12.2 Fire Tender Equipments
- 12.3 Exposed Wiring
- 13.1 Bukka Village Group Discussion –Members
- 13.2 Gbajibu Village Group Discussion –Members
- 13.3 Highest Flood Mark at South Jebba

ACRONYMS

AGM(O)	Assistant General Manager (Operations)
BA	Breathing Apparatus
CEO	Chief Executive Officer
CSR	Corporate Social Responsibility
EHS	Environmental, Health and Safety
EMS	Environmental Management System
EPP	Emergency Preparedness Plan
ERSU	Environmental, Resettlement and Social Unit
ESMP	Environmental and Social Management Plan
ESU	Environmental and Social Unit
FME	Federal Ministry of Environment
FEPA	Federal Environmental Protection Agency (currently FEM)
FERC	US Government's Federal Energy Regulatory Commission
GIS	Geographical Information System
GEF	Global Environment Fund
H&S	Health & Safety
HEP	Hydro Electric Power
HIV/AIDS	Human Immuno Deficiency Virus/Acquired Immunodeficiency Syndrome
HQ	Headquarters
HSE	Health Safety & Environment
HSMS	Health and Safety Management System
HYPPADEC	Hydroelectric Power Producing Areas Development Commission
IFC	International Finance Corporation
IP	Instrumentation Plan
IS	Information System
ISOs	International operational Standards
JHEPLC	Jebba Hydroelectric Company PLC
KHEPLC	Kainji Hydroelectric Company PLC
KLNP	Kainji Lake National Park
KWARMA	Kwara State Roads Maintenance Agency
LGA	Local Government Area
M&E	Monitoring and Evaluation
MW	Megawatt
NBA	Niger Basin Authority
NEBOSH	National Examination Board for Occupational Safety & Health
NERC	Nigeria Electricity Regulatory Commission
NESREA	National Environmental Standards and Regulations Enforcement Agency
NIFFR	National Institute of Freshwater Fisheries Research
NISP	Nigerian Institute Of Safety Professionals
O&M	Operation and Maintenance
OHSAS	Occupational Health and Safety Assessment Series
OMP	Operation and Maintenance Plan
OP	Operational Paper
PAD	Project Appraisal Document
PC&M	Protection Control Metering

PDCA	Plan, Do, Check, Act
PEM	Project Environmental Manager
PFMA	Potential Failure Mode Analysis
PHCN	Power Holding Company of Nigeria plc
PM	Principal Manager
PPE	Personal Protective Equipment
PRO	Public Relations Officer
RA	Risk Assessment
RUWASSA	Rural Water Supply and Sanitation Agency
SDAP	Sustainable Development Action Plan
SMS	Safety Method Statements
SO	Safety Officer
SWMP	Site Waste Management Plan
TBT	Tool-Box-Talk
WHO	World Health Organisation
WMP	Waste Management Plan
WRD-SEM	Water Resources Development and Sustainable Ecosystems Management Project
WSA	Waste Storage Areas

SUMMARY

SECTION 1

1. Introduction

Background

This ESMP has been requested as part of the Niger Basin Authority's Water Resources Development and Sustainable Ecosystems Management Project (WRD-SEM). An important sub-component of this project is the rehabilitation of Kainji Hydropower Facility (\$US 115.9 million, mainly for renewal of turbines) and Jebba Hydropower Facility (\$US 11.7 million). Between them these two facilities provide most of Nigeria's hydropower production and make an important contribution to national power supply.

Previous Studies

Neither facility has an operational environmental and social management plan. A previous ESMP by CIMA (2007) was apparently never finalised while EAECL undertook an audit for Kainji HEP also in 2007. There is little evidence that the findings of either of these reports have been implemented. This report now replaces the CIMA report.

Report Content

The current study reviews separately for each dam operational impacts and the limited construction impacts associated with the implementation of WRD-SEM. An overall Environmental Management Plan is provided together with appendices covering factors ancillary either to the ESMP or to the implementation of WRD-SEM or both. These are Introduction of an Environmental Management Systems, use of carbon credits, health and safety, waste management protocol, waste management plan, dam safety protocol, dam operation manual and preliminary training to be provided under this ESMP contract.

The report has four sections. Section 1 is a general introductory section dealing with matters common to both dams. Section 2 deals with Kainji and Section 3 Jebba. Section 4 provides a combined Environmental Management Plan.

2. Policy and Legal Framework

The study has been undertaken in the broad context of international and national established procedures and legislation relating to hydropower plants and associated activities.

Reference is made to the Equator Principles, World Bank Operational Procedures and safeguard policies, WHO, UK Environment Agency and all the relevant Nigerian policy and legislation at both Federal and State level.

3. PHCN Institutional Arrangements

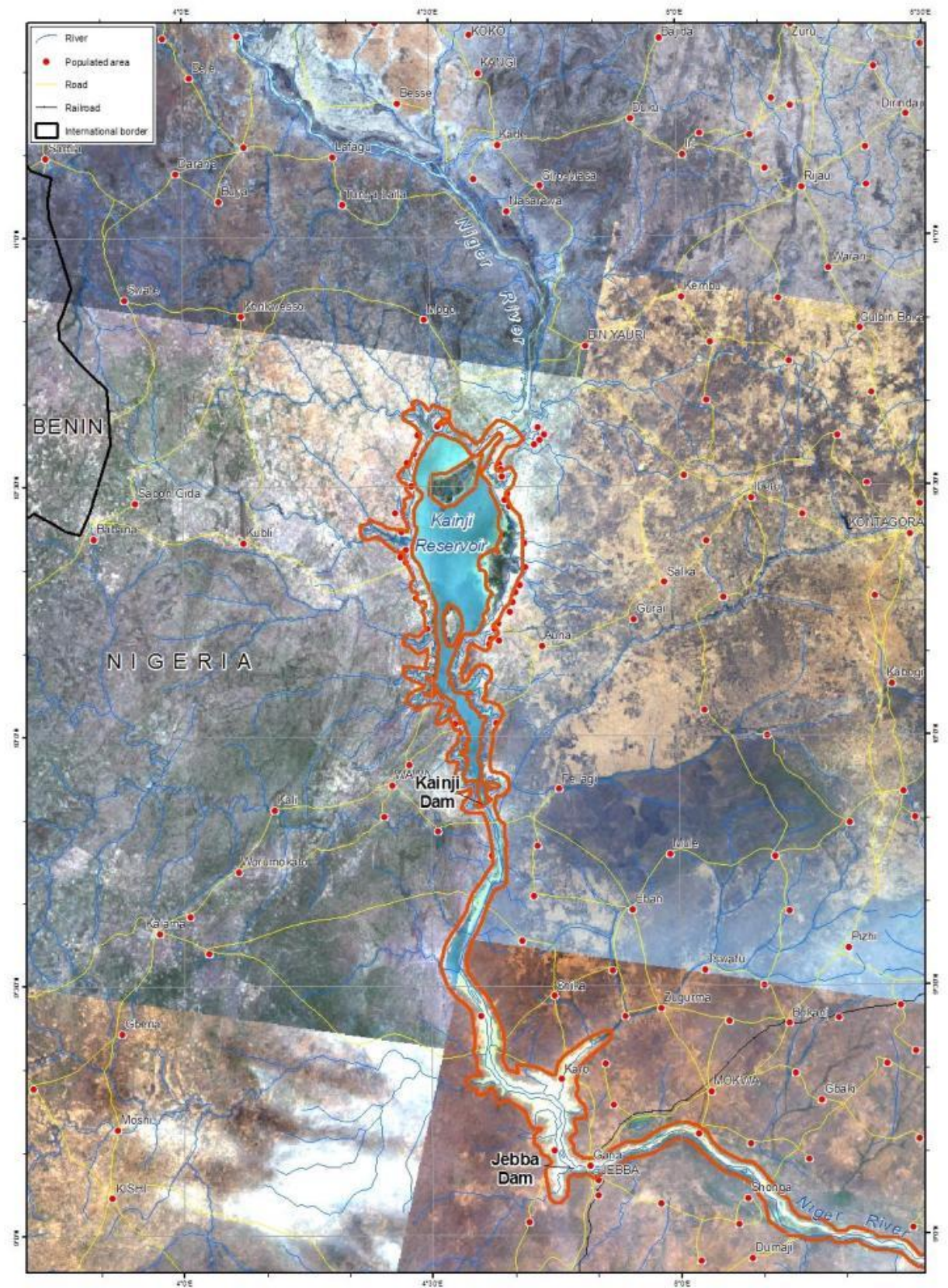
The two power plants are managed by two separate companies, Kainji Hydroelectric plc (KHEPLC) and Jebba Hydroelectric plc (JHEPLC), both of which come under the overall umbrella of the Power Holding Company of Nigeria plc (PHCN).

The overall structures of KHEPLC and JHEPLC are examined particularly with reference to their current environmental management through their Environmental Resettlement and Social Units (ERSUs).

It is suggested that the term "re-settlement" be dropped from the title as it is anachronistic and encourages the impacted communities to hang onto a compensation culture. The units would therefore become just Environmental and Social Units (ESUs).

Requirements for establishing Environmental Management Systems and proceeding towards ISO 14001 certification are set out.

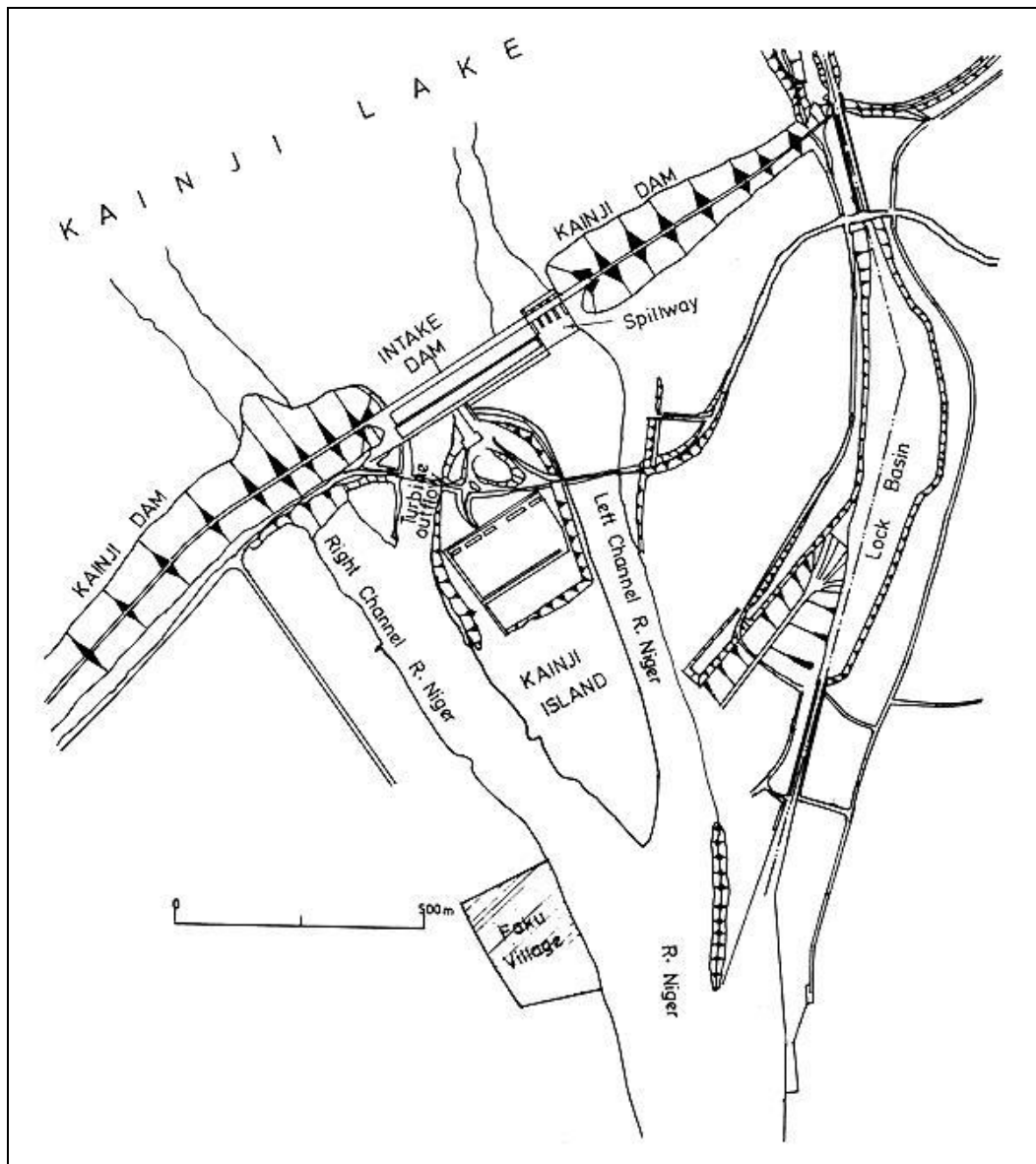
Kainji and Jebba Lakes



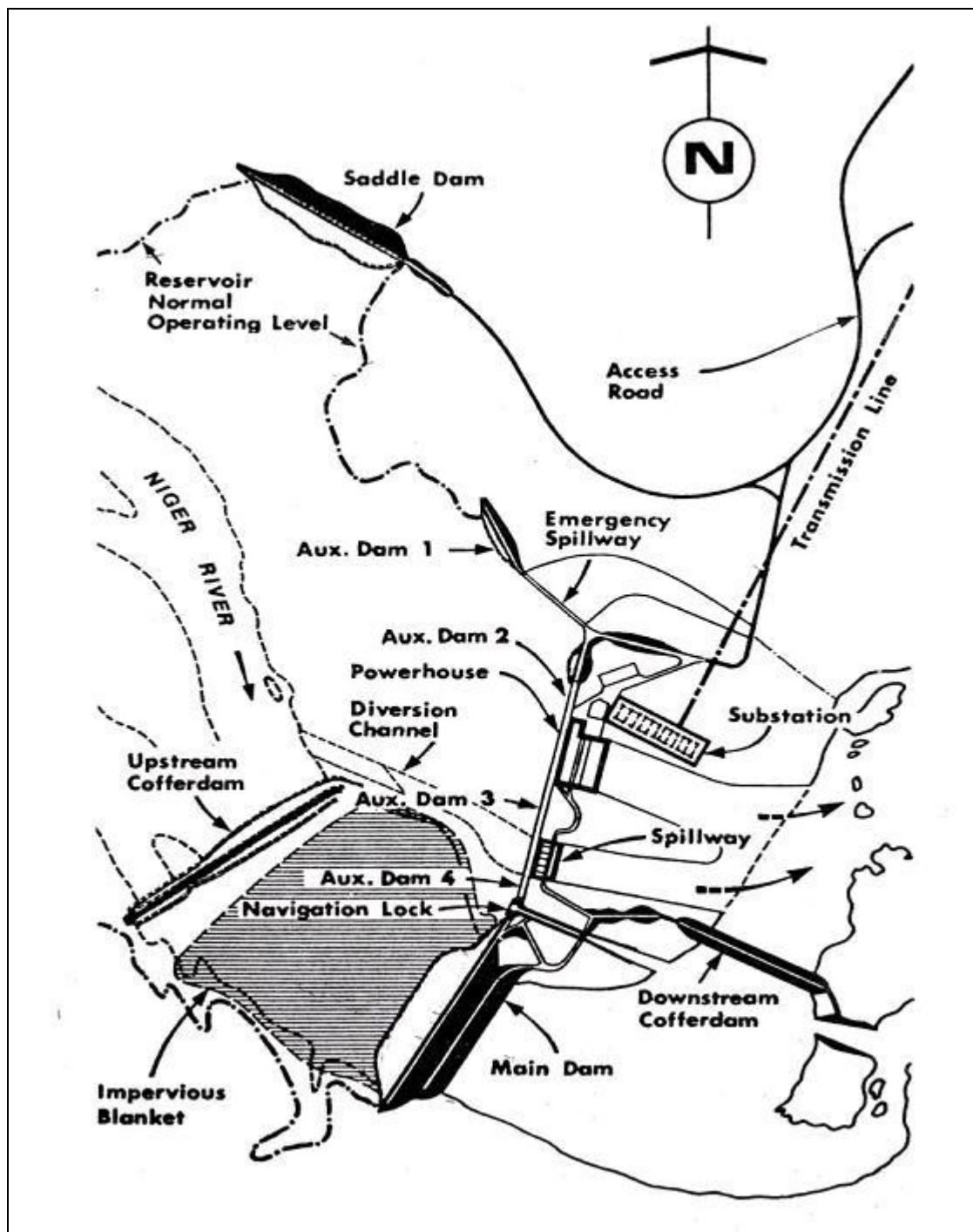
Major Administrative Unit Map for the Kanji-Jebba Systems



Kainji Site Plan



Jebba Site Plan



SECTION 2 Kainji Dam

4. Management of the Dam

Present Operation of the Dam

Kainji Dam is described in terms of the dam itself, the spillway, the lock, trash screens and instrumentation, storage of documentation and dam safety.

Two documents have been developed; the first being Operational Procedures based entirely on the Operation Manual developed on completion of construction and the second on Dam Safety Protocol using an example from overseas as the framework for the development of safety procedures for Kainji dam.

A review of alternative spilling arrangements is recommended together with the role of the lock's function as an emergency spillway. Deficiencies in instrumentation were noted and also in the way that important reference documentation is stored. Recommendations for improvements are made.

Power Generation

A review of power output is provided together with an examination of the "Rule Curves". Operation and maintenance is reviewed and improvements suggested together with workshop requirements and improvements to the Control Room.

Flood Management

Concerns about KHEPLC's ability to deal with the extreme, flood event are examined. While existing procedures are found to be adequate there is a great deal of room for improvement including closer attention to the original operations documentation.

A hydrological study for the lower Niger is recommended and it is proposed that the operation of the Kainji dam be reviewed in the light of the findings of this study should it be undertaken. This will be basis for the implementation of early flood warning system.

Water Weed

Water weed infestation and control is discussed.

Flood Warning Communications

Existing flood warning communications are examined and re commendations made for improvements mainly through improved muster points and much stronger community engagement to ensure the transmittal of speedy, accurate and relevant information to potentially affected communities.

5. Impacts and Mitigation Proposals

Hydrology and Sedimentation

The overall hydrology of the Niger is discussed together with the availability of data from gauging stations and the need for an updated hydrological assessment of river flows in the light of upstream developments. Also recommended is an improved telemetry system.

It is noted that there is no information on the state of sedimentation in Lake Kainji although there is some anecdotal information that suggests there may be at least local problems. Recommendations are made for limited bathymetric surveys and sediment load sampling.

Soil Erosion and Catchment Degradation

Population pressure and the need to obtain firewood are leading to spoil erosion in some areas although Kainji Lake National Park is effective in controlling this impact in areas that come under its control.

Recommendations are made for the use of satellite imagery to identify areas and causes of serious degradation.

Water Quality

Current actions aimed at maintaining water quality are reviewed and sources of pollution identified. Impacts arising from the WRD-SEM project are also discussed.

Monitoring procedures, compliance with FME legislation and other standards, are discussed.

Flora and Fauna

The main impact discussed is that of fish. Fisheries production increased following the creation of the lake but has subsequently declined but appears still to be higher than that in the pre-dam situation. At the same time there appears to have been a substantial loss of diversity.

KLNP do not report any major impact on terrestrial flora and fauna species.

Public Health

The expected range of illnesses and disease for a riverine community occur within the area including HIV/AIDS. There are relatively good local health facilities with a hospital provided by KHEPLC but it needs upgrading and an ambulance is recommended.

Proposals are made for a variety of household level interventions to improved community based water treatment and also for waste management.

Cultural and Historic Sites

The loss of such sites was significant during construction of the dam but is no longer a major issue

Project Traffic

Transport and traffic impacts are considered in the light of the WRD-SEM proposals but are not considered likely to create a significant impact.

6. Waste Management

Solid Waste

The main waste types are identified together with areas where problems are considered to exist. Impacts under WRD-SEM are also listed including disposal of “dunnage” which refers to packaging of procured goods and hazardous wastes.

Liquid Wastes

Impacts from liquid wastes are largely covered by the section on water quality already considered.

Recommendations

It is concluded that there is room for improvements of routine waste management. A Waste Management Protocol including a Waste Management Plan is provided in an Appendix.

However as most waste management activities are contracted out under PHCN directive improvements will be largely directed to wards managing the way that contractors operate.

7. Health and Safety

There is no evidence that a Health and Safety policy is in place and existing practices are generally very weak with an absence of proper planning or formal documentation of standardised procedures. No risk assessments are carried out and no risk control processes in place and we regard this as an area of major concern representing an area of significant financial risk to KHEPLC.

Apart from the general poor H&S culture there is no H&S safety training, maintenance of records and communication is poor although one or two areas of good practice are noted such as the Safety Tool-Box Talks. The inspection process is also weak. Also noted is a lack of care in the safe use of electricity and in some areas a lack of protective fencing and railings.

Health conditions give less cause for concern and are largely covered under Public Health above. However some ergonomic deficiencies are noted.

A complete approach to behavioural change is proposed through the introduction of a Health and Safety management system which will lead towards compliance with the standard OHSAS 18001-2007. Details of the process for this are summarised and set out in an appendix.

The need for H&S audits is emphasised and a list of equipment needs under the project is provided.

8. Community Relations and Management

Community problems are examined in the light of the background of the establishment of the project some 50 years ago. The main continuing problems are listed and the role of the recently formed HYPPADEC are discussed and highlighted as a likely source of difficulty for KHEPLC if on-going community issues are not fully addressed.

The results of the public consultation meeting are presented in an Appendix and KHEPLC's Corporate Social Responsibility (CSR) is discussed. While some CSR activities already exist eg the school and the hospital further activities could include lowering of school fees for non KHPLC staff, provision of boreholes, development of special electricity tariffs and provision of a separate supply and improvement of drainage facilities in some areas.

In addition a range of community awareness programmes is recommended and details of a grievance mechanism are provided.

A social survey of all estimated 200 communities affected by either dam is proposed as part of the ESMP.

SECTION 3 Jebba Dam

9. Management of the Dam

Present Operation of the Dam

Jebba Dam is described in terms of the dam itself, the spillway, the lock, trash screens and instrumentation, storage of documentation and dam safety.

Two documents have been developed (yet to be supplied) the first being Operational Procedures based entirely on the Operation Manual developed on completion of construction of Kainji dam and the second on Dam Safety using an example from overseas as the framework for the development of safety procedures for Jebba dam.

Concerns relating to instrumentation, leakage and seepage on the left abutment of the spillway structure and erosion to the side walls of the spillway return channel are all noted.

It is recommended that remote controlled piezometers be reinstated and regular data collection is started so that the seepage path for the left abutment leak is identified and remedial works identified and implemented.

Further recommendations relate to instrumentation and general support facilities including document storage.

Power Generation

A review of power output is provided and the intention that the system be run in close conjunction with Kainji HEP plant upstream is noted. Day to day operation is essentially driven by the availability of water, availability of plant and the demands of the grid system

Recommendations are also made to identify the dam's O&M manuals and follow them closely, develop maintenance schedules, improve workshop facilities and to train staff.

Flood Management

Flood management at Jebba is closely linked to that at Kainji. It is recommended that the current procedures for flood management and data collection be maintained.

The hydrological study for the lower Niger recommended for Kainji above is applicable to Jebba and should be extended to include tributaries joining the river below Kainji. Operational plans should be reviewed following the outputs from the hydrological study should it be implemented.

Flood Warning Communications

Existing flood warning communications are examined and recommendations made for improvements mainly through improved muster points and much stronger community engagement to ensure the transmittal of speedy, accurate and relevant information to potentially affected communities.

10. Impacts and Mitigation Proposals

Hydrology and Sedimentation

This section is covered by the same text as for Kainji above.

Soil Erosion and Catchment Degradation

Shoreline erosion due to cultivation and vegetation removal is noted and it is recommended that areas of severe erosion be identified. A catchment management programme for implementation through LGAs is proposed.

Water Quality

Current actions aimed at maintaining water quality are reviewed and sources of pollution identified. Impacts arising from the WRD-SEM project are also discussed.

Monitoring procedures, compliant with FME legislation and other standards, are discussed.

Flora and Fauna

The main impact discussed is that on fish. Data are poor and JHEPLC are encouraged to work with NIFFR to improve fisheries extension to the local population.

Public Health

The expected range of illnesses and disease for a riverine community occur within the area including HIV/AIDS. There are relatively good local health facilities with a hospital provided by JHEPLC with relatively good facilities but these could be further improved

Proposals are made for a variety of household level interventions to improved community based water treatment and also for waste management.

Cultural and Historic Sites

The loss of such sites was of some significance during construction of the dam but is no longer a major issue.

11. Waste Management

Solid Waste

The main waste types are identified together with areas where problems are considered to exist. Impacts under WRD-SEM are also listed including disposal of “dunnage” which refers to packaging of procured goods and hazardous wastes.

Liquid Wastes

Impacts from liquid wastes are largely covered by the section on water quality already considered.

Recommendations

It is concluded waste management procedures at JHEPLC are largely adequate. Further improvement could be effected by the introduction of the waste management plan and a waste management protocol provided in an appendix.

12. Health and Safety

There is a Health and Safety policy signed by the Managing Director in 2001 which covers basic H&S practices. However the policy is generic, it has not been recently reviewed and few staff know about it.

Standards are generally higher than at KHEPLC although not in all areas. For example there is no Emergency Response Procedure and there is no budget for safety training.

Health conditions give less cause for concern and are largely covered under Public Health above. However some ergonomic deficiencies are noted.

Also of concern is a lack of protective fencing and railings.

A behavioural change approach is proposed through the introduction of a Health and Safety Management system which will lead towards compliance with the standard OHSAS 18001-2007. Details of the process for this are summarised and set out in an appendix.

The need for H&S audits is emphasised and a list of equipment needs under the project is provided.

13. Community Relations and Management

Community problems are examined in the light of the background of the establishment of the project some 25 years ago and the impacts of that event are still prominent in the community's memory.

There have been some poor public relations which led to the power plant being barricaded for two days in August 2008. Since then a Close Communities committee has been formed and this has improved relations

Mitigations are proposed, such as the stakeholder forums, as a means to engage with communities, through flood plan mapping to clearly identify areas of risk and through development of JHEPLC's Corporate Social Responsibility (CSR). Some CSR activities already exist eg the school and the hospital; further activities are identified by the Technical Committee such as fisheries extension, alternative livelihoods assistance, improved public health and an awareness raising of the benefits that the dam brings.

The results of the public consultation forums are presented in Appendix L and a social survey of all estimated 200 communities affected by either dam is proposed as part of the ESMP.

Finally a grievance mechanism is provided.

SECTION 4 Environmental Management Plan

14. Environmental Management Plan for Kainji and Jebba

The environmental management plan for the mitigation measures suggested in individual chapters has been summarised in the table below.

Table 14.1 ESMP Summary

Sl. No	Details
1	Hydrology - Hydrological modelling, bathymetry survey, floodplain mapping, flood warning communication system, etc.
2	Catchment degradation assessment
3	Dam instrumentation, Kainji
4	Workshop Upgrading, Kainji
5	Dam instrumentation, Jebba
6	Dam Safety, Jebba
7	Workshop Upgrading Jebba
8	Community Support through NIFFR
9	Public Health awareness programmes
10	Social Survey
11	Waste Management, Kainji
12	Waste Management, Jebba
13	Health and Safety, Kainji
14	Fire Engine, Kainji
15	Health and Safety, Jebba
16	ESU Office establishment (Kainji and Jebba)
17	EMS assistance

15. Procurement Plan

The Procurement Plan for the above ESMP mitigation measures are as follows

Sl. No.	Topic	Allocated Areas *	Period of Execution	Approximate Cost (mUS\$)
Service Contracts				
1	Studies on hydrology, flood management, flood warning communication system, catchment assessment, dam safety and instrumentation	CSJK2 + KJ13	24 months	1.830
2	Social survey and community support for both KHEPLC and JHEPLC	CSJK12	10 months	0.185
3	EMS 14001 Assistance for both KHEPLC and JHEPLC	CSJK12	16 months	0.045
4	OHSAS Compliance and establishment of Audit System for both KHEPLC and JHEPLC	CSJK12	7 months	0.050
5	Designing of Waste Management Systems and Equipments for both KHEPLC and JHEPLC	CSJK12	4 months	0.050
	Sub-Total			2.160
Supply Contracts				
1	Hydrological and Meteorological Instruments	KJR3A +KJR3B		0.550
2	Purchase of vehicles for ESU, hydrological divisions and dam instrumentation divisions	CSJK12		0.200
3	Office equipments including computers, printers for ESU, hydrological and dam instrumentation divisions	CSJK12 +KJ13		0.300
	Sub-Total			1.050
	TOTAL			3.210

Note: Some of the instrument design, tendering and implementation of goods and work contracts needs to be taken up during the implementation of service contract 1

* The numbers refer to contract package numbers approved for Component 2 under the WRD-SEM Procurement Plan.

RESUME

SECTION 1

1. Introduction

Contexte

Cet ESMP (*Environmental & Social Management Plan* – Plan de gestion environnemental et social) a été demandé dans le cadre du projet de développement des ressources en eau et de gestion des écosystèmes renouvelables (*Water Resources Development and Sustainable Ecosystems Management Project* - WRD-SEM) de l'Agence du bassin du Niger (*Niger Basin Authority* – NBA). Un sous-composant important de ce projet est représenté par la réhabilitation des installations hydroélectriques de Kainji (115,9 millions USD, destinés essentiellement au renouvellement des turbines) et des installations hydroélectriques de Jebba (11,7 millions USD). A elles deux, ces installations fournissent la plus grande partie de la production d'hydroélectricité du Nigeria et apportent une contribution importante à l'approvisionnement en électricité national.

Etudes antérieures

Ni l'une ni l'autre des installations ne dispose d'un plan de gestion environnemental et social opérationnel. Un ESMP antérieur réalisé par CIMA (2007) n'a, apparemment, jamais été finalisé, alors qu'EAECL a entrepris un audit de l'énergie hydroélectrique (Hydro Electric Power – HEP) de Kainji, également en 2007. Il y a peu de signes indiquant que les constatations relevant de l'un ou l'autre de ces rapports ait donné lieu à une mise en œuvre.

Teneur du rapport

La présente étude examine séparément, pour chacun des barrages, les impacts opérationnels et les impacts de construction limités associés à la réalisation du WRD-SEM. Un Plan de gestion de l'environnement global est fourni ainsi que des annexes couvrant des facteurs connexes, soit à l'ESMP, soit à la mise en œuvre du WRD-SEM, ou aux deux. Il s'agit d'une introduction à un système de gestion de l'environnement, l'utilisation des crédits de carbone, la santé et la sécurité, le protocole de gestion des déchets, le plan de gestion des déchets, le protocole de sécurité des barrages et la formation préliminaire qui doit être fournie au titre de ce contrat d'ESMP.

Le rapport comporte quatre sections. La Section 1 est une section de présentation générale traitant de sujets communs aux deux barrages ; la Section 2 traite de Kainji et la Section 3 traite de Jebba. La Section 4 fournit un Plan de gestion de l'environnement combiné.

2. Principe directeur et cadre juridique

L'étude a été entreprise dans le contexte plus large des procédures nationales et internationales établies et de la législation concernant les usines hydroélectriques et les activités y afférentes.

Il est fait référence aux Principes de l'Equateur, à la commission mondiale sur les barrages, aux procédures opérationnelles et aux principes de sauvegarde de la Banque mondiale, à l'OMS, à l'Agence du Royaume-Uni pour l'environnement et à tous les principes directeurs et législations pertinents du Nigeria, à la fois au niveau fédéral et au niveau de l'Etat.

3. Dispositions institutionnelles de la PHCN

Les deux usines hydroélectriques sont gérées par des sociétés séparées : la Kainji Hydroelectric plc (KHEPLC) et la Jebba Hydroelectric plc (JHEPLC), toutes deux fonctionnant sous l'égide de la Power Holding Company of Nigeria plc (PHCN).

Les structures d'ensemble de la KHEPLC et de la JHEPLC sont examinées, surtout en ce qui concerne leur gestion actuelle de l'environnement, par l'intermédiaire de leurs unités chargées du ré-établissement environnemental et des aspects sociaux (*Environmental Resettlement and Social Units* - ERSU).

Il est suggéré d'abandonner le terme « ré-établissement », dans le titre de ces unités, car il est anachronique et il encourage les communautés touchées à s'accrocher à une culture d'indemnisation. Ces unités deviendraient donc tout simplement des unités environnementales et sociales (*Environmental and Social Units* - ESU).

Les conditions requises pour établir des systèmes de gestion de l'environnement et progresser vers l'homologation ISO 14001 sont énoncées.

SECTION 2 Barrage de Kainji

4. Gestion du barrage

Exploitation actuelle du barrage

Le barrage de Kainji est décrit dans les termes du barrage lui-même : le déversoir, l'écluse, les cribles à déchets et l'instrumentation, l'archivage de la documentation et la sécurité du barrage.

Deux protocoles ont été élaborés : le premier consistant en des Procédures d'exploitation, reposant entièrement sur le Manuel d'exploitation élaboré lors de l'achèvement de la construction, et le deuxième concernant la Sécurité du barrage, utilisant comme cadre un exemple tiré d'un cas situé outremer pour l'élaboration de procédures de sécurité pour le barrage de Kainji.

Un examen d'autres dispositions de déversement est recommandé ainsi que du rôle de la fonction de l'écluse comme déversoir d'urgence. Des manques ont été remarqués dans l'instrumentation et aussi dans la manière dont la documentation de référence importante est archivée. Des recommandations d'amélioration sont présentées.

Production d'électricité

Un bilan du rendement en électricité est fourni ainsi qu'un examen de la courbe des niveaux optimaux. L'exploitation et la maintenance sont examinées et des améliorations sont suggérées ainsi que les exigences concernant l'atelier et les améliorations de la salle des commandes.

Gestion des crues

Les préoccupations relatives à la capacité de la KHEPLC à gérer un événement de crue extrême sont examinées. Alors qu'il a été noté que les procédures existantes sont adéquates, il y a encore beaucoup de possibilités d'amélioration, y compris une attention particulière qui devrait être apportée à la documentation d'exploitation originale.

Une étude hydrologique du Niger inférieur est recommandée et il est proposé d'entreprendre un examen de l'exploitation du barrage de Kainji à la lumière des constatations de la présente étude.

Herbes aquatiques

L'infestation par les herbes aquatiques et leur contrôle sont discutés.

Communication des avertissements de crue

Les communications d'avertissement de crue existantes sont examinées et des recommandations d'amélioration sont présentées, surtout par le biais de points de rassemblement améliorés et d'un engagement beaucoup plus fort de la communauté pour assurer la transmission rapide d'informations précises et pertinentes aux communautés potentiellement affectées.

5. Impacts et propositions d'atténuation

Hydrologie et envasement

L'ensemble de l'hydrologie du Niger est discutée, ainsi que la disponibilité des données provenant des stations de jaugeage et le besoin d'une évaluation hydrologique actualisée des débits fluviaux, à la lumière des développements en amont. Un système de télémessure amélioré est également recommandé.

Il est noté qu'il n'y a aucune information sur l'état d'envasement du lac Kainji, bien qu'il existe quelques renseignements anecdotiques suggérant qu'il pourrait y avoir des problèmes au moins au niveau local. Des recommandations sont présentées pour des relevés bathymétriques limités et un échantillonnage de la charge solide.

Erosion du sol et dégradation du bassin de captage

La pression démographique et le besoin d'obtenir du bois de chauffage conduisent à une érosion du sol dans certaines zones, bien que le parc national du lac de Kainji soit efficace dans le contrôle de cet impact dans les endroits placés sous son influence.

Des recommandations sont faites pour l'utilisation des images satellite pour identifier les zones et les endroits où la dégradation est grave.

Qualité de l'eau

Les actions actuelles visant à maintenir la qualité de l'eau sont examinées et les sources de pollution sont identifiées. Les impacts émanant du projet WRD-SEM sont également discutés.

Les procédures de surveillance et la conformité à la législation du FME (*Federal Ministry of Environment* – Ministère fédéral de l'environnement) et aux autres normes sont également discutées.

Faune et flore

Le principal impact discuté est celui concernant la pêche. La production de la pêche a augmenté à la suite de la création du lac, mais elle a ensuite baissé. Pourtant, elle semble être toujours plus élevée que ce qu'elle était dans la situation antérieure au barrage. Dans le même temps, il semble qu'il y ait eu une perte de diversité substantielle.

Le KLNP ne déclare aucun impact majeur sur les espèces de la faune et de la flore terrestres.

Santé publique

La gamme des maladies et affections attendues dans une communauté fluviale est présente dans la région, y compris le VIH/sida. Il y a des installations médicales locales relativement bonnes, avec un hôpital fourni par la KHEPLC, mais il a besoin d'être amélioré et une ambulance est recommandée.

Des propositions sont faites pour toute une variété d'interventions au niveau des ménages pour améliorer le traitement de l'eau fondé sur la communauté et aussi pour la gestion des déchets.

Sites culturels et historiques

La perte de ces sites a été importante pendant la construction du barrage, mais ce n'est plus un problème majeur.

Circulation associée au projet

Les impacts du transport et de la circulation sont examinés à la lumière des propositions de WRD-SEM, mais on ne les considère pas comme susceptibles d'être significatifs.

6. Gestion des déchets

Déchets solides

Les principaux types de déchets solides sont identifiés ainsi que les zones où l'on considère qu'il existe des problèmes. Les impacts au titre du WRD-SEM sont également énumérés, y compris l'évacuation des emballages protecteurs associés à l'emballage des biens acquis et des déchets dangereux.

Déchets liquides

Les impacts causés par les déchets liquides sont largement couverts par la section sur la qualité de l'eau déjà prise en considération.

Recommandations

Il est conclu qu'il y a des possibilités d'amélioration de la gestion des déchets normaux. Un plan de gestion des déchets et un protocole de gestion des déchets sont fournis sous forme d'une annexe.

Cependant, comme la plus grande partie des activités de gestion des déchets fait l'objet d'un contrat de sous-traitance au titre de la directive de PHCN, les améliorations viseront largement la gestion de la manière dont les prestataires de services opèrent.

7. Santé et sécurité

Il n'y a aucune preuve qu'une politique de santé et de sécurité soit en place et les pratiques existantes sont généralement très faibles en l'absence d'une planification correcte ou d'une documentation formelle des procédures normalisées. Aucune évaluation de risque n'est réalisée et aucun processus de contrôle des risques n'est en place, et nous considérons cela comme un domaine de préoccupation majeur représentant un sujet de risque financier significatif pour la KHEPLC.

Mis à part une faible culture de santé et de sécurité, il n'y a aucune formation sur la santé et la sécurité, aucun dossier n'est tenu à jour et la communication est mauvaise, bien qu'un ou deux domaines de bonne pratique aient été remarqués, comme les réunions d'information sur la sécurité. Le processus d'inspection est également faible. Il a également été remarqué un manque de soin dans l'utilisation de l'électricité et, dans certains lieux, un manque de clôtures de protection et de rambarde.

Les conditions sanitaires présentent moins de sujets de préoccupation et sont largement couvertes par la section sur la santé publique ci-dessus. Cependant, certains manques dans le domaine de l'ergonomie ont été notés.

Une approche complète à l'égard du changement des comportements est proposée grâce à l'introduction d'un système de gestion de la santé et de la sécurité qui mènera à la conformité à la norme OHSAS 18001-2007. Les détails concernant le processus y afférent sont résumés et énoncés dans une annexe.

Le besoin d'audits de santé et de sécurité est souligné et une liste des besoins en équipements au titre du projet est fournie.

8. Relations avec la communauté et gestion de ces relations

Les problèmes communautaires sont examinés à la lumière du contexte de l'établissement du projet, il y a quelques 50 ans. Les principaux problèmes qui continuent sont énumérés. Avec le rôle de la Commission pour le développement des zones productrices d'hydroélectricité (*Hydroelectric Power Producing Areas Development Commission* – HYPPADEC), ils sont discutés et soulignés comme une source de difficulté probable pour la KHEPLC si les problèmes communautaires qui se poursuivent ne sont pas pleinement traités.

Les résultats des forums réunissant les parties prenantes sont présentés (Annexe J) et la responsabilité sociale d'entreprise (*Corporate Social Responsibility* - CSR) de la KHEPLC est discutée. Alors que certaines activités liées à la CSR existent déjà, par exemple, l'école et l'hôpital, d'autres activités pourraient inclure l'abaissement des frais scolaires pour ceux qui ne font pas partie du personnel de la KHEPLC, la fourniture de forages, la mise au point de tarifs spéciaux et la fourniture d'un approvisionnement séparé et l'amélioration d'installations de drainage dans certaines zones.

De plus, une série de programmes de sensibilisation de la communauté est recommandée et les détails d'un mécanisme de règlement des griefs sont fournis.

Un sondage social des 200 communautés dont on estime qu'elles sont affectées par l'un ou l'autre des barrages est proposé dans le cadre de l'ESMP.

SECTION 3 Barrage de Jebba

9. Gestion du barrage

Exploitation actuelle du barrage

Le barrage de Jebba est décrit dans les termes du barrage lui-même : le déversoir, l'écluse, les cribles à déchets et l'instrumentation, l'archivage de la documentation et la sécurité du barrage.

Deux documents ont été élaborés (qui n'ont pas encore été fournis) : le premier consistant en des Procédures d'exploitation, reposant entièrement sur le Manuel d'exploitation élaboré lors de l'achèvement de la construction, et le deuxième concernant la Sécurité du barrage, utilisant comme cadre un exemple tiré d'un cas situé outremer pour l'élaboration de procédures de sécurité pour le barrage de Jebba.

Les préoccupations liées à l'instrumentation, aux fuites et aux infiltrations sur l'appui gauche de la structure du déversoir et l'érosion des parois latérales du canal de retour du déversoir sont toutes notées.

Il est recommandé de rétablir les piézomètres commandés à distance et de commencer une collecte régulière de données de façon que la voie d'infiltration de la fuite de l'appui gauche soit identifiée et que des travaux de remise en état soient déterminés et exécutés.

D'autres recommandations concernent l'instrumentation et les installations de soutien générales, comme l'archivage des documents.

Production d'électricité

Un examen du rendement en électricité est fourni et l'intention d'exploiter le système en étroite relation avec l'usine HEP de Kainji en amont est notée. L'exploitation au jour le jour est essentiellement pilotée par la disponibilité de l'eau, la disponibilité de l'usine et les demandes du réseau national

Des recommandations sont également présentées pour identifier les manuels d'exploitation et de maintenance du barrage et pour les respecter étroitement, définir des calendriers de maintenance, améliorer les installations d'atelier et former le personnel.

Gestion des crues

La gestion des crues à Jebba est étroitement liée à celle de Kainji. Il est recommandé de maintenir les procédures actuelles pour la gestion des crues et la collecte des données.

L'étude hydrologique du Niger inférieur recommandée plus haut pour Kainji s'applique à Jebba et devrait être étendue pour inclure les affluents qui se jettent dans le fleuve au-dessous de Kainji. Les plans opérationnels devraient être revus à la suite des résultats obtenus de l'étude hydrologique, si cette dernière devait être réalisée.

Communication des avertissements de crue

Les communications d'avertissement de crue existantes sont examinées et des recommandations d'amélioration sont présentées, surtout par le biais de points de rassemblement améliorés et d'un engagement beaucoup plus fort de la communauté pour assurer la transmission rapide d'informations précises et pertinentes aux communautés potentiellement affectées.

10. Impacts et propositions d'atténuation

Hydrologie et envasement

Cette section est couverte par le même texte que celui concernant Kainji ci-dessus.

Erosion du sol et dégradation du bassin de captage

L'érosion de la zone côtière due aux cultures et à l'élimination de la végétation est notée et il est recommandé d'identifier les zones d'érosion sévère. Un programme de gestion du bassin de captage

en vue de sa mise en œuvre par l'intermédiaire des instances locales (Local Government Area – LGA) est proposé.

Qualité de l'eau

Les actions actuelles visant à maintenir la qualité de l'eau sont examinées et les sources de pollution sont identifiées. Les impacts émanant du projet WRD-SEM sont également discutés.

Les procédures de surveillance et la conformité à la législation du FME (*Federal Ministry of Environment* – Ministère fédéral de l'environnement) et aux autres normes sont également discutées.

Faune et flore

Le principal impact discuté est celui concernant la pêche. Les données sont mauvaises et la JHEPLC est encouragée à travailler avec l'Institut national de la recherche sur la pêche en eau douce (*National Institute of Freshwater Fisheries Research* – NIFFR) pour améliorer l'extension de la pêche à la population locale.

Santé publique

La gamme des maladies et affections attendues dans une communauté fluviale est présente dans la région, y compris le VIH/sida. Il y a des installations médicales locales relativement bonnes, avec un hôpital fourni par la JHEPLC, mais elles pourraient être encore améliorées.

Des propositions sont faites pour toute une variété d'interventions au niveau des ménages pour améliorer le traitement de l'eau fondé sur la communauté et aussi pour la gestion des déchets.

Sites culturels et historiques

La perte de ces sites a été importante pendant la construction du barrage, mais ce n'est plus un problème majeur.

11. Gestion des déchets

Déchets solides

Les principaux types de déchets solides sont identifiés ainsi que les zones où l'on considère qu'il existe des problèmes. Les impacts au titre du WRD-SEM sont également énumérés, y compris l'évacuation des emballages protecteurs associés à l'emballage des biens acquis et des déchets dangereux.

Déchets liquides

Les impacts causés par les déchets liquides sont largement couverts par la section sur la qualité de l'eau déjà prise en considération.

Recommandations

Il est conclu que les procédures de gestion des déchets à la JHEPLC sont largement insuffisantes. Des améliorations supplémentaires pourraient être effectuées par l'introduction d'un plan de gestion des déchets et d'un protocole de gestion des déchets fournis sous forme d'une annexe.

12. Santé et sécurité

Il existe un règlement de santé et de sécurité qui a été signé par le Directeur général en 2001 et qui recouvre les pratiques de santé et de sécurité élémentaires. Cependant, le règlement est générique, il n'a pas été revu récemment et peu de membres du personnel en sont informés.

Les normes sont généralement plus élevées qu'à la KHEPLC, bien que cela ne soit pas vrai pour tous les domaines. Par exemple, il n'y a pas de Procédure d'intervention d'urgence et il n'y a aucun budget pour la formation sur la sécurité.

Les conditions sanitaires présentent moins de sujets de préoccupation et sont largement couvertes par la section sur la santé publique ci-dessus. Cependant, certains manques dans le domaine de l'ergonomie ont été notés.

Une approche complète à l'égard du changement des comportements est proposée grâce à l'introduction d'un système de gestion de la santé et de la sécurité qui mènera à la conformité à la norme OHSAS 18001-2007. Les détails concernant le processus y afférent sont résumés et énoncés dans une annexe.

Le besoin d'audits de santé et de sécurité est souligné et une liste des besoins en équipements au titre du projet est fournie.

13. Relations avec la communauté et gestion de ces relations

Les problèmes communautaires sont examinés à la lumière du contexte de l'établissement du projet, il y a quelques 25 ans et les impacts causés par cet événement sont encore saillants dans la mémoire communautaire.

Il y a eu quelques relations publiques de mauvaise qualité qui ont conduit au fait que l'usine hydroélectrique a été barricadée pendant deux jours en août 2008. Depuis lors, un Comité des communautés proches a été créé et cela a amélioré les relations.

Des mesures d'atténuation sont proposées, telles que les forums réunissant les parties prenantes comme moyen de communiquer avec les communautés, grâce à l'établissement d'une cartographie du plan de crue visant à identifier les zones de risque et au développement de la responsabilité sociale d'entreprise (*Corporate Social Responsibility* - CSR) de la JHEPLC. Certaines activités liées à la CSR existent déjà, par exemple, l'école et l'hôpital ; d'autres activités sont identifiées par le Comité technique, comme l'extension de la pêche, une assistance à d'autres moyens d'existence, une santé publique améliorée et un renforcement de la sensibilisation aux avantages apportés par le barrage.

De plus, une série de programmes de sensibilisation de la communauté est recommandée et les détails d'un mécanisme de règlement des griefs sont fournis.

Les résultats du deuxième forum des parties prenantes sont présentés en Annexe J et un sondage social des 200 communautés dont on estime qu'elles sont affectées par l'un ou l'autre des barrages est proposé dans le cadre de l'ESMP.

Enfin, un mécanisme de règlement des griefs est fourni.

SECTION 4 Plan de gestion de l'environnement

14. Plan de gestion de l'environnement pour Kainji et Jebba

Le plan de gestion de l'environnement pour les mesures d'atténuation suggérées dans les chapitres individuels a été résumé dans le tableau suivant.

Tableau 14.1 Récapitulatif des besoins budgétaires pour l'ESMP

1	Hydrologie – Modélisation hydrologique, relevé bathymétrique, cartographie de la plaine d'inondation, <i>Communication des avertissements de crue</i> , etc.
2	Evaluation de la dégradation du bassin de captage
3	Instrumentation du barrage, Kainji
4	Mise à niveau de l'atelier, Kainji
5	Instrumentation du barrage, Jebba
6	Sécurité du barrage, Jebba
7	Mise à niveau de l'atelier, Jebba

8	Appui à la communauté grâce au NIFFR
9	Programmes de sensibilisation à la santé publique
10	Sondage social
11	Gestion des déchets, Kainji
12	Gestion des déchets, Jebba
13	Santé et sécurité, Kainji
14	Autopompe, Kainji
15	Santé et sécurité, Jebba
16	Etablissement d'un bureau ESU (Kainji et Jebba)
17	Assistance EMS (<i>Environmental Management System</i> – Système de gestion de l'environnement)

15. Plan d'approvisionnement

Le Plan d'approvisionnement pour les mesures d'atténuation de l'ESMP précitées est le suivant:

	Sujet	Zones allouées*	Période d'exécution	Coût approximatif (millions USD)
Contrats de services				
1	Etudes sur l'hydrologie, la gestion des crues, l'évaluation des bassins de captage, la communication des avertissements de crue, la sécurité des barrages et l'instrumentation	CSJK2 + KJ13	24 mois	1.830
2	Sondage social et appui à la communauté, à la fois pour la KHEPLC et la JHEPLC	CSJK12	10 mois	0.185
3	Assistance EMS 14001, à la fois pour la KHEPLC et la JHEPLC	CSJK12	16 mois	0.045
4	Conformité OHSAS et établissement d'un système d'audit, à la fois pour la KHEPLC et la JHEPLC	CSJK12	7 mois	0.050
5	Conception de systèmes et équipements de gestion des déchets, à la fois pour la KHEPLC et la JHEPLC	CSJK12	4 mois	0.050
	Sous-total			2.160
Contrats de fourniture				
1	Instruments hydrologiques et météorologiques	KJR3A +KJR3B		0.550
2	Achat de véhicules pour les ESU, les divisions hydrologiques et les divisions chargées de l'instrumentation des barrages	CSJK12		0.200
3	Matériel de bureau, y compris des ordinateurs, des imprimantes pour les ESU, les divisions hydrologiques et les divisions chargées de l'instrumentation des barrages	CSJK12 +KJ13		0.300
	Sous-total			1.050
	TOTAL			3.210

Note : Une partie de la conception des instruments, de l'appel d'offres et de l'exécution des contrats de fourniture de biens et de travaux devra être entreprise pendant l'exécution du contrat de services n° 1.

* Les numéros font référence aux numéros des lots contractuels approuvés pour le Composant n° 2 au titre du Plan d'approvisionnement WRD-SEM.

TAKAITAWAR GUDANARA

Sashi 1

1. Gabatarwa

Wannan shiri na ESMP an bukace shi a matsayin Hukumar Bunkasa Ruwa ta Niger Basin da rayar da kyakkyawan yanayi na aikin gudanar da halittu dake wurin (WRD – SEM). Wani muhimmin mahadi na kayan aiki na wannan tsari shine gyaran Inji mai bada wutar lantarki da ke kainji (\$ US 115.9 Million, musamman domin gyaran babban injin dake juyawa a ruwa) da kuma injin dake bada wutar lantarki a Jebba (\$ US 11.7 million). A tsakanin wadannan Injina biyu ake samun wutar lantarki a Nigeria kuma suna bada muhimmiyar gudunmawa ga bayar da wutar lantarki.

Nazari da ya gabata

Babu wani a cikin wadannan injina da yake da shirin kulawa ta muhalli da shirin gudanarwa ta zamantakewa. A ESMP da ya gabata ta wurin CIMA (2007) ba'a kawo karshensa ba yayinda EAECL suka yi binciken kudi akan Kainji HEP kuma a 2007. Akwai cikakkiyar shaida cewa abin da aka gano a kowane daya cikin wadannan rahotanni ba'a yi aiki da shi ba.

Abin da rahoton ya kunsu

Nazari yanzu ya bada bita a rabe domin kowane sakamako na aikin dam da kayyadadden sakamakon gini tattare da aiwatarwar WD – SEM. Shirin Gudanar da muhalli gaba daya an tanadinsa tare da bayanai da suka shafi al'amura da suke goyon bayan ko dai ESMP ko kuma aiwatar da WRD – SEM ko kuma duka. Wadannan gabatar da Tsarin Gudanar da muhalli, amfani ma'adanin gawayi, lafiya da kariya, gudanar da tsarin kwashe shara, shirin kula da kwashe shara, tsarin kula da dam, tsarin gudanar da dam, da horaswa ta farko da za'a yi tanadi a karkashin wannan kwangila ta ESMP.

Rahoton yana da sassa hudu. Sashi na 1 sashi ne na gabatarwa gaba daya yana zance a kan al'amura iri daya da suka shafi dam guda biyu. Sashi na 2 yana zance a kan Kainji kuma sashi na 3 Jebba. Sashi na 4 ya tanada hadadden shiri na Gudanar da muhalli.

2. Manufa da siga bisa shari'a

Nazari an yi shi ne a bisa cikakken muhalli na kaffafun ka'idodi na kasashen duniya da na kasa da tsarin dokoki da suka danganci injinan dake bada karfin wutar lantarki da ayyukan da suka danganci haka.

An yi zance game da tsarin tsakiyar duniya Hukumar kula da Dam ta Duniya, ka'idodin Aikin bankin Duniya da tsari na kiyayewa, Hukumar lafiya ta Duniya (WHO), Hukumar kula da muhalli ta hadaddiyar daular Turai (UK) da dukan muhamman tsari na Nigeria da tsarin dokoki na Tarayya da mataki na Jiha.

3. Shirye-shirye na kulawar Hukumar bada wutar lantarki ta kasa (PHCN)

Manyan Injina biyu na bada wutar lantarki ana gudanar da sun e ta wurin kamfanoni biyu dabam-dabam, kamfanonin kula da Injinan bada wutar lantarki dake cikin ruwa na Kainji (KHEPLC) da kamfanin kula da injinan bada wutar lantarki dake cikin ruwa na Jeba (JHEPLC), dukansu biyu sun fito ne a karkashin shugabancin Hukumar bada wutar lantarki ta kasa (PHCN).

Tsari gaba daya na KHEPLC da JHEPLC ana duba su ne musamman tare da duban kulawa da muhalli na yanzu ta wurin sake tsugunarwa a muhalli da Sassa na zamantakewa (ERSUS).

Ana bada shawarar cewa wannan kalma "sake tsugunarwa" a ajiye ta a suna kamar yadda ta zama tsohon yayi kuma tana karfafa jama'ar da abin ya shafa ga al'ada ta neman diyya. Don haka sashin zai zama kawai sassa na muhalli da zamantakewa (ESUS).

Ka'idodi domin kafa Tsari na Gudana da muhalli da ci gaba zuwa ISO 14001 an bada tabbatawa.

SASHI NA 2 KAINJI DAM

4. Tattalin (Kulawa) da Dam

Kainji Dam an bayyana a bisa ga dam da kan sa, barkewar ruwa, kullewa, abubuwan kariya da kafa na'urori, ajiyar kayayyaki da kariyar dam.

An bunkasa tsari biyu; na daya ya zama ka'idodi na farawa gaba daya bisa ga littafin bayanin aiki akan kammalawar gini da na biyu akan kula da lafiyar Dam ana amfani da misali daga kasashen waje a matsayin siga domin bunkasa ka'idodi na kula da lafiya domin kainji dam.

Bitu akan hanyoyi na tsare-tsaren kare ambaliyar ruwa an goyi bayansa tare da aikin kulawa a matsayin hanyar gagawa ta kare ambaliya. Kasawa a kafa na'urori a inda aka gane da kuma a cikin hanyar da za'a koma inda aka ajiye muhimman bayanai. An yi goyon baya domin yin gyara.

Samo Wutar Lantarki

Akan yi tanadi domin bitu akan wutar lantarki tare da duba "ka'idodi." Ana nazarin aiki da adanawa kuma da shawara bitu da ingantawa zuwa dakin Sarrafawa.

Kulawa da Ambaliya

Kula game da iyawar KHEPLC domin magance zarcewa, ambaliya an duba su. Yayinda ka'idodi da ake da su an same su isassu akwai baban aiki na ingantawa hadawa da mai da hankali da kyau ga shiri na asali na ayyukan bayanai da aka adana.

Nazari akan binciken ruwa game da Niger ta kasa an goyi bayansa kuma an amince cewa aiki na kainji dam a sake bitarsa a cikin hasken abin da aka gano a wannan nazari ya kamata a dauke shi.

Ciyawa a ruwa

An tattauna kariya da magance ciyawa a ruwa a nan.

Sadarwar kashedi game da ambaliya

Ana duba kashedin sadarwa game da ambaliya da ake da ita kuma a bada shawarwari na ingantawa musamman ta wurin inganta wuraren ballewar ruwa da kuma aikin tukuru na al'umma su tabbataas da gaggawar aikewa da sako da sauri, yadda ya kamata ga dukan wuraren da abin ya shafa.

5. Tasiri da shawara ta rage hatsari

Dangantakar kasa da ruwa da rarrabuwasu.

Dangantakar kasa da ruwa gada daya a Niger an tattauna tare da bayani da ake da shi a hannu daga wuraren da ake aunawa da kuma bukatar bincike na yanzu na dangantakar kasa da ruwa na gudanar ruwa a cikin hasken bunkasa gudanar rafuffuka. Kuma an yaba da tsarin sadarwa na zamani.

An gane cewa babu wani labari akan matsayin rarrabuwar ruwa da kasa a kogin Kainji duk da cewa akwai wasu labarai marasa tushe da suke cewa mai yiwuwa akwai matsaloli na cikin gida. An bada shawarwari domin rashin isasshen binciken zurfin ruwa da kayan gane iyakar ruwa da kasa.

Zaizayar kasa da Rashin kula a tattara ruwan sama.

Matsin yawan jama'a da kuma bukatar samun itacen girki na haifar da zaizayar kasa a wasu sassa duk da cewa gandun Dajin kainji yana amfani a kare wannan a wasu sassa da suka zo karkashin kulawarsa.

An bada shawara domin amfani da tauraron dan'adam domin gano sassa da sanadin wannan rashin kula.

Ingancin Ruwa

Ayyuka an yanzu an yi su da manufar adana ingancin ruwa an duba su kuma an gano tushen zaizayar kasa. Tasiri dake tasowa daga WRD – Sem kuma an tattauna aiki (Project).

Ka'idodin kulawa, yarda da tsarin dokokin FME da wasu mataakai, ana tattaunasu.

Tsire-Tsire da dabbobi

Babban tasiri da aka tattauna shine game da kifi. Sarrafa kifi yana kara wadannan na haifar da tafki amma a hankali ya ragu amma ya bayyana da girma fiye da yanayi na inda ba'a sami dam ba. A lokaci daya ya kan zama a sami asara ta rarrabuwa.

KLNP ba sa bada wani rahoto na tasiri na irin jinsin Tsire-Tsire da dabbobi.

Lafiyar Al'umma

Rashin lafiya da cututtuka da ake tsammani a al'ummar (Jama'ar) da suke a gefen ruwa da ke faruwa a kewayen yankin sun hada da cutar kanjamau (HIV/AIDS). Akwai kayan inganta lafiyar jama'a da asibiti da KHEPLC ta yi tanadi amma yana bukar a inganta shi kuma akwai bukar motar daukan marasa lafiya.

An kawo shawarwari domin abubuwan kariya a iyalai domin inganta ruwan da ake sha da kuma kula da kwashe shara.

Wuraren al'ada da tarihi

Rasa irin wadannan wurare a lokacin gina dam abin la'akari ne amma ba ya zama baban al'amari ba.

Ayyukan tafiye-tafiye

Tasirin sufuri da tafiye-tafiye an yi la'akari da su a cikin hasken shawarwarin WRD – SEM amma ba'a duba su ko zasu kawo wani tasiri na azo-a-gani.

6. Sarrafa Shara

Daskarariyar shara

Manyan ire-iren shara da an gano su tare da sassa inda ake la'akari da akwai matsaloli. Tasiri a karkashin WRD – SEM an bada jerinsu sun hada da kwashe "tarkace" wanda ke nufin tattara da kunshe shara dake da hatsari.

Shara mai ruwa-ruwa

Tasiri daga shara mai ruwa na a rufe ne yawanci a sashin dake a bisa ingancin ruwa da ake la'akari a akai.

Shawarwari

An kammala cewa akwai dama ta ingantawa akan sarrafa shara. Shirin sarrafa shara da ka'idodin sarrafa shara an yi tanadinsu a matsayin takardun rataye biyu (appendix).

Bugu da kari kamar yadda yawancin ayyukan sarrafa shara suka zama kwangila a karkashin PHCN bishewa da ingantawa yawanci za'a bida su zuwa ga hanyar sarrafa hanyar da yan kwangila zasu yi aiki.

7. Lafiya da Kariya.

Babu alamar akwai matakan lafiya da kariya a wurin, kuma ayyukan da ke a wurin sun raunana tare da rashin tsayayyen shiri ko daidaitaccen ajiyayyen rahoto na gogaggun hanyoyi. Babu gwajin hatsari da aka yi kuma babu hanyoyin shawo kan hatsari da aka sa kuma mun dubi wannan a matsayin babban abin damuwa da ke wakiltar bangare mai muhimmin kasadar kudi ga KHEPLC.

Ban da raunin al'adar lafiya da kariya (HES) babu horaswa game da lafiya da kariya (HES), adana rahotanni, sadarwa na da rauni koda shike an lura da wasu wurare da akwai ayyuka. Hanyar dubawa ta yi rauni. Wani abin da aka lura da shi shine rashin kula game da kariyar wurin aiki da lantarki da wasu wurare rashin shingen kariya da kewayewa.

Yanayin lafiya na bada dalili kadan na neman kulawa kuma an hada da su karkashin lafiyar al'umma a bisa. Sai dai an lura da rashin himma a wurin aiki.

An bada shawara game da tunkarar cikakken canji halaye ta wurin gabatar da tsarin kulawa da lafiya da kariyar wanda zai kai ga daidaito ga mizanin OHSAS 18001 – 2007. An takaita da bayar da cikakkiyar hanya cikin rataya (Appendix).

8. Huldar Al'umma da Tattali

Ana gwada matsalolin al'umma daga fuskar tushen kafa aikin tun shekaru hamsin a baya. An lissafita dukan matsaloli da tattaunawa da nuna aikin HYPPADEC da aka kafa ba da jimawa ba kamar sanadin wahalar da KHEPLC zasu fuskanta idan ba'a lura da al'amuran dake cikin al'ummar ba.

An nuna sakamakon tataunawar masu ruwa da tsaki cikin rataya (Appendix) da hadin kai na hakkin zamantakewa (corporate social responsibilities C.S.R.) Da shike ayyukan CRS na nan a kasa misali makaranta da asibiti, wasu ayyukan na iya hadawa da rage kudin makaranta da asibiti, wasu ayyukan na iya hadawa da rage kudin makaranta ga wadanda ba ma'aikatan KHPLC ba ne, tana da rijiyoyin burtsatse, habaka kafofin samun wutar lantarki na musamman da tanada kayan indaroron ruwa na dabam da habaka kayan sa a wasu bangarori.

Dadin dadawa akwai shirye-shirye na kawo masaniya da aka nuna da dogon bayani game da korafe-korafen da hanyar da za'a bida su.

Akwai gawayar zamantakewa game da a kalla al'umma 200 da Dam din zai shafa da aka shawarta daya daga cikin ESMP.

SASHI NA 3 DAM NA JEBBA

9. Tattalin kulawa da Dam.

Aikin da dam din ke dashi a yanzu.

Ana bayyana Dam din Jebba bisa ga shi kansa dam din, hanyar rage ruwa wurin rufe madatsa, fayafayen (trash-screens) da kayan aiki, ma'ajin rahotanni da kula da lafiyar Dam.

An fito da mata kai guda biyu (ba'a habaka su ba tukuna) na fari shine hanyoyin aiki bisa ga Daftarin Aiki da aka habaka lokacin kammala gina Dam na Kainji na biyu kuma game da kula da lafiyar Dam ana morar misali daga kasashen ketare a matsayin jigon aiki domin habakar matakan kullawa da lafiyar Dam na Jebba.

Nuna damuwa game da kayan aiki, wurin digewa da zanzarewa a gefen hagu na cibiyar kasa ta hanyar rage ruwa da zaizaya daga gefen bangayen hanyar bututun maidowar ambaliya duk an lura da su.

An bada shawara game da sake saka na'urorin gwada karfin tafiyar ruwa (piezometers) an kuma fara tattara zaunannun bayanai yadda za'a gano kafar madatsar da ke gefen hagu na tushen digewa da sansance ayyukan share fage da gudanar da su.

Karin shawarwari game da kayan aiki da kayan tagazawa tare da adana rahoto.

Tanada karfin Wuta

An tanada sabuwar hanyar fitar da karfin wuta da niyyar amfani da hanyar hannu da hannu da HEP na injin Kainji, duk an lura da shi. Aiki na rana-rana na samuwa daga yalwar ruwa, kasancewar inji a yalwace da bukatun layin wayoyin wutar (grid system).

Kulawa da Ambaliya

Kulawa da ambaliya a Jebba yana da dangataka da na Kainji. An bada shawarar ci gaba da amfani da hanyar da ake mora yanzu ta kula da ambaliya da tsayawa kan hanyar tara bayanai.

Bincike game da ruwa (hydrological study) na Niger ta kasa da aka bayar da shawarar game da Dam na Kainji a bisa za'a mora a Jebba a kuma hada da magudanan ruwa da ke haduwa da kogin karkashin Kainji. A sake duba tsare-tsaren ayyuka sakamakon abin da aka samu daga bincike game da ruwa da kaddamar da shi.

Sadarwar gargadi game da Ambaliya

An duba hanyoyin sadarwa game da ambaliya da bada shawarwari domin ingantawa musamman cibiyoyin mahada da aka inganta da karfafawar hannun al'umma domin tabbatar da yadda bayanai cikin hamzari, masu daidai da amfani da zasu dace ga al'ummar da kyau.

10. Shawarta tasiri da hanyar sauskutawa

Binciken ruwa da laka (Hydrology and sedimentation).

Wannan sashi an gama shi daga irin sa na kainji da ke bisa.

Zaizayar kasa da raguwar ingancin gwalalo. An lura tare bada shawarar gano wurare da suka zaizaye daga gabar ruwa sanadin noma da cire shuke-shuke dake wurin. An shawarta shirye-shirye domin kulawa da gwalalo cikin kananan hukumomi.

Nagartar Ruwa

An sake duba yunkuri na baya-bayan nan da nufin kulawa da ingancin ruwa da gano hanyoyi gurbata. An kuma tattaunawa tasirin da aka samu sakamakon cikin WRD – SEM.

Tsire-tsire da Dabbobi

Abin da ya fi tasiri da aka tattauna shine kifi. Bayani na rauni, an karfafa JHEPLC su yi aiki da NIFFR domin habaka aikin kifi zuwa ga mutanen karkara.

Lafiyar Al'umma

Irin cututtukan da ake sa zuciyar samu a wurare da ke gefen koguna na nan a wurin kamar Kanjamau (HIV/AIDS). Akwai kayan kula da lafiya masu nagarta da asibiti da JHEPLC suka tanada da kayan aiki masu nagarta amma za'a iya kara inganta su.

Ana shawara inganta hanyoyin kai dauki a gidaje domin habaka gyara ruwa na al'umma da kuma kula da shara.

Filaye na tarihi da al'adu

Rasa irin wadannan filaye na da dan muhimmanci lokacin aikin ginin dam amma yanzu bai kasance al'amari mai karfi ba.

11. Kulawa da shara

Daskarriyar shara

An gano wurare da ke da shara da kuma ire-iren sharar. An kuma lissafta amfanin da aka samu karkashin WRD – SEM hadi da kawasda “bola” wanda ke nufin tare kaya da aka samu da shara mai hatsari.

Shara ruwa-ruwa.

An duba tasirin shara mai ruwa ruwa cikin bangaren nagartar ruwa da aka duba.

Shawarwari

An yarda cewa matakan kula da shara na JHEPLC sun dace. Za'a iya kara habakawa ta wurin shigo da tsari na kulawa da shara da matakan kula da shara kamar rahotanni dabam da juna guda biyu.

12. Lafiya da kariya

Akwai tsari na lafiya da kariya da Babban manaja ya sa hannu a kai a 2001 wanda ya hada da ayyukan musamman na H&E. Sai dai tsarin ya dade, ba'a sake duba shi ba kwanan nan ba kuma ma'aikata kadan ne suke da masaniya game da su.

Mizanin ya zarce a KHEPLC sai dai ba a kowane wuri ba. Misali babu matakan maida martanin gaggawa kuma babu kasafi domin horaswa na kariya.

Yanayin lafiya babu dalilin damuwa sosai kuma an hada da su karkashin lafiyar al'umma a bisa. Sai dai an lura da kasawa himma cikin muhallin aiki.

Wani abin kulawa shine rashin shinge na kariya da kewayewa.

An shawarta canjin halayen tunkarar al'amura ta wurin gabatar da tasirin kulawa da lafiya da kariya wadda ke jagora zuwa yarda da mizani OHSAS 18001-2007. An takaita dukan matakan wannan da fito da su a rataya (Appendix).

An nanata bukatar bincike H&E da tanada lissafin bukatun na'urorin aiki karkashin aikin.

13. Huldar Al'umma da tattali.

An duba matsaloli ta fuskar tushen kafuwa aiki (project) na shekaru 25 da suka wuce kuma tasirin wannan abin yana nan cikin tunanin al'ummar.

An samu raunin dangantaka na al'umma wanda ya kawo keke injunan karfin wuta na kwanki biyu cikin Agusta 2008. Tun daga lokacin aka kafa kwamiti na al'ummar da ke kurkusa kuma wannan ya inganta dangantaka.

An shawarta ayyukan sassauta radadi, kamar zauren masu rawa da tsaki, a matsayin hanyar sa hannun. Al'umomin, ta wurin taswirar shirin ambaliya domin sansance wurare dake da hatsarin fuskanta sa da kuma habaka hadin kan hakkin zamantakewa (CSR) na JHEPLC. Wasu ayyukan CSR suna kasa misali makaranta, da asibiti; kwamitin fasaha ya gano wasu karin ayyuka kamar yada kiwon kifi zuwa wasu wurare, wasu zabubbukan taimakon rayuwa, habaka lafiyar al'umma da wayar da kai game da amfanin da dam zai kawo.

An nuna sakamakon tattaunawar masu ruwa da tsaki cikin rataya (Appendix) da gewayar zamantakewa na al'ummomi a kalla 200 da dam din zai shafa a matsayin shawara na bangaren ESMP.

Daga bisani an tanada tsarin isar da korafi.

SASHI NA 4: Shiri na kulawa da muhalli.

14. Shiri na kulawa da muhalli domin Kainji da Jebba.

An takaita shiri na kulawa da muhalli da matakan sassautawa da aka shawarta cikin surori a kan tebur dake kasa.

Tebur na 14.1 ESMP Takaitaccen bukatun kasafi

1. Binciken ruwa – samfurin ruwa, gewayar zurfin ruwa
Taswirar sararin ambaliya,
2. Bincika raunanar gwalalo
3. Kayan aikin Dam; Kainji
4. Kara darajar dakin gyare-gyare; Kainji
5. Kayan aikin Dam; Jebba
6. Kariyar dam; Jebba
7. Kara darajar dakin gyare-gyare; Jebba
8. Tallafin al'umma ta wurin NIFFR
9. Shirye-shiryen wayar da kai game da lafiyar al'umma
10. Gewayar zamantakewa
11. Kula da shara; Kainji
12. Kula da shara; Jebba
13. Lafiya da kariya; Kainji
14. Injin wuta, Kainji
15. Lafiya da kariya, Jebba
16. ESU kafa ofishi (Kainji da Jebba)
17. Taikon EMS

15. SHIRIN SAMARWA

Shirin samar da matakan sassautawa na ESMP da ke bisa shine kamar haka:

S/No	Kan Magana	Wuraren da aka sa	Lokacin aikatawa	Kimanin farashi (M US \$)
Kwangilar Aiki				
1.	Nazari na binciken ruwa, kulawa da ambaliya, raunanar gwalalo, Kariyar Dam, da bada kayan aiki	CSJK2 + KJ13	Wata 24	1.830
2.	Gewayar zamantakewa da tallafin al'umma domin KHEPLC da JHEPLC duka	CSJK12	Wata 10	0.185
3.	Taimakon EMS 14001 domin KHEPLC da JHEPLC duka	CSJK 12	Wata 16	0.045
4.	Yarjin OHSAS da kafa sashin bincike kudi domin KHEPLC da JHEPLC duka	CSJK12	Wata 7	0.050
5.	Zaiyana tsarin kula-da shara da na'urori domin KHEPLC da JHEPLC duka	CSJK12	Wata 4	0.050
	Karamar Jimla			2.160
Kwangila samar da kaya				
1.	Na'urorin binciken ruwa da yanayi	KJR 3A +KJR3B		0.550
2.	Sayen motoci domin ESU, bangaren ruwa da kayan aiki na bangaren dam	CSJK12		0.200
3.	Kayan aikin ofis tare da na'urori masu kwakwalwa, buga takardu domin ESU, bangaren ruwa da bangaren kayan aiki na dam	CSJK12 +KJ13		0.300
	Karamar Jimla			1.050
	JIMLA			3.210

LURA: Wasu daga cikin kayan aikin da aka tsara, kawo su da aiki da su da kuma kwangilar aiki na bukatar aiwatarwar aikin kwangila 1

* Lambobi da ke nuna kwangila lambobi da aka amince domin mahadi na 2 a karkashin WRD – SEM shirin samarwa

SECTION 1: FACTORS COMMON TO **BOTH DAMS**

1. INTRODUCTION

1.1 Location and Description of the Existing Power Plants

Kainji and Jebba dams are located across Niger River, which originates from Loma Mountains, at the border between Sierra Leone and Guinea, in the Fouta Djallon Region, the water tower of West Africa. The Niger River basin is 1.5 million km² and is shared by nine countries: Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria and Chad (Fig 1.1).

Kainji dam is located in Borgu LGA of Niger State and Jebba dam is located between Niger and Kwara States (Fig 1.3 and 1.4).

Kainji and Jebba hydropower plants are located on the Niger River in Eastern Nigeria, approximately 100 km apart (Fig 1.2). They have installed hydropower capacity of 760 MW and 578MW respectively.

Kainji powerhouse is equipped with eight turbine-alternator groups including four Kaplan type rated at 80 MW, two turbines also Kaplan type rated at 100 MW and two propeller turbines rated at 120 MW. The available head ranges between 23.8 m and 41.2 m according to the water level in the reservoir. Provision was made for a further four turbines in the dam structure but these were never installed.

The development perimeter comprises the main concrete gravity dam with earth embanked dams on either side of the main and saddle dams, which closes a secondary valley, and two gates. The main dam is 550m long with a maximum height of 64m. It comprises the water intakes, the flood evacuator and the abutments. The powerhouse is located downstream of the dam, on the right bank, and at right angles to the water intakes. The reservoir, which presently forms the Lake Kainji, is 136 km long and has a capacity of c15 billion m³.

Jebba dam is earth and rock-fill and is coupled with several auxiliary dams and infrastructure. The main dam is located to the south and its imperviousness is secured by an upstream blanket. It is followed by a lock and the auxiliary concrete dams 4, 3 and 2. Between these auxiliary dams there is a spillway and the powerhouse with water inlet. The emergency reinforced spillway and auxiliary dam 1 are composed of a dike of the same type as the main dam. A saddle dam, of the same type as the main dam, closes a secondary valley. The normal operating level is 103.0 metres.

The powerhouse is equipped with six turbines and six turbine-alternator groups. Each of the propeller turbines is rated at 96.4 MW for a net head and 102 MW at maximum output. The total nominal power installed is 578 MW.

Fig 1.1 River Niger Basin



Fig 1.2 Kainji and Jebba Lakes

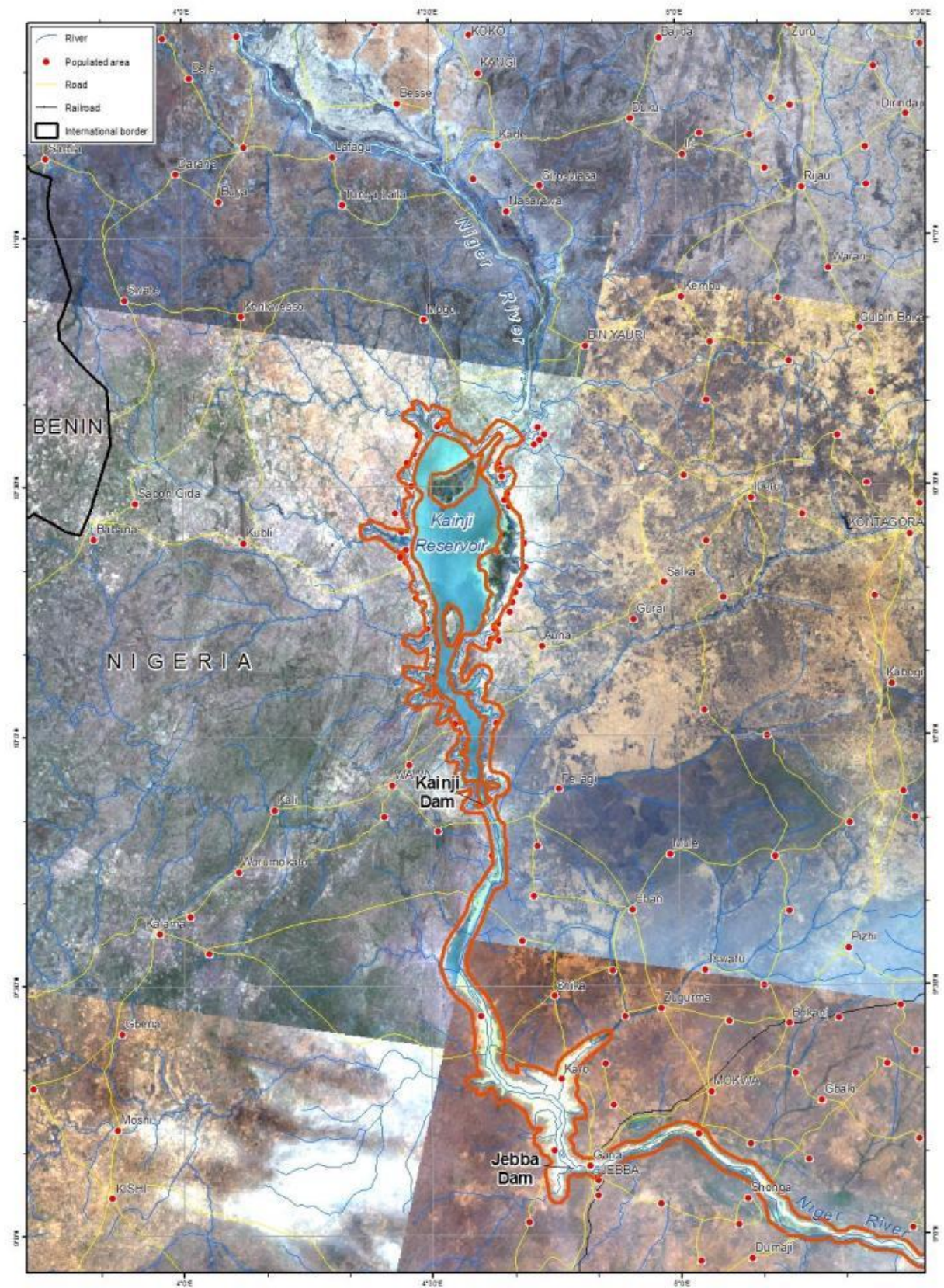


Fig 1.3 Major Administrative Unit Map for the Kanji-Jebba Systems

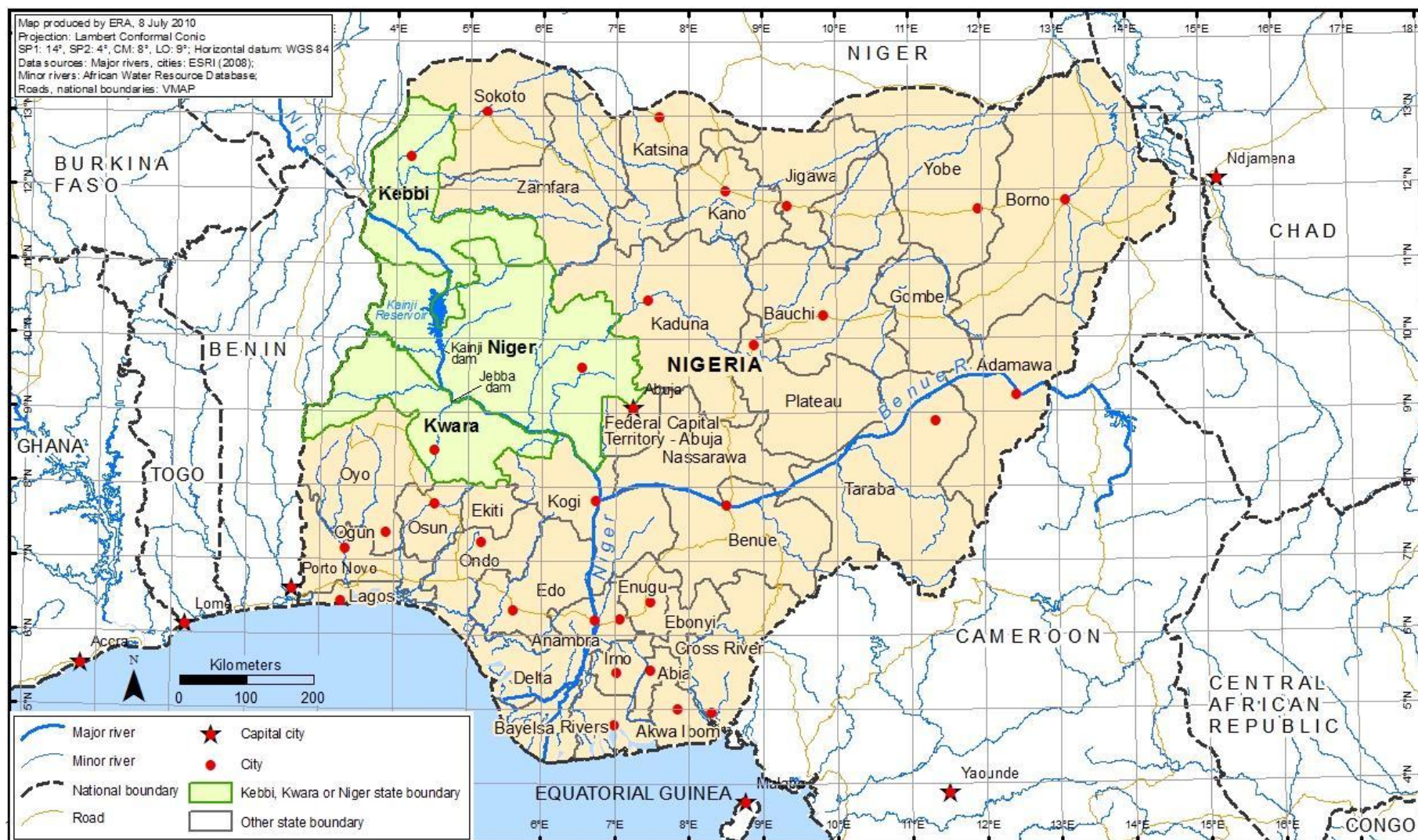
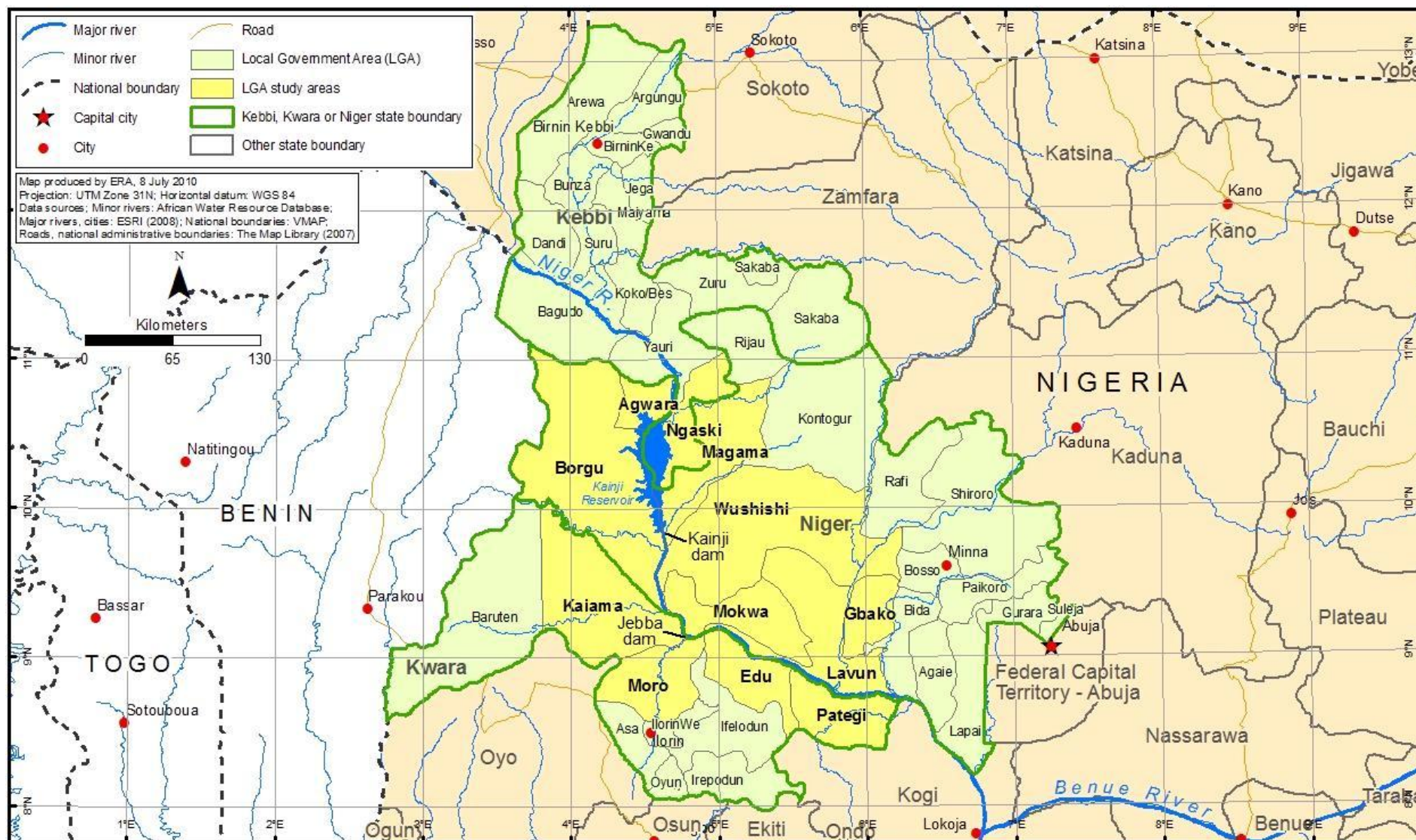


Fig 1.4: Local Government Areas in the Kainji-Jebba Area



1.2 Niger Basin Authority

The Niger River basin is 1.5 million km² and is shared by nine countries (Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Guinea, Mali, Niger, Nigeria and Chad) (Fig 1.1). The population of the basin is about 100 million people, of which around 80% live in Nigeria.

The World Bank identifies the main pressures facing the basin as being:

- Increasing population and vulnerable groups
- Degraded environment
- Unutilised development potential
- Inadequate operation and maintenance of existing water infrastructure
- Competitive unilateral development and the Niger Basin Authority's (NBA's) inefficiencies.

The Niger Basin Authority (1980), successor to the Niger River Commission (1963), was established to foster, promote and co-ordinate studies and programmes relating to the Niger River basin. The Authority is required to promote co-operation among the member countries and to ensure integrated development of its resources, notably in the fields of energy, water resources, agriculture, forestry, exploitation, transport and communication and industry. However until the Heads of the Basin States acknowledged the need for much greater co-operation in 2002 the NBA was unable to implement its mandate.

In 2003, the nine member states of the Niger Basin Authority (NBA) formulated a "clear and shared Vision" for the Niger Basin. The vision is to create an enabling environment for co-operation based on a Sustainable Development Action Plan (SDAP).

The Declaration of Paris on the "principles of management and good governance for sustainable and shared development of the Niger Basin" was signed in April 2004 by the nine Heads of State and Government.

1.3 The WRD-SEM Project

Since 2002 the above and other reforms have made the NBA a more effective basin wide organisation and this has led to the World Bank offering funding for a twelve year Niger Basin Programme. The programme is being executed in two phases and is known overall as the Niger Basin Water Resources Development and Sustainable Ecosystems Management Project (WRD-SEM). Phase I of the project extends for five years and has three components with the largest component (number 2) having three sub-components as follows:

- 1) NBA institutional strengthening and capacity building (US\$ 7.7 million).
- 2) Rehabilitation, optimisation and development of regional infrastructure (US\$ 138.5 million). Sub-components:
 - a. Rehabilitation of Kainji Dam and Hydropower Plant (US\$ 115.9 million).
 - b. Rehabilitation of Jebba Hydropower Dam (US\$ 11.7 million).
 - c. Assessing optimisation and management options for the development of regional water infrastructure (US\$ 10.9 million).
- 3) Sustainable management of selected degraded ecosystems and rehabilitation of small water infrastructure (US\$ 39.8 million).

Sub-component 2.1 comprises:

- i) Rehabilitation and harmonisation of productive electromechanical equipment to restore the available capacity from the current 480 MW up to the total installed capacity of 760 MW.
- ii) Rehabilitation of auxiliary services.
- iii) Rehabilitation of the navigation lock.
- iv) Upgrading instrumentation and monitoring equipment.
- v) Improvement of the flood warning systems and development of a decision support and management system.
- vi) Implementation of the environmental action plan to mitigate potential impact of the rehabilitation of Kainji and Jebba sites.
- vii) Operational support and reinforcement of PHCN and the National Focal Structure in Nigeria.

Subcomponent 2.2 for Jebba Dam comprises

- i) Selected rehabilitation of electro-mechanical equipment to ensure the availability of the entire installed capacity of 578 MW.
- ii) Rehabilitation of auxiliary services.
- iii) Civil works for stabilisation of the tailrace channel and rehabilitation of the upper navigation lock.
- iv) Upgrading of instrumentation and monitoring equipment.
- v) Prevention of tree invasion.
- vi) Reinforcement of the maintenance workshops.

This current study, while primarily focussing on the update of the ESMP (Component 2.1 vi), also addresses issues under Components 2.1 iv, 2.1 v and 2.2 iv.

1.4 Kainji and Jebba Dams' Contribution to Nigeria's Power Supply

Kainji's installed capacity is 760 MW but it currently has a maximum available capacity of 460 MW, owing to the decommissioning in 2000 of Unit 5 and the poor status of Units 6, 9, 10 and 12. Jebba, located 100 km downstream of Kainji, has an installed capacity of 578.4 MW. The turbines at Jebba are reported to be in good working condition.

The combined maximum output of the two plants is currently around 1,000 MW which represents about 10-15% of national demand.

1.5 Previous Environmental Studies

While much of the content of this report has been obtained from field investigations background information has been taken from two principal recent previous studies:

- CIMA International: Report on the Social and Environment Audit of Kainji and Jebba Dams (draft – apparently never finalised). Nov 2006.
- EAECL: Environmental Audit Report for Kainji Hydro-Electric plc. July 2007.

This report is an update of the CIMA and EAECL reports.

1.6 Early Flood Warning System

This report has also dealt extensively with the existing flood warning communication system and proposal under Chapter 4 Dam management. The procurement documents for implementation of the early flood warning system are included in Service Package 1.

1.7 ESMP Study Area

The impact area is taken as extending from the head of Kainji Lake to the confluence of the Niger and Kaduna Rivers at Pategi as stated in the Atkins offer of services. The reason for this is that there are very significant flows joining the Niger from the Kaduna and even more significant flows joining from the Benue at Lokoja. This is discussed further in section 5.1.2.

Once the hydrological model is developed, as proposed under the ESMP (see Chapter 14), it will be possible to determine the nature of downstream impacts, if any, below Pategi and this should be specifically addressed in the work proposed under Service Package 1.

As part of the work on the hydrological model, the nature of any downstream impacts from the Kainji and Jebba rehabilitation will be identified. In addition, the water management of the dam should be adapted (fine-tuned) based on the results of the hydrological model. If any significant downstream impacts are determined, a downstream induced impacts management plan will be prepared. This work will be completed under service package 1 and included in the PHCN procurement plan.

1.8 ESMP Focus and Structure

1.8.1 Report Layout

The focus of this ESMP is principally on operational procedures and considerations since both power plants have been in operation for several decades. However environmental factors related particularly to the installation of the new turbines at Kainji are also considered.

The ESMP is in four sections. This first section (chapters 1-3) covers the introduction, legal and institutional factors common to both dams.

Section 2 provides the ESMP for Kainji in Chapters 4 to 8 covering management of the dam, current impacts and mitigation proposals, waste management, health and safety and community relations and management.

Section 3 provides the ESMP for Jebba in Chapters 9 to 13 in the same format as Section 2 for Kainji. In some parts text from Kainji ESMP is repeated for Jebba.

Section 4 provides the combined summary Environmental Management Plan for both dams.

There are eight appendices (A to M) which apply to both dams. They cover A) Environmental Management Systems (EMS), B) Carbon Financing, C) Health and Safety, D) Waste Management Protocol and Plan, E) Social Survey Rapid Assessment, F) Training Conducted, G) Operation and Maintenance Plan, H) Emergency Preparedness Plan, I) Instrumentation Plan, J) Contractor's EMP, K) Public Consultation August 2010, and L) Terms of Reference for the ESMP Update.

The Dam Safety Protocol and Safety Plans are presented in separate documents each for Kainji and Jebba.

The report layout is presented in Table 1.1.

1.8.2 Protocol Documents

The following protocol documents are presented in the Appendices

1. Occupational Health and Safety Management System (Appendix C)
2. Waste Management Protocol and Plan (Appendix D)
3. Emergency Preparedness Plan (Appendix H)
4. Contractor's Environmental Management Plan (Appendix J) – to be used during the implementation of rehabilitation or maintenance works through contractors
5. Dam Safety Plans for Kainji and Jebba dams are presented as separate documents

Table 1.1 Report Layout

Section 1 Factors Common to Both Dams	
1. Introduction	
2. Policy and Legal Framework	
3. PHCN Institutional Arrangements	
Section 2 Kainji Dam	Section 3 Jebba Dam
4. Managment of the Dam	9. Managment of the Dam
5. Impacts and Mitigation Proposals	10. Impacts and Mitigation Proposals
6. Waste Management	11. Waste Management
7. Health and Safety	12. Health and Safety
8. Community Relations	13. Community Relations
Section 4 Environmental Management Plan for Jebba and Kainji	
14. Environmental Management Plan	
15. Procurement Plan	
References	
Appendices	
A Environmental Management System	
B Carbon Financing	
C Health and Safety	
D Waste Management Protocol	
E Social Survey Rapid Assessment	
F Training Conducted	
G Operation and Maintenance Plan	
H Emergency Preparedness Plan	
I Instrumentation Plan	
J Contractor's EMP	
K Public Consultation - August 2010	
L Terms of Reference for the ESMP Update	

2. POLICY AND LEGAL FRAMEWORK

2.1 International Framework

2.1.1 Equator Principles

The Equator Principles (July 2006) have been adopted by financial institutions to ensure that projects being financed are developed in a manner that is socially responsible and reflect sound environmental management practices.

There are nine principles that mainly apply to new or up-graded works. Principle 1 relates to categorisation. Projects are rated Category A to C with C being projects “with minimal or no social and environmental impacts”. However no guidelines are provided for rating existing projects.

Principle 4 relates to an Action Plan and Management System and is the most relevant Principle for existing facilities. It states that (for Category A and Category B projects) “borrowers will build on, maintain or establish a Social and Environmental Management System that addresses the management of impacts, risks and corrective actions required to comply with applicable host country social and environmental laws and regulations”.

Principle 5 relates to Consultation and Disclosure and calls for affected communities to have access to “free, prior and informed consultation” while Principle 6 states the need to have a grievance mechanism in place.

2.1.2 World Bank and IFC Principles

World Bank and IFC’s approach to the environmental and social impact of dams is set out in a series of operational papers and guidance notes. These are primarily aimed at new investments (and have formed the basis for the Equator Principles mentioned above) but provide important background principles and some specific guidelines notably the IFC’s Environmental, Health and Safety Guidelines for Hazardous Material Management which is contained in their General EHS Guidelines.

Safeguard policies triggered by the overall WRD-SEM project (as identified in the Project Appraisal Document (PAD)) are as follows:

- Environmental Assessment (OP 4.01)
- Natural Habitats (OP 4.04)
- Physical Cultural Resources (OP 4.11)
- Involuntary Resettlement (OP 4.12)
- Forests (OP 4.36)
- Safety of Dams (OP 4.37)
- Projects on International Waterways (OP 7.50)

OP 4.01, OP 4.04, OP 4.37 and OP 7.50 are the main safeguard policies applying to this component of the project.

2.2 Policies and Legislation

2.2.1 International

Important references relating to water quality are as follows:

- Guidelines for safe recreational water environments, World Health Organisation, 2003.
- WHO. Monitoring bathing waters- A practical Guide to the Design and Implementation of Assessments.
- Monitoring Programmes. World Health organisation, 2000.
- General Sampling of the Aquatic Environment (ES 001). UK Environment Agency, 2009.
- Monitoring of Discharges to water and sewer – M18. UK Environment Agency, 2009.

The international conventions considered relevant to waste management include:

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992); Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1998).
- The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh in 2001, and are called the “Marrakesh Accords.” It is an international agreement linked to the UNFCCC. Its three mechanisms are (a) Emissions trading (carbon market), (b) clean development mechanism (CDM) and joint implementation (JI)

Both of these conventions are binding in Nigeria. However, they are relevant to transboundary (international) waste movement and should be adhered to in the unlikely event that such movements should be considered necessary as a means of waste management at the site. The waste management plan and protocols within this report are also expected to adhere to the principles outlined within these conventions.

2.2.2 National

- National Policy on the Environment (FEPA 1999).
- National Guidelines for Environmental Audit in Nigeria (FEPA 1999).
- National Guidelines for Environmental Management System in Nigeria (FEPA 1999).
- Environmental Impact Assessment Decree (Law No 86, 1992).
- National Guidelines and Standards for Water Quality in Nigeria (FME).
- S.1.5 National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (1991).
- S.1.8 National Environmental Protection (Effluent Limitation) Regulations (1991).
- S.1.9 National Environmental Protection (Pollution Abatement in industries and facilities Generating Wastes) Regulations (1991).
- Federal National Parks Decree (No. 36 of August 26 1991).
- Law No. 37 of August 16, 1958: Forestry Act.
- Law No. 25 of June 15, 1976: River Business Development Authority Act.
- Law No. 6 of March 29, 1978 Land Use Act,
- Law No. 46 of June 30, 1979: Kainji Lake National Park Act.

- Law No. 87 of June 5, 1979: River Basins Development Authority Act.
- Law No. 35 of October 1, 1986: River Basins Development Authority Act and
- Decree No. 50 of December 29, 1989: National Resources Conservation Council Decree.

The National Environmental Standards and Regulations Enforcement Agency (NESREA) was founded in 2007 and has since published a series of regulations of which the following are the most relevant:

- National Environmental (Sanitation and Wastes Control) Regulations, 2009
- The National Environmental (Wetlands, River Banks and Lake Shores Protection) Regulations, 2009
- The National Environmental (Watershed, Hilly, Mountainous and Catchment Areas) Regulations, 2009
- Draft Policy, Guidelines and Strategic Plan on e-Waste Management

2.2.3 State Level

The two principal states on the banks of river basin in the vicinity of Kainji and Jebba are Niger and Kwara. The state ministries and their roles are described below. Though some of the roles presented are not directly related to dam operation and the proposed project, KHEPLC and JHEPLC should be aware of them as lack of clarity of roles and misunderstanding between the companies and the communities should be avoided.

Table 2.1: Relevant State Level Ministries and their Roles

Ministries	Role
<u>Niger State</u>	
Commissioner for Water Resources & Rural Development	General rural development and water resources development
Commissioner for Agriculture & Animal Health	Farming, livestock grazing, fishing
Commissioner for Land, Housing & Environment	Land, housing and environment
Commissioner for Local Government, Community Development & Chieftaincy Affairs	Community relationship, LGA,
Commissioner for Health	Health Issues
<u>Kwara State</u>	
Ministry of Agriculture and Natural Resources	Farming, livestock and fishing
Ministry of Works and Transport	Roads (Kwara State Roads Maintenance Agency (KWARMA))and transport
Ministry of Environment and Forestry	Forestry and environment including waste management
Ministry of Rural Development	General rural development including rural electrification (through Rural Electrification Board) and Rural Water Supply and Sanitation Agency (RUWASSA)
Ministry of Local Government and Chieftaincy Affairs	Local Government relationship
Ministry of Housing and Urban Development	Housing issues – surveying and mapping
Ministry of Health	Health
Ministry of Energy	Power supply and energy

2.2.4 Local Government Level

The LGAs involved are as follows:

Kainji Dam

Borgu LGA, Niger State
Wushishi LGA, Niger State
Agwara LGA, Niger State
Ngaski LGA, Kebbi State

Jebba Dam

Mokwa LGA, Niger State
Lavun LGA, Niger State
Gbako LGA, Niger State
Edati LGA, Niger State
Edu LGA, Kwara State
Moro LGA, Kwara State
Patagi LGA, Kwara State

3. PHCN INSTITUTIONAL ARRANGEMENTS

3.1 Kainji Hydroelectric Plc (KHEPLC)

3.1.1 Organisation

The organisation of Kainji Hydroelectric plc (KHEPLC) is shown in Figure 3.1. KHEPLC is headed by a Chief Executive Officer (CEO). The three main divisions and subdivisions of KHEPLC are:

1. **Production;** comprising the following departments:
 - a. Hydrology;
 - b. Generation;
 - c. Fire and Safety; and
 - d. Dam Instrumentation.
2. **Plant Services;** comprising the following departments:
 - a. Civil;
 - b. Mechanical;
 - c. Electrical;
 - d. Workshop;
 - e. Protection, Control and Metering; and
 - f. Technical Services.
3. **Finance and Corporate Services;** comprising the following departments:
 - a. Finance and Accounts;
 - b. Human Resources;
 - c. Legal Section;
 - d. Internal Auditor;
 - e. Procurement, commercial and contract; and
 - f. Performance Management

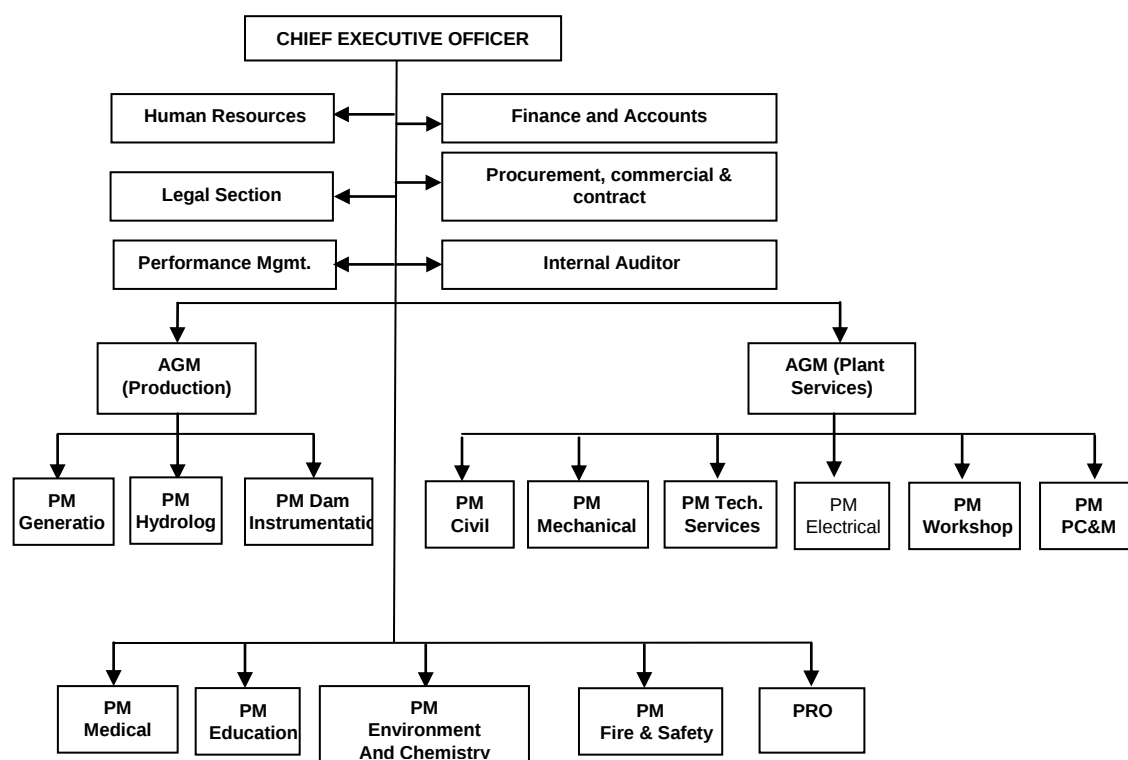
In addition to the main divisions and subdivisions listed above, the following units report directly to the CEO:

- Medical;
- Education;
- Environment and Chemistry;
- Fire and Safety; and
- Public Affairs.

3.1.2 Staff Numbers

Most of these units are headed by a Principal Manager (PM). There are 423 members of staff at KHE as at 25th March 2010. The latest vacancy returns for 2010 also indicate 221 positions to be filled. There has been an embargo on recruitment of staff in recent years. The general opinion is that there are staff shortages in the organisation, especially in the engineering cadre. However, a detailed analysis has not been performed on staffing needs as there are no data on performance history or justifications for the various positions in the organization.

Fig 3.1: KHEPLC Organisation



3.1.3 In-House Training

In-house training courses are organised for staff from time to time. The list of courses and target participants for 2008 is shown in Table 3.1. Data for 2009-2011 were not forthcoming in time to include in this report.

Table 3.1: Training Courses Organised in 2008

Sl.No.	Course Description	Target Staff	Duration	No.
1	Road Safety Course for Drivers	Drivers	NA	24
2	Hydrological & Meteorological Data Requisition, Analysis & Management	Hydrology	NA	2
3	Health, Safety & Environmental Mgmt	Officers	NA	16
4	Computer Appreciation Course	Clerks, Aux Staff below Asst. Mgrs	3-days	29
5	Operation & Maintenance of Hydro-Meteorological Equipt & Data Analysis	Hydrologists	3-days	2
6	Gauge Installation, Maintenance & Data Collection	Officers	3 days	3
7	I.T. for Secretaries	Secretaries/ Officers	3 days	4
8	Pre-Retirement Course	All staff due to retire 3-5 years	5 days	50
9	AIDS Awareness	All staff	2 days	30
10	Management Training	PM and above	3 days	14
11	I.T. for Managers	Managers to PM	3 days	18
12	Effective legal drafting for contract agreements & related issues	Legal department	2 days	2

3.1.4 Data Gaps

In order to carry out comprehensive institutional and training needs analysis full information on staff qualifications, job schedules and prior professional training of individual staff are required. Forms designed for this purpose were delivered to KHEPLC and a request for information on in-house and external courses for staff attended in and out of Nigeria was submitted to Human Resources. However no information has been received for inclusion in this report.

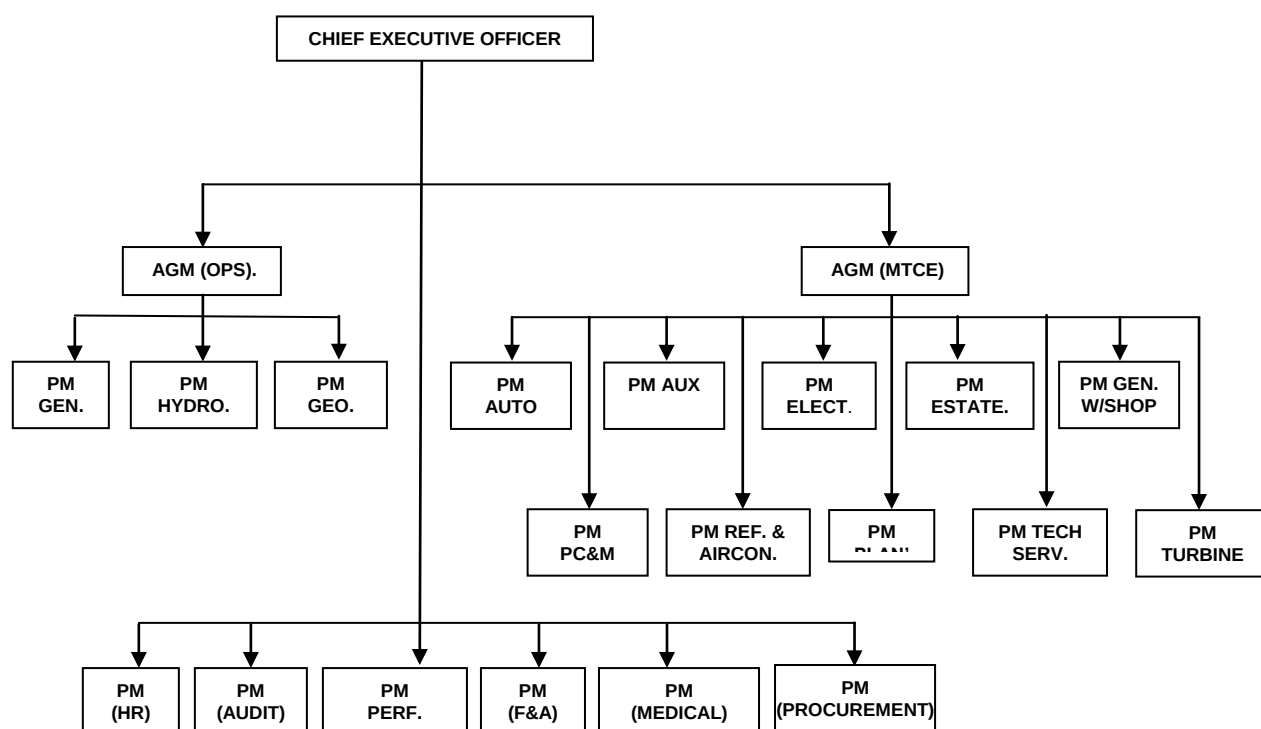
3.2 Jebba Hydroelectric Plc (JHEPLC)

3.2.1 Organisation

JHEPLC organisation is shown in Figure 3.2. JHEPLC is headed by a Chief Executive Officer (CEO). There are two main divisions and several subdivisions as follows:

1. **Production**; comprising the following departments:
 - a. Generation;
 - b. Hydrology; and
 - c. Dam Instrumentation.
2. **Maintenance**; comprising the following departments:
 - a. Automobile;
 - b. Mechanical (recently reorganised into Turbine, Generation Workshop and Auxiliary);
 - c. Technical Services;
 - d. Estate;
 - e. Planning;
 - f. Electrical; and
 - g. Protection, Metering and Control

Fig 3.2: JHEPLC Organisation



In addition to the main divisions and subdivisions highlighted above, the following departmental level subdivisions and units report directly to the CEO:

Subdivisions:

- Human Resources;
- Medical; and
- Finance and Accounts.

Units

- Performance Management;
- Internal Audit;
- Procurement; and
- Public Affairs;

3.2.2 Staffing

The two main divisions are headed by Assistant General Managers (AGM), the subdivisions, departments and units are headed by Principal Managers (PM). There are 415 members of staff at JHE as at the beginning of 2010 and 219 vacant positions for a total of 706 approved positions. There is no further staff breakdown by departments available. However a breakdown by positions is shown in Table 3.2. There has been an embargo on recruitment of staff in recent years. The general opinion is that there are staff shortages in the organisation, especially in the Control Room, Mechanical Departments (Maintenance of Turbines and Workshops, Protection, Control and Metering (PC&M), Dam Instrumentation, Human Resources (Security personnel, drivers and typists) and Hospital (Doctors and Nurses). However, a detailed analysis has not been performed on staffing needs as there are no data on performance history or justifications for the various positions in the organisation. The staff shortages in power generation, transmission and PC&M are deemed as critical to the continued performance of the organization.

Table 3.2 Summary of Staff Distribution by Cadre

Sl.No.	Position	Approved	Appointed	Vacancy
1	CEO	1	1	0
2	AGM Production	1	1	0
3	AGM Plant Services	1	1	0
4	PM	18	12	6
5	SM	36	21	15
6	M	55	30	25
7	AM	63	36	27
8	Officer I	74	37	37
9	Officer II	152	94	58
10	Officer III	139	75	64
11	Officer IV	166	108	58
		706	415	291

Notes: CEO – Chief Executive Officer; AGM- Assistant General Manager; PM- Principal Manager; SM- Senior Manager; M- Manager; AM- Assistant Manager;

The hospital also caters to the community and the delays in attending to patients, most especially staff on duty, is not conducive to effective health care delivery and optimum job performance. It may be necessary to separate the clinics for staff and community.

3.2.3 Data Gaps

In order to carry out comprehensive institutional and training needs analysis the information requested on staff qualifications, job schedules and prior professional training of individual staff should be provided. Forms designed for this purpose has been delivered to JHEPLC. A request for in-house and external courses for staff attendance in and out of Nigeria was submitted to Human Resources. No information has been received to date.

3.3 Institutional Arrangement for Environmental and Social Management

3.3.1 Social and Environmental Audit Reports Observations and Present General Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The absence of a service or department exclusively in charge of management of environmental and social aspects (No. 18 and 44). The absence of skilled staff for management of environmental and social impacts of this type of installation (No. 19 and 45). The top management and staff are not very sensitive to the environmental and social issues. (No. 20 and 46). The lack of continuous monitoring of the real environmental and social impacts relating to the operation of the installations (No. 17 and 43). The environmental and social management plan resulting from the audit 2002 has not been implemented due to lack of financial means and willingness of the top management (No. 23 and 49).	Measure 3.26 and 4.26: To create and make operational an environment division which should be directly answerable to the Assistant General Manager (in case of Jebba it is under the direct supervision of the Assistant Director of Production). This division shall be in charge of the preparation of an action plan for the implementation of the recommendations made in the environmental audits Measure 3.23 and 4.23: To conduct an environmental and social monitoring coupled with the production of an annual report. Measure 3.24 and 4.24: To conduct an environmental and social audit of the installations every 5 year Measure 3.29 and 4.29: To finance the implementation of the short term measures of the environmental and social management plan. Measure 3.30 and 4.30: To organise training sessions on the environmental management of hydro-power installations and the monitoring assessment of environmental and social impacts. Measure 3.31 and 4.31: To conduct specialised training sessions for two high level staff of the firm in environmental management and in safety of hydropower installations.	The Kainji Environmental Audit 2007 suggested • Creation of Health, Safety and Environment (HSE) unit with PM as head. • Establishment of Environmental Management System (EMS). • Establishment of Environmental Monitoring System, and • Adequate staff training Both KHEPCL and JHEPCL have • established ERSU committees and provided basic training on environment and social aspects. • established regular water quality monitoring system. • established Technical committee between KHEPCL/JHEPCL and Community to implement small scale social projects to support the local communities. • conducted Environmental and Social Audits in 2002, 2007 and now 2010 The environmental and social issues and monitoring outcomes are not adequately presented in the annual report. The current situation of ERSU functioning and community relationships is elaborated further in the forthcoming sub-sections with specific mitigation measures.

3.3.2 Environment, Resettlement and Social Units (ERSUs)

The current Environment, Re-settlement and Social Units (ERSUs) at both Kainji and Jebba function as a committee on an ad-hoc basis at both dams. The organisation comprises members who have other primary assignments but have been co-opted into a committee to handle ERSU matters.

Currently the PM (Environment and Chemistry) is the head of the ERSU at KHEPLC and PM (Hydrology) is heading the ERSU at JHEPLC.

The Jebba ERSU formed a technical committee in January 2010 following the two day protest by youths of the close communities in August 2009. Although the Technical Committee is a good starting point to close the gap between the communities and the JHEPLC, the results not fruitful as there is a lack of decision making and follow-up due to the present ERSU set-up.

The ERSU at Jebba has been divided into three sub-units covering (a) dam safety & monitoring, (b) environment and (c) community affairs and communication, whereas in Kainji they work as a single unit.

As such the functioning of the ERSU is not satisfactory as all staff have functions outside the ERSU and there is no clearly identified unit with its own budget. Furthermore the use of the term "Re-settlement" implies that this subject is still an issue some 40 years after Kainji dam was commissioned. Hence we suggested that the 'Resettlement' aspect has to be removed from the title and the ERSU should be renamed as Environmental and Social Unit (ESU). Hereafter we name the ERSU as ESU in this report.

We suggested that an ESU be formed combining the units relating to environment and social aspects. Additionally PM (Medical), PM (Education) and PM (Fire & Safety) should be brought under the newly created ESU which would be given AGM status in order to raise the importance of environmental and social issues.

Fig 3.3 shows the proposed revised organisation at Kainji and Fig 3.4 the revised organisation at Jebba.

The role and function of the ESU is discussed further in Chapter 14, Environmental Management Plan (sub-chapter 14.10). We also suggested an ESU at HQ in Abuja to coordinate the ESUs at the dam sites.

Fig 3.3: Proposed ESU Organisation under KHEPLC

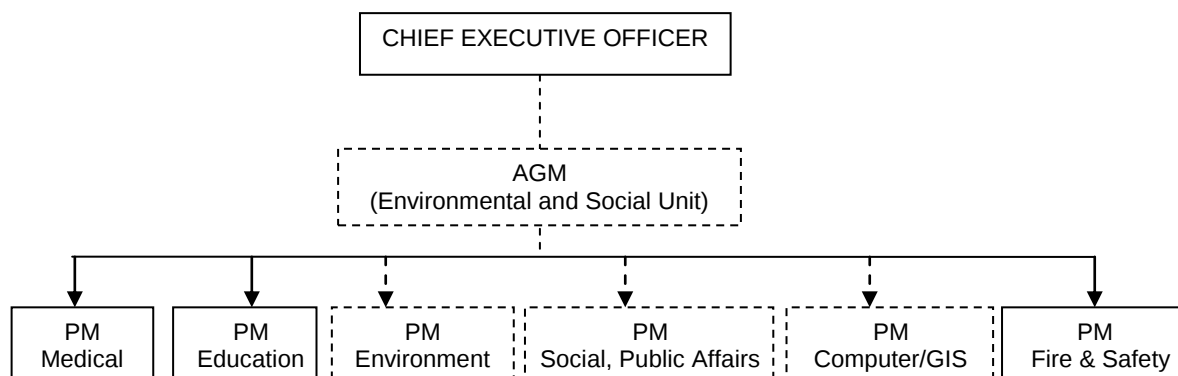
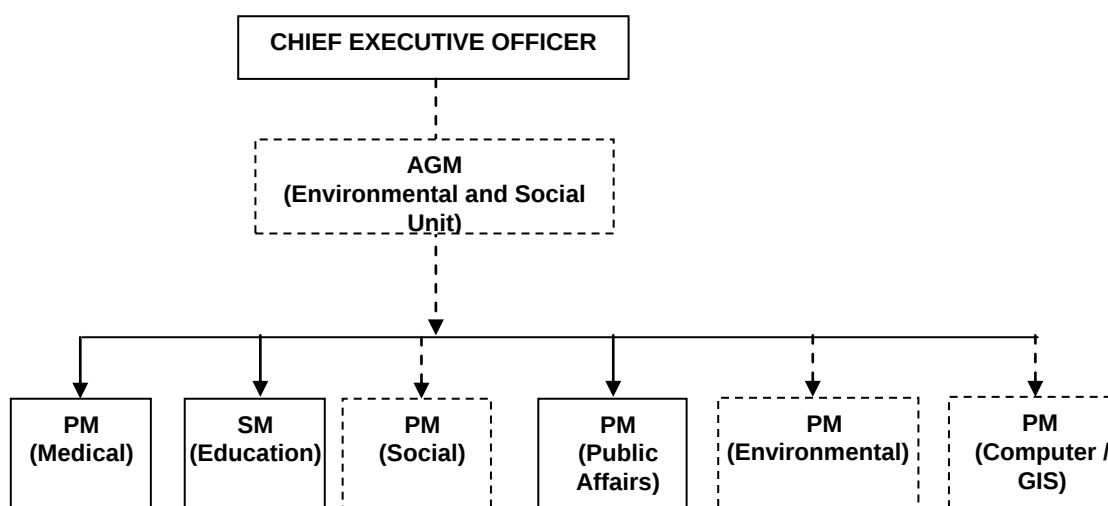


Fig 3.4: Proposed ESU Organisation under JHEPLC



3.4 Environmental Management System

Both KHEPLC and JHEPLC have very little formal control mechanisms in place for moving towards ISO 14001 compliance. Effectively PHCN need to start the process of developing a formal EMS from scratch.

Recommendations are presented in Part 1 of the document that explain how existing arrangements can be modified and new measures put in place to achieve compliance with ISO14001. These recommendations will form the structure of the management workshops planned for September 2010.

- Elements where new documentation and management controls will be required include:
- An environmental policy, establishing the goals and direction of environmental management.

- Environmental Aspects and Impacts Register, with a clear indication of those that are considered to be significant to PHCN for management purposes.
- Environmental performance objectives and targets and management programmes
- Identification and evaluation of legal requirements applicable to aspects and impacts of the facility.
- Environmental organisation and responsibilities, combined with a reliable environmental training programme to ensure that staff are able to fulfil their responsibilities.
- Operational controls in the following areas of environmental impact:
 - Water Use/Conservation
 - Energy Use/Conservation
 - Solid Waste Disposal
 - Liquid Waste Disposal
 - Noise & Vibration
 - Plant Maintenance
 - Ecology
 - Bulk Storage of Fuels and Chemicals
 - Drainage
 - Vehicles
 - Procurement/Suppliers
 - Sub-contractors
 - *Emergencies (spillage, fire, theft, vandalism etc)*
- Internal environmental audit and corrective action programme, together with a formalised environmental management review process.

The attainment of ISO14001 is certainly possible for PHCN, but it must be recognised that it will be a challenging task as the business is starting from scratch. However, with the correct degree of senior management commitment and buy-in (the essential ingredient for success with an EMS programme), there is no reason why this should not be achieved with time. The programme for achieving certification should be set at 24 months, this to allow the organisation sufficient time to understand the necessary requirements and implement the EMS in full once it has been developed.

We have suggested a series of workshops to assist with empowering senior management to develop and implement the EMS successfully to a level that is considered ready for certification.

3.5 Carbon Credit Financing

On the basis of discussions with PHCN and review of available documentation as described in the following chapter, it is the view of the project team that there is no apparent justifiable reason why the project should not gain approval by the CDM Executive Board under the CDM process. This would permit the project to generate Certified Emissions Reductions (CERs) that can be traded on the carbon markets.

We have reviewed the project for its status and the current level of compliance with UNFCCC requirements. We have set out a series of clear recommendations for the management at PHCN which, when completed appropriately and in accordance with UNFCCC requirements, will ensure that the project is able to generate CERs.

Further details are presented in Appendix B.

SECTION 2: KAINJI DAM

4. MANAGEMENT OF THE DAM

4.1 Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The mode for management of the reservoir causes periodical inundations at downstream with risks for material and corporal damages (No. 3). The occupation of lands located at downstream of the drainage for farming and housing requirements, despite the real risk in case of inundation of breach (No. 13). The present method of management of the reservoir is not optimum for it does not take into account the works located at downstream notably the Jebba dam. (No. 14). The procedure for flood evacuation warning which is not adjusted to emergency situations or breach. (No. 15). The lack of continuous monitoring of the real environmental and social impacts relating to the operations of the installations (No. 17). The people are not at all associated with the management on environmental and social risks which should result from the floods and breaking of the dam (No. 22). The auscultation and inspection of dykes and dam is not suitable (No. 24). The emergency works for maintenance and refection of dykes and dams were not done in time, often due to lack of human and material resources (No. 25). The lack of funds to	Measure 3.4: To mark out a safety perimeter downstream the spillway gate where settlement is prohibited. The existing settlements must be relocated Measure 3.5: To install environmental kits with monitoring and equipment. Measure 3.6: To install an alarm mechanism which announces flood discharge or a system to give signal ten kilometres away from the site. To develop an information campaign for the neighbouring and concerned populations Measure 3.8: To conduct urgent maintenance activities on the dykes and dams: control of termites, injection of cracks and vegetation control. Measure 3.9: To replace the auscultation and instrumentation for dykes and dams surveillance by the adequate and authorised equipment, as quickly as possible, so as to secure the stability of the infrastructures and the safety of the populations located downstream. Measure 3.16: To conduct an analysis on the dam safety as well as a study of breach of dam and the assessment of the related consequences downstream. To develop a plan for the management of the reservoir in the event of high flood as well as a manual for the surveillance of the installations. Measure 3.17: To develop an emergency and contingency measure plan in the event of threat of breach. Measures 3.18: To develop a participatory plan for the management of the flood and inundation evacuation downstream. Measure 3.20: To develop a reservoir management plan, using short, mid, long terms forecasting based on the hydrological data of the river Niger upstream and the meteorological forecasting. To be proactive rather than reactive. Measure 3.28: To Create and make operational a joint committee 'enterprise-community' for the management of the	The Environmental Audit 2007 mentioned nothing about the conditions of the dam structures, operations and hydrology None of the measures suggested by CIMA were taken up so far by KHEPCL except the regular maintenance work of the dam against excessive vegetation (measure 3.8). The current situation of the dam structures, hydropower facilities, hydrology and flood management is elaborated further in the forthcoming sub-sections with specific mitigation measures.

undertake the refecton and expansion works, such as addition of 4 missing groups for Kainji (No. 26). And The existing safety measures such as switching off of a piece of equipment for servicing are not documented (No. 27).	environmental and social impacts of the dam and more specifically the flood problems. Measure 3.28: To Create and make operational a joint committee 'enterprise-community' for the management of the environmental and social impacts of the dam and more specifically the flood problems.	
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4.2 Present Operational Condition of Kainji Dam

4.2.1 General Description

Kainji and Jebba Dams operate a conjunctive use of the Niger River to provide Hydro Electric Power (HEP) as well as flood protection and, originally, navigation from the coast to the headwaters of the Kainji reservoir. Kainji dam provides the majority of storage with Jebba HEP operating largely as a run-of-river scheme.

Apart from a single recorded use of the navigation lock at Kainji, soon after its completion, the lock has not been operated and no shipping passes upstream from the coast through Kainji to its headwaters.

Demand from the power plant generally exceeds water availability with plant outage reducing load factors to less than 50% (although unit 8 had a load factor of over 70% in 2008).

Inevitably the low load factors are generally the result of outages other than routine maintenance and the proposed works under the WRD-SEM project are intended to remedy this situation.

4.3 Condition and Maintenance of Structures

4.3.1 Introduction

Kainji Dam comprises the civil dam structure, the gated spillway, the hydroelectric turbine and generators, and a navigation lock, with monitoring and control systems to all these, and M&E appurtenant works as shown in Table 4.2. Fig 4.1 represents all the associated structures to the Kainji dam and power house.

The dam stores and safely releases water to generate hydroelectric power, provide flood protection and, originally, support navigation.

Fig 4.1: Kainji Site Plan

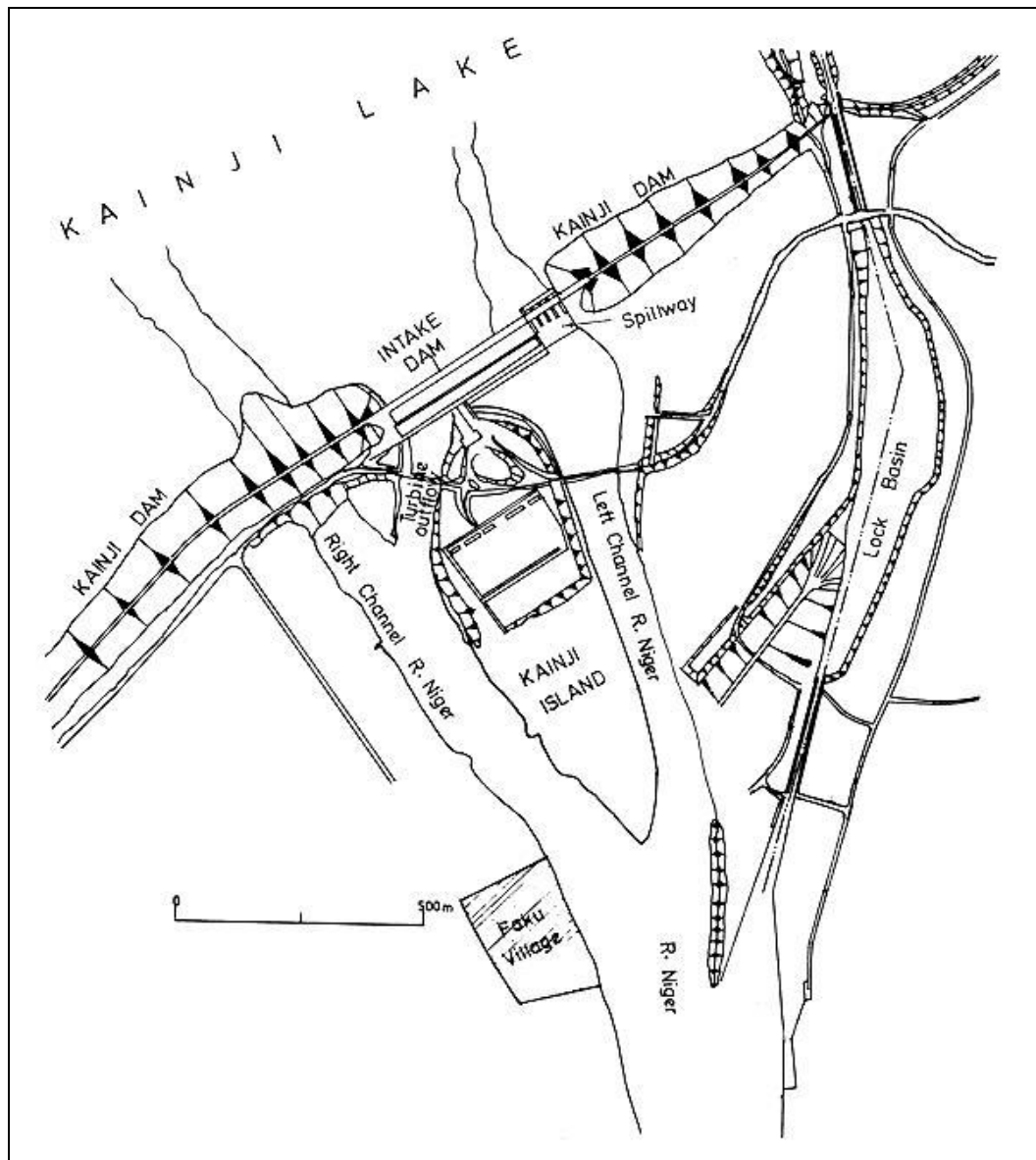


Table 4.2: Kainji HEP Plant Technical Details

Date of Construction	1968								
		Excavation (m³)		Volume (m³)	Volume (m³)				
Dams	Type	Rock	Soft	Concrete	Earthfill	Length (m)	Found-ation el. (m)	Crest el.(m)	Height (m)
Main dam	Concrete gravity	3,400	4,200	610,000		550	79.5	145	65.5
Fill dams	Embankment				6,900,000				
					TOTAL	7,750			
Spillway		Dimensions							
	Type	Length (m)	Height (m)	No.	Capacity (m³/s)				
	Radial gates	15.3	15.3	4	7,900				
Intake Gates		Dimensions							
	Type	Length (m)	Height (m)	No.	Capacity (m³/s)				
	Fixed wheel	10.8	4.88	24					
Penstocks		Dimensions							
	Type	Diameter (m)		No.	Capacity (m³/s)				
	Steel lined	8.55		12					
	Volume (m³)								
Navigation	Concrete								
	134,000								
		Length (m)							
Power House		350							
Generation	Unit No	Penstocks	Unit Power (MW)	Phase	Year	Speed s (rpm)			
	1	1968							
	2	1968							
	3	1968							
	4	1968							
	5	1968	120	3		107.2			
	6	1968	120	3		107.2			
	7	1968	80	1	1968	115			
	8	1968	80	1	1968	115			
	9	1968	80	1	1968	115			
	10	1968	80	1	1968	115			
	11	1968	100	2	1968	115			
	12	1968	100	2	1968	115			
2no Crane capacity combined	200 t								

4.3.2 The Dam

The dam comprises a 550m long central concrete gravity structure housing the penstocks to the turbines immediately downstream with a radial gated spillway to its left and rock-fill dams on each side, and a separate rockfill saddle dam on the left abutment. The total length of this structure is 7,750m.

A navigation lock is located at the left end of the left rockfill dam but this is not operable, which is a serious limitation as it is the nominated emergency spillway. Apart from this limitation the dam is generally in reasonable condition.

4.3.3 The Spillway

The spillway comprises four 15.3m by 15.3m radial gates. These appear to be in reasonable condition although the bottom left corner of the first gate on the left is leaking.

Photo 4.1: Discharge from Kainji Dam Spillway on 6th October 2010



Operation of the spillway radial gates is essential for the dam's safety. Consequently their maintenance is critical.

The spillway gates lock in position on any failure of the operation system. The Operation Manual states that failure was considered unlikely in the early stages of operation and later only if the gates are not maintained properly.

Verbal evidence referred to the radial gates being inspected and re-built in 1998, when one gated failed to operate correctly. It is essential that all spillway gates are included in the regular inspections by independent experts as required by the sample dam safety framework in the Dam Safety Protocol submitted separately to this report. The inspection of each spillway gate should include its operation through the full travel from closed to fully open, when the loss of water is a small cost against the knowledge that it is fit for purpose.

The Operation Manual in Appendix I contains a copy of a Memorandum on Provision of Emergency Discharge Capacity (Ref. Kainji Development - Memorandum on Provision of Emergency Discharge Capacity, August 1966 for Niger Dams Authority by Balfour Beatty & Co. Ltd and NEDECO). The memo notes that an emergency spillway in the saddle dam was initially proposed but was not implemented “after it was found that the locks might provide sufficient emergency spilling capacity”.

4.3.4 The Lock

It is understood that the navigation lock was last operated when passing the last ship on completion of the Kainji Dam, i.e. approximately 1968, and it is not, currently, operable.

Should this structure not be required to be used as a lock it begs the question, why rehabilitate it? It is not normal practice to operate the gates of a lock under full head but equalise pressures by pumping water in or out of the lock, and then open or close the gates. Consequently simply rehabilitating the lock gates will not provide a suitable emergency gate facility. However it is likely that the main lock structure could be relatively easily revised to accommodate alternative gates designed to operate under these full heads.

We recommend that:

- A review of alternative spilling systems within the existing lock structure is carried out and their feasibility evaluated. These spilling systems might be a simple sliding radial gate with emergency upstream stop logs.
- The lock is rehabilitated, or reconstructed to accommodate a recommended alternative spillway arrangement, as soon as possible to provide this emergency spillage capacity in the event of an extreme hydrological event,
- Once rehabilitated, the lock and/or spillway is maintained and demonstrated to be fully operable on an annual basis and at each Dam Safety Inspection.

4.3.5 Powerhouse

The Photos 4.2 and 4.3, taken from the wall of the powerhouse, shows the artistic section of the Kainji powerhouse.

Photo 4.2: Artistic Section of Kainji Power House



Photo 4.3: Continuation of Photo 4.2



4.3.6 Trash Screens

There is reported difficulty with lifting and/or closing intake trash screens and gates. These are included in a maintenance schedule, and would be subject to checks during the required independent expert inspections.

4.3.7 Instrumentation

The sample framework requires that an owner of a dam such as Kainji install, monitor and maintain instrumentation to adequately monitor the performance of the dam. Kainji has satisfactory instrumentation installed but, following the site visit during June 2010; the need for rehabilitation of some of this was identified.

A review by Coyne & Bellier in 1993 recommended the rehabilitation of instrumentation and this was carried out in 1997. However, the success of some of this rehabilitation was short lived and is not operating, or the measuring equipment is not useable. This circumstance would not be acceptable under a legislated sample Dam Safety Framework as, without the results of monitoring instrumentation, it is not possible to identify that there is no change to the condition of that part of the structure. The controlling body under the legislation of the sample framework would be empowered to instruct the owner to remediate these deficiencies, and should these works not be carried out, then have them executed by a third party who would then recover their costs from the owner. Monitoring instrumentation will be rehabilitated under the WRD-SEM.

It cannot be understated that the safety of the dam is paramount to the continuing operation of the HEP, and dam's capability to safely pass an extreme event flood. Dam safety instrumentation and the capability of the dam safety team to carry out their monitoring duties and analyses are essential. The capability of the dam safety team to successfully carry these out requires suitable equipment, transport, offices, computer facilities and workshops to maintain their equipment.

The following deficiencies in the instrumentation and monitoring equipment were noted

Instrumentation

- Inverted plumb line - float and bath, base with marked steel
- Blocked and damaged piezometers downstream of the saddle dam

- Terminal boards for the main dam piezometers
- Totalising weir below the saddle dam

Monitoring equipment

- Plumb Micrometer, base and eyepiece

Support facilities

- Improved office IT equipment
- Workshop with light repair tools
- 4 wheel drive twin cab
- Working lights to all shafts, tunnels and adits.

Photo 4.4: Inverted Plumb Line

(float disconnected with bath visible, and corroded vertical metal measuring bar)



Photo 4.5: Damaged Headworks to Piezometer



Photo 4.6: Terminal Board for Pneumatic Piezometers

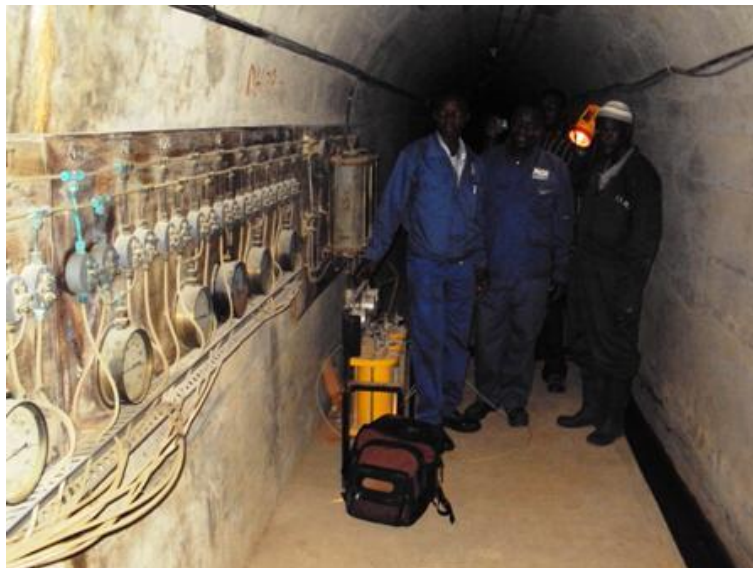


Photo 4.7: Poor Access Road to Totalising Weir



4.3.8 Storage of Documentation

Much of the original design information on Kainji Dam is probably still available but it is not centrally located and not easily to hand. The drawing offices in Kainji contain numerous cabinets of drawings and documents that would be irreplaceable if lost or destroyed. Other useful documents were located in the library of the National Fisheries Institute.

Photo 4.8: Documents thrown in the open near Kainji Data Store House



A particular hazard to these hard copy documents is fire, which is discussed in Chapter 7.

We recommend:

- All documents identified in this report are located,
- These documents are classified and registered,
- These documents are scanned and digital copies stored in more than a single location,
- Digital copies are made available to users as a local digital network and IT Department are developed under the proposed ESU.

4.4 Power Generation

4.4.1 Introduction

KHEPLC is one of the pioneer power generating companies under the control of The Power Holding Company of Nigeria PLC (PHCN). Income is solely from the sale of electrical power generated by each company and the rate earned per unit of power is set by national Government.

Thus the only way for KHELPC to increase the operating and maintenance budget is to increase the amount of power generated and sold. However, a way to reduce the costs of its generation is to improve the load factor of each power generating unit and for KHEPLC as whole.

The amount of power generated is controlled by the quantity of water available, and its head, and also the amount of power the grid will accept at any one time.

4.4.2 Use of Rule Curves

The hydrologic control of power is derived from a set of “Rule Curves”. These are also applicable to flood control and minimum flows downstream of Kainji dam, for the conjunctive use by Jebba HEP that also provides electrical power to the national grid, and for navigation. These form the basis of the Operation Manual in Appendix I under Niger Dams Authority Operation Manuals, 1100 – Hydrology and Reservoir Operation, 23 October 1970, that in turn refers to “Note on Reservoir Operation, February 1967.”

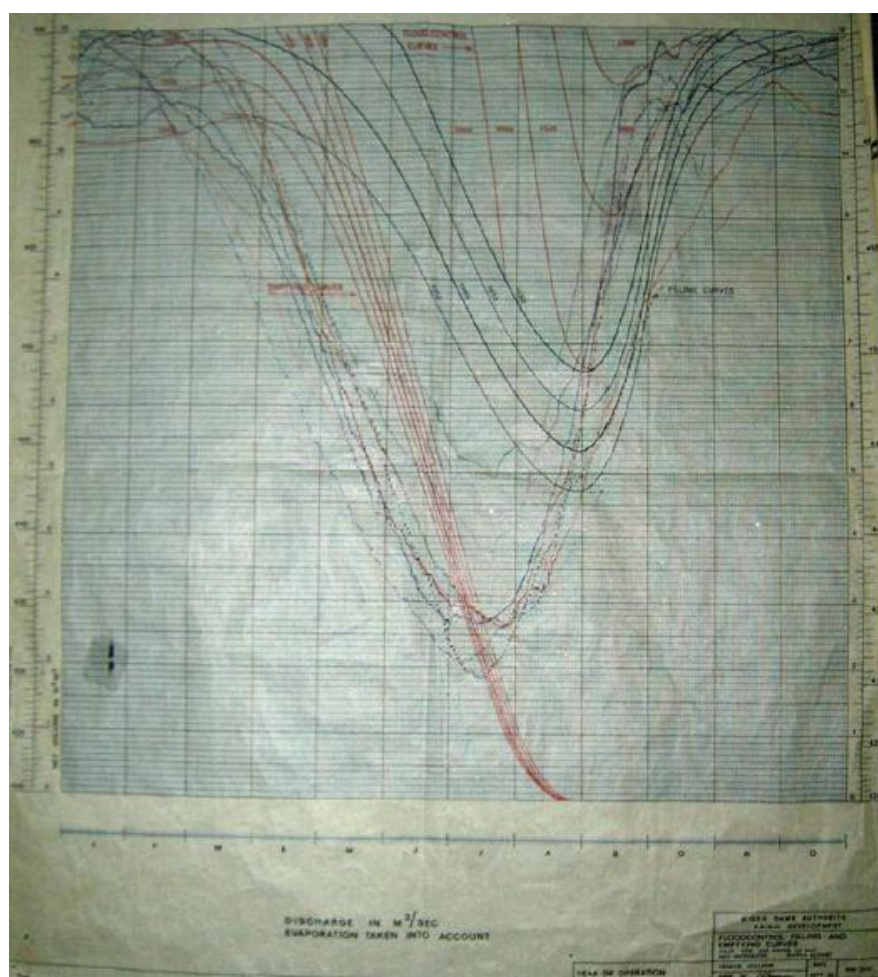
For day to day operation Operation Manual 1100 states that much of the information in the “Note on Reservoir Operation, February 1967.” is not necessary. Rather, the most important information is embodied in the rule-curves shown in chart “Flood Control, Filling and Emptying Curves, No. 606-2432” in the Manual for Kainji Reservoir Operation.

Regrettably this manual was not located during the site visit, but three Filling and Emptying Curves for 283MWh/h (or Less) generation, 660 MW-363 MWh/h generation, and 660 MW-403 MWh/h generation from the “Note on Reservoir Operation, February 1967.” are given in the Operation Manual Appendix I.

Although the use of the rule curve is in evidence, in effect the day to day operation is determined by

- availability of water,
- availability of plant, and
- demand, or grid system capacity, defined by National Control Centre (NCC) at Oshogbo.

Photo 4.9: Kainji Reservoir Rule Curve



4.4.3 Power Generation

A summary of recorded power generation at Kainji in 2006 to 2008 is provided in the Table 4.3 below, derived from the 2008 annual report.

Table 4.3: Kainji HEP Power Generation 2006, 2007 & 2008 (MWh)

	2006	2007	2008
JAN	278086	226974	288577
FEB	224865	186810	275747
MAR	248107	299805	286227
APR	231246	299348	254223
MAY	174846	248057	187202
JUN	137481	120051	117863
JUL	135438	86015.3	91069
AUG	108225	168660	141135
SEP	146876	247023	226982
OCT	226036	305307	253227
NOV	211417	296300	288952
DEC	244090	332399	284019
TOTAL	2366416	2816749	2695223

The installed capacity at Kainji HEP is nominally as shown in Table 4.4 below. Recent records indicate that the generation over the period 2006 to 2008 has remained relatively consistent, but that the generation for each unit at the Kainji HEP is low, with the highest Load Factor being 73% for unit 8 and below 50% for Units 10 to 12. Unit 5 has been out for several years.

Table 4.4: Kainji HEP Nominal Installed Capacity (MW)

Unit No.	1	2	3	4	5	6	7	8	9	10	11	12
Nominal Capacity (MW)	-	-	-	-	120	120	80	80	80	80	100	100
Nominal power (MWh)					876000	876000	700800	700800	700800	700800	1051200	1051200
Generation in 2008					0	558993	8047	508915	411463	304339	515810	387456
Load Factor					0%	64%	1%	73%	59%	43%	49%	37%

Inevitably the low load factors are the result of outages other than routine maintenance and the proposed works under the WRD-SEM Project are intended to remedy this situation.

The staff of KHEPLC are to be commended for retaining capacity at this plant but there is room for improvement, apart from the major rehabilitation proposed under the WRD-SEM project.

4.4.4 Operation and Maintenance

Following the rehabilitation of the plant, this must be fully maintained as defined under the Operation and Maintenance Manuals. We have recommended that all manuals are located, registered and digitised. These provide the basis for all O&M.

However, several matters might be addressed that would be expected to have a positive impact on the generated output.

Whilst accepting that the plant is over 50 years old, general cleanliness and tidiness of the plant and offices might be improved. Cleanliness is generally a matter of implementation rather than equipment and materials and can be easily demonstrated by “before and after” photographs.

Minor maintenance might correct a Health and Safety hazard that was noted, that of open power points such as light switches and plugs, and particularly the absence of light in shafts, tunnel and adits.

4.4.5 Workshop Requirements

The major maintenance requirement is the provision of workshop facilities and equipment for correctly trained staff. We recommend that the main heavy mechanical workshop is rehabilitated with:

- the oil and grease engrained flooring being removed and replaced with a suitable workshop floor material
- facility to collect and drain liquid waste
- aged plant is replaced including
 - a new digital heavy lathe
 - a new digital heavy drill press
 - additional tool-boxes with tools and new replacement tools

Photo 4.10: Kainji HP Plant Workshop Area



4.11: Lathe in the Workshop



Photo 4.12: Power Drill in the Workshop



The light mechanical workshop is suitable but contains minimal equipment. This should be remedied to support the achievements to date by this team.

Photo 4.13: Workshop Floor



Photo 4.14: Storage of Equipment



Photo 4.15: Storage of Instruments and Office Working Area



It is understood a list of this equipment has been collated by the electrical maintenance staff. An electrical workshop also requires additional equipment and this has been listed by the staff.

Equally important is the requirement to maintain all monitoring and control equipment, which is under the KHEPLC maintenance department. This unit maintains all monitoring and alarm equipment in the control room. Recent experience demonstrated their capability when identifying a sensor within windings was at fault rather than the alarm dial, or the windings themselves.

We recommend that improved office and workshop facilities are provided for this team. We also recommend that the invaluable manuals within these offices are identified and registered before being digitised.

We understand that the KHEPLC maintenance staff have identified additional equipment which may be included under the WRD-SEM Project.

4.4.6 Control Room

The control room of the power plant is in good condition. However, it is based largely on analogue data transfer and readout. Some digitisation has been introduced but this has not always been successful. A new digital operator station of unit 11 was provided in 2002 following its reconditioning but the station has not been operating under “remote auto” in the control room since 2006 necessitating unit 11 being operated at the unit under “local remote”.

The capability of KHEPLC maintenance, both staff and facilities, could be upgraded to enable them to remedy this. Particularly since additional digitisation is inevitable as units are upgraded.

The control room houses an old Siemens type “Sequence of Event Recorder”, which has not operated for many years. We consider the KHEPLC, combining its strategic importance with its age, warrants this facility and we recommend its replacement under the WRD-SEM project.

Photo 4.16: Old Siemens Sequence of Event Recorder



4.5 Flood Management

4.5.1 Management of an Extreme Flood Event

There is concern that Kainji dam is not prepared for an extreme hydrological event such as a flood of 10,000m³/s for the following reasons:

- An emergency spillway was excluded from construction on the expectation that the navigation lock could be opened in the event of such a flood however the navigation lock is not operable.
- It is not apparent that a filling and emptying curve is being used as a “Flood Rule Curve”.
- There have been recent instances of mechanical failure of opening or closing gates and screens.

Hydrological prediction of floods is reliant on the collection of data from the data bank of Niger River gauging station data held in Bamako, the capital of Mali. This is collected by staff from Kainji in September/October for use in predicting the Black Floods at Kainji in January and the White Floods peaks in September. The Black Flood is a term that refers to flow generated in the upper reaches of the Niger from which much of the suspended load has already been shed much further upstream. The White Flood refers to sediment rich flows generated by runoff from the catchment immediately upstream from Kainji.

4.5.2 Recommendations

Existing operation and maintenance procedures should be maintained but other procedures are implemented following implementation of recommendations for a hydrological study of the Niger River that includes a flood study, and procedures for improving transfer of data from gauging stations upstream of Kainji dam.

Use of the Flood Rule Curve is described in the Operation Manual in Appendix I. We recommend that this curve is used in a simulation exercise to ensure that staff are familiar with the procedure.

Following implementation of the recommendations for improvements in hydrological management, we recommend that the Flood Rule Curves are upgraded.

4.6 Water Weed

4.6.1 Impact

Water Hyacinth (*Eichhornia crassipes* (Martius)) first appeared in 1989 and by 1995, it covered 23% of the lake surface area (Aveni et.al., 1995). The impacts of water hyacinth are as a hindrance to boat traffic, it harbours snakes, blocks beaches, dislodges set nets, kills livestock, kills the Niger grass on which livestock feeds and reduces fish breeding grounds. NIFFR launched a project 'the Nigerian-German Kainji Lake Fisheries Promotion Project (NG-KLFPP) in 1996 and undertook research on various methods to control water hyacinth. The control measures include, construction of a barrier at the entry point of the Niger into Kainji Lake (proved to be more effective as more hyacinth started to come with the black flood), biological control measures using weevils (*Neochetina Bruchi* (Hustache) and *Neochetina Eichhorniae* (Warner)), mechanical removal of weeds using boats and natural control during drawdowns (drying and burning) at low water levels. Mechanical removal is found to be the best among these methods.

4.6.2 Mitigation

KHEPLC should take part and support NIFFR to continuously monitor water hyacinth and to undertake control measures. It will be necessary for KHEPLC to incorporate a provision for this activity in their annual operating budget.

4.7 Flood Warning Communications

4.7.1 Current System

The existing communication system for Kainji dam is shown in Fig 4.2. There was indication during the field visit that upstream communities may not receive flood warning messages.

Fig 4.2: Existing Flood Warning Communication System at Kainji



The current system is satisfactory as an early warning system but is not suitable for emergency announcements.

4.7.2 Mitigation Measures

Flood warning messages should be extended to all upstream communities.

The flood warnings may be issued using a set of easily recognisable codes. The warnings should be communicated to the concerned at appropriate time (well in advance) and in a realistic manner.

The important issues while developing flood warning communication system are

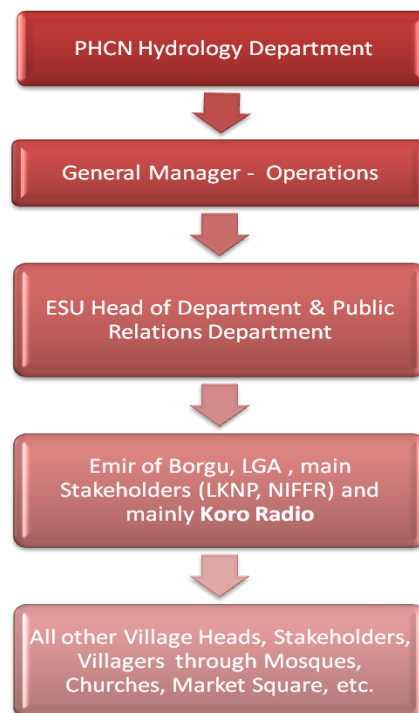
- Range of communication messages and techniques should be employed (eg. Flood warning codes, flags, communication sirens, use of floodlines, etc.)
- More effective public participation should help build trust and better understanding between the public, community networks and the officials.
- The public cannot be treated as one target group as in reality they are made up of many different groups with different perceptions. For example, the public can be categorised as follows
 - Experienced regular flooders – people who are living on the fringes of the flood plain and having knowledge of flood management. These people must be involved in the flood management. They should be provided with enough communication systems (eg. Floodline) to provide information and to ensure that they are taking enough steps to avoid damages.
 - People with lack of understanding – those who have not been flooded but living in the danger zone have received information and do not understand the risk
 - Information deficit – People who are not receiving the information and also those who moves into flooding areas
 - Communication deficit – People who are difficult to reach. This may also include those whose physical or mental impairments require more resources to ensure that the message reaches them.

- Not at risk – People who will not be flooded but they need general awareness on flood.
- Third parties - A wide range of trades, institutes and professions, who are all involved with properties in the floodplain.

Identification of target groups & partners in flood management and development of flood warning codes & communication system are included in the service contract package 1.

Figure 4.3 proposes an improved flow of communication from KHEPLC Hydrology Department to villagers.

Fig 4.3: Recommended Flood Warning Communication System at Kainji Dam



In order to enhance the proposed communication system and to directly communicate with the communities, a toll free lines or emergency call centres should be introduced. At the same time, to develop a fully interactive system between the dam and the riverside communities, the communication equipment options explored during field investigation were follows.

- Satellite telephony (Thuraya)
- Provision of radio booster station
- Provision of television broadcasting facility (NTA)
- Regular radio and television programs to be conducted on flood forecast and water level situation report.
- Short Wave Radio facility

The most workable of the options explored is as follows:

- Provision and enhancement of radio booster station – MOD. 10B HARRIS upgrade from 2.5 kHz to 6 kHz. This would cover 150km radius, while the existing coverage is only 20 km radius.

- Regular radio and television programs to be conducted on flood forecast and water level situation report.

This approach is recommended because many more people in the rural areas would find a portable radio set affordable, accessible and would require no maintenance from KHEPLC. KHEPLC should inculcate in the public the habit of listening to water level, discharges and flood flow reports on a daily basis. The cost of broadcasting a five minute programme on Koro Radio is N 10,000 per day. The daily broadcast should feature the following:

- Water levels (upstream & downstream).
- Forecast of flood threat and its timing.
- Recommended steps to be taken in flood prone areas.
- Reasons for any reported anomalies given in layman's language.
- Use of English and local languages (Nupe).
- Aired at prime time as much as possible.
- Publicise KHEPLC's corporate social responsibility projects and other notable achievements.
- Publicise the benefits of the dam and its activities.
- Address any other issue relating to the activities of the dam.
- Programme to be interesting to listeners.
- Clear statement of KHEPLC's commitment to the environmental and social responsibilities.

On preparation of flood plain mapping, the management of KHEPLC should work with the local communities to create a safe emergency assembly point. This point should be well publicised, villagers should be adequately sensitised to this effect and drills conducted. The safe assembly point should be selected bearing in mind the following features:

- Located on high points and easily accessible.
- To be completely away from the flood plain (to be determined by proposed mapping)
- Equipped with dedicated standby passenger canoes/boats, where necessary (depending on frequency of floods, accessibility of rescue aids, proximity to rescue aid, etc.).
- Conform to conventional safety standards.

5. IMPACTS AND MITIGATION PROPOSALS

5.1 Hydrology and Sedimentation

5.1.1 Hydrology

An August 1966 Memorandum on Provision of Emergency Discharge Capacity for Niger Dams Authority, Kainji Development by Balfour Beatty and NEDECO (see Appendix I) advises that comprehensive details on the hydrology are available in Niger Dams Project Report, Part 2 “Hydrology and Reservoir Operation”, dated April 1961.

The memo notes that six years of reliable records from 1954 to 1959 of Niger River flows at Jebba provided the basis for the hydrological analyses of the Kainji HEP project; this is very limited data set for such analysis.

The Kainji Dam Operations Manual 1100: Hydrology and Reservoir Operation, dated 20th July 1970 (See Appendix I) also refers to the Niger Dams Project Report, Part 2 “Hydrology and Reservoir Operation” but draws attention to the most useful information needed to influence regulation policies being inflows measured at Kowara. Regrettably this information was only available monthly at that time. The difficulty in obtaining such information on a daily basis continues.

Kowara Water Level Gauging station is upstream of Yelwa at the headwaters of Kainji reservoir on the Niger River.

Other water level gauging stations were constructed on the Niger River at the same time and these now provide information to the Niger Basin Authority through National co-ordinators under the Niger-HYCOS Project. The most important for Kainji HEP operation is Jidere Bode gauging station at the headwaters of the Kainji reservoir.

The hydrology of the Niger River has two distinct high flow periods:

- The White Flood increasing from August and peaking at the end of September between 2000 and 5000 m³/s, and
- The Black Flood beginning in December and peaking in late February that seldom exceeds 2000 m³/s.

The White Flood originates closer to Kainji whilst the Black Flood originates above the inland delta of Mali where it loses a large proportion of flow to evaporation and infiltration and also loses much of its silt load.

The highest flood experienced at Kainji since its construction occurred in the 1967/68 season and was attributed to the Black Flood with the peak flood of 9340m³/s on 12th October 1967 at Koulikoro Gauging Station on the Niger River. This is close to the highest estimated flow at this station of 9670m³/s in the same month of 1925.

However, there is a long period of approximately three months between the development of large flows of the Black Floods at the headwaters of the inland delta in Mali and the peak arriving at Kainji, which offers the opportunity of flood warning in the event of extreme events. To make best use of this opportunity two criteria need to be satisfied:

- Data from the international level gauging stations must be made available at regular and short intervals, and
- An up to date hydrological assessment of the River Niger for the Black Flood and contributors to the White Flood should be made available that includes a Flood Study of extreme events.

Such an updated hydrological assessment is essential if the detailed system operation studies of the integrated operation of Kainji and Jebba HEPs that were recommended in the 15 February 1977 Feasibility Report for Jebba Hydroelectric Development, are to be carried out. (Ref. Feasibility Report for Jebba Hydroelectric Development for National Electric Power Authority, 15 February 1977 by Montreal Engineering, Page A21 Vol. II - Appendix A "Hydrology and Generation Potential").

It is possible that this has been carried out when studying the feasibility of the proposed dams for HEP and irrigation water supply on the Niger River in countries upstream of Kainji but these are not to hand.

The impact of any upstream storage on the Niger River is likely to impact the operation of Kainji and Jebba plants; particularly should water be abstracted for irrigation.

Currently the passage of data from gauging stations in Mali requires the physical collection of hard copy which involves a flight by KHEPLC staff. This collection is timed to enable its use to predict the Black Flood, i.e. some 2 months in advance of its passage into Kainji reservoir, and usually during the month of September/October with floods reaching Kainji between December and March.

5.1.2 Downstream Hydrological Impacts

At Onitsha nearly two thirds of the Niger's flow has been generated from within Nigeria below Jebba, mainly from the Benue but also from the River Kaduna where it joins the main river at Pategi. Flows from the main river, through the Kainji-Jebba system, form a small proportion of total flow and thus present a relatively low impact on downstream flooding. The effect is reduced further because the upstream flooding is part of the "black" flood which has a lower discharge than the "white" flood (see above).

The World Bank has ranked flooding as needing moderate to high priority attention in the Niger Delta¹. Also, the Nigerian Environmental Study/Action Team (NEST, 2004), reported that sea-level rise and repeated ocean surges will not only worsen the problems of coastal erosion that are already a menace in the Niger Delta, the associated inundation will increase problems of floods, intrusion of sea-water into fresh water sources and ecosystems destroying such stabilizing system as mangrove, and affecting agriculture, fisheries and general livelihoods².

The proposed hydrological modelling and analysis can be used to further reduce the extent (if any) of the downstream impact of the "black" flood by careful regulation of the levels in Kainji Lake. Indeed this is a principle objective of the modelling.

¹ E. Uyigue and M. Agho 2007, Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria, Community Research and Development Centre (CERDC) Nigeria.

² Nigerian Environmental Study/Action Team (2004), 'Executive Summary of five multi-sector surveys on Nigeria's vulnerability and adaptation to climate change, Canada-Nigeria Climate Change Capacity Development Project, ISBN 0-9736371-4-5.

5.1.3 Hydrology Recommendations

We recommend that an updated hydrological study of the Niger River be carried out to assess:

- Extreme event floods
- Optimising integrated operation of all existing schemes
- The impact of proposed additional schemes on the integrated operation of Kainji and Jebba plants.
- The current procedure for transfer of data from NBA stations is continued to ensure there is no disruption to a procedure that, whilst not being efficient, does result in a known predictive process, but also
- To implement a procedure of measuring and transferring the data from gauging stations by telemetry. This transference should be of both stored data on a regular weekly of monthly basis, as well as “live”.
- The results of the hydrological study will be used to fine-tune/adapt the water management of the Kainji and Jebba dams to help mitigate any downstream impacts. In addition, if any significant downstream impacts are determined, a downstream induced impacts management plan will be prepared under service package 1.

5.1.4 Sedimentation

The April 1961 Report on the Niger Dams Project Vol. 1 Part 1 “General” refers to regular measuring of the silt content of the Niger River indicating it was carrying little silt. It estimates the annual silt transport of the whole catchment to be 6×10^6 m³/annum, and taking 1500 years to halve the live storage of the Kainji Reservoir. (Ref. Report on the Niger Dams Project for Electricity Corporation of Nigeria, April 1961 by NEDECO and Balfour Beatty & Co Ltd, Page A-17).

In contrast, The February 1977 Feasibility Report for Jebba Hydroelectric Development notes a significant increase in sediment load in the Niger River at Jebba during September of the sample year 1976. It attributes this to large wash-loads at the beginning of the rainy season as deposits of fine dust laid down under Harmattan conditions, along with desiccated surface soils, are washed into the streams.

A continuing sediment sampling programme is recommended in the report to confirm this, but we understand this has not been carried out.

5.1.5 Recommendations

Notwithstanding the confidence of the limited sediment load in the Niger River in Kainji’s early report, it is likely that the run-off characteristics have altered over the 50 intervening years and we consider two matters should be addressed:

- Bathymetric surveys are carried out in the headwaters of Kainji Reservoir and main tributaries to Jebba reservoir.
- Sediment load sampling is implemented in the Niger River at Jidere Bode Gauging station and the main tributaries to Kainji reservoir below this station and into the Jebba reservoir.

5.2 Soil Erosion and Catchment Degradation

5.2.1 Impacts

Catchment degradation has not been reported by any stakeholders and even Kainji Lake National Park (KLNP) mentioned that their forest area is intact due to the support from local communities and constant vigilance over the illegal tree felling. USAID report on 'Nigeria Biodiversity and Tropical Forestry Assessment' assessed the following major threats to the Kainji Lake National Park, which also explains the degradation status of immediate catchment.

- Deforestation of savannah woodland areas
- Uncontrolled grazing of livestock
- Uncontrolled fires

It is also evident that the villagers use firewood obtained from the land other than the protected areas thus increasing the erosion risk. Another problem is cultivation of the periphery of the lake, sometimes even on the flood plain (eg. Monnai village), which increases the chances of erosion.

5.2.2 Mitigation

Catchment degradation, especially on the catchments of the tributaries, should be measured using satellite imagery taken from two different dates, a decade or two apart. Based on the catchment degradation assessment, the locations of erosion risk areas can be identified. A catchment management programme can be developed for the risk prone areas with external sources of funding. This programme can be managed through LGAs rather than by KHEPLC themselves.

5.3 Water Quality

5.3.1 Introduction

At Kainji the power plant takes water from the river to drive the turbines and discharges turbined water directly into the river without any form of water treatment. While water for driving the turbines creates very little potential for contamination a number of processes occur within the plant and the associated offices that may introduce both chemical and biological agents into the waters. Activities include:

- Transport, use and storage of chemical agents used for electricity generation:
 - transformer oils;
 - lubricants;
 - electrolyte fluids for battery maintenance;
 - degreasers;
 - substances present in fire fighting equipment, in the event of release;
 - fumigants and pesticides; and
 - detergents and other cleaning agents.
- Substances used in the water treatment facility, including:
 - Aluminium sulphate; and
 - Sodium hypochlorite

- Release of sewage containing biological and chemical agents from sanitary facilities (toilets) and kitchen areas within the power generation premises and associated offices.

In addition drains leading directly into the river are positioned within the workrooms where oils and other materials are likely to be washed into the river during routine cleaning exercises (see photo below).

Photo 5.1: Oil Spill in the Open Well of Turbine 4



The waters of the River Niger are currently used for a number of purposes other than power generation. These uses include:

- abstraction for use as a drinking water source by Kainji Hydroelectric Plc and Jebba Hydroelectric Plc.
- direct use for domestic purposes by individuals in communities local to the river, such as for bathing, household sanitation and drinking.
- irrigation of crops.
- fishing.

The following sections examine the existing impacts of these activities on the water quality of the Kainji Lake and River Niger in the light of Nigerian water quality legislation already presented in Chapter 2.

5.3.2 Monitoring

In accordance with current requirements of the Federal Ministry of Environment as outlined in The Nigerian Federal Government Regulation S.I.8 and S.I.9, monthly effluent discharge monitoring and analysis reporting is undertaken at Kainji Hydroelectric Plc. There are four sampling points currently adopted at the Kainji plant, namely:

- power intake and the dam crest;
- boatyard;

- tailrace; and
- downstream tailrace

The existing reporting process is undertaken on a monthly basis by Godirra Chemicals Ltd. Their reports detail methodologies for sample analysis, as well as providing an estimate of impact on water quality due to activities by KHEPLC. In addition every three months samples are sent to the Regional Water Laboratory Minna while FME have a mandate to take samples every six months but results are not available to KHEPLC and data collection is reportedly irregular.

Water sampling methodologies are not clearly outlined in the Godirra report, but are stated to adhere to standard WHO, United States Environmental Protection Agency and the Federal Ministry of Environment procedures. The impact on water quality is made on the basis of comparison with FEPA 1991 standards although this is not stated in the report.

Analytical results for the following parameters are reported, based on analysis undertaken by a certified laboratory (Unilag Consult – the University of Lagos Consultancy Services):

- pH;
- Temperature
- Conductivity
- Total dissolved solids;
- Total suspended solids;
- Biological oxygen demand;
- Chemical oxygen demand;
- Dissolved oxygen
- Total hardness
- Oil/Grease;
- Turbidity
- Cations (Ca^{2+} , Mg^{2+} , Na^+ , Ca^{2+} , K^+);
- Anions (PO_4^{3-} , NO_3^- , CO_3^{2-} , SiO_3^{2-} , SO_4^{2-} , Cl^- , HCO_3^-);
- Extractable heavy metals (cadmium, chromium, copper, iron, lead, mercury, nickel, vanadium and zinc); and
- Total hydrocarbon content.

5.3.3 Operational Impacts

On the basis of the assessment contained within the water quality monitoring reports impacts are minimal and from 2007-2010 data examined, remain below the prescribed environmental standards for industrial effluents.

Sewage from the power generation plant and associated office areas is collected centrally and released to the river at the tailrace. The sewage is not treated prior to its release but the Godirra monitoring does not include the evaluation of bacteriological parameters that would give an indication of the impact of the discharges on water quality.

In addition, anecdotal evidence from Fakun village indicates that unidentified 'oil' is released into the river. The release is sporadic and has been associated with 'system failure' by the village residents. However, there are currently inadequate monitoring data to quantitatively evaluate or confirm the likely impacts of such releases.

5.3.4 Conclusion and Recommendations on Operational Impacts

Overall impacts on water quality from power generation are minimal. However given the domestic and other uses of river water downstream of the power plant trade effluent standards

do not provide the best means of assessment. The compliance with the standards for aquatic waters, as contained within Table 5 of the National Guidelines and Standards for Water Quality in Nigeria, in conjunction with the standards for trade effluents contained within the National Effluent Limiting Regulations is recommended to provide a more suitable means of evaluating water quality.

It is imperative that the sewage from the power plant and associated office areas is collected centrally and pre-treated prior to release in to the river, or prior to an alternative means of waste disposal. Water quality monitoring should also be inclusive of suitable bacteriological parameters to provide a means of estimation of any potential impacts. Such parameters would include the evaluation of total coliforms, faecal coliforms and faecal streptococci, as described in the National Guidelines and Standards for Water Quality in Nigeria.

The potential release of 'oil' affecting Fakun village needs to be investigated further, in order to determine the level of impact. It is recommended that the current water monitoring programme is extended to include this area. Such data will also serve to increase the robustness of data available for the area as a whole.

5.3.5 WRD-SEM Impacts

The rehabilitation works under WRD-SEM comprise engineering works associated with the replacement of turbines. During implementation the following activities may have an impact on water quality:

- Release of oils, lubricants and degreasing agents from existing equipment being removed.
- Release of oils, lubricants and degreasing agents during the installation of new equipment.
- Increase in sewage volume due to the presence of staff associated with dam rehabilitation.

These impacts are expected to be minimal, provided appropriate waste management procedures are put into place during the rehabilitation process, such as will be achieved with adherence to the steps detailed in the appended waste management protocol and plan.

The implementation of management procedures should also ensure that incidental losses of oils, lubricants and other chemical agents be reduced during future operation of the power plant. Similarly, management procedures should be sufficient to significantly reduce the impact of sewage materials on water quality.

5.4 Terrestrial and Aquatic Flora and Fauna

5.4.1 Social and Environmental Audit Reports (2006 and 2007) Observations and Present General Situation

The Social and Environmental Audit Report by CIMA International did not mention any impact of the dam on the existing terrestrial and aquatic flora and fauna. It only listed the most common flora and fauna resources. The KHE Environmental Audit Report (2007) also reported general flora and fauna but highlighted the changes that occurred before and after the construction of dam. We have approached NIFFR and KLNP to assess the present situation and the results are presented below.

5.4.2 Impacts

The dams are located on the Sudan-Guinea savannah woodlands. The lake is also an important ground for Palaearctic migrant water birds. The important animal species reported in the KLNP are elephant, kob, hartebeest, roan antelope, hunting dog, mountain reed buck and red-flanked duiker.

The Kainji Lake National Park (KLNP) authorities have not reported any danger to the existing flora and fauna in the Park due to dam operation except the movement of people living on the lake shore to the tributaries, where fish are abundant. The use of dynamite to kill the fish was reported by the KLNP staff. The KLNP is currently implementing microprojects (GEF funded 5-year programme from 2004-09) in 40 communities around the lake and within the KLNP boundary through activities such as livestock fattening, agro-processing and orchard cultivation. The KLNP is happy with these programmes as a means to keep the community away from the Park and thus conserve the forest. KLNP is planning to extend this project to all the communities but through LGAs.

Fish production recorded a boom from 3,048 MT during pre-impoundment days to 17,000 MT in 1969 and 28,638 MT in 1971 (Oyedipe, 1982). The statistics obtained from National Institute of Fresh Water Fisheries Research (NIFFR) are presented below. In 2004, the production stood at 9,248 MT.

Table 5.1: Fish Production and Number of Boats in Kainji Lake

Year	Fish Production (metric tonnes)	Number of fishing boats on the Kainji lake
Pre-impoundment	3,048	NA
1969	17,000	1,800
1970	28,638	3,400
1971	11,037	3,500
1972	10,905	3,500
1973	7,320	3,500
1974	6,093	3,400
1975	6,000	3,400
1976	5,800	3,400
1977	4,500	3,300
1978	4,500	3,300
1995	32,474	8,800
1996	38,246	9,300
1997	28,753	7,600
1998	28,851	7,100
1999	16,351	6,200
2000	13,375	5,400
2001	13,361	4,800
2004	9,248	4,400

Source: Abiodu (in press), Kainji Lake Fish Production Statistics (1961-2004), A paper prepared for National Institute for Freshwater Fisheries Research (NIFFR) at 40 year celebrations.

The data in Table 5.1 suggest that fish catch has substantially increased since construction of the dam but the variable nature of the data gives cause for concern over its accuracy and the absence of data from recent years enhances this concern.

Photo 5.2: Meeting with NIFFR



The study by Tafida et.al (2009) revealed that some important fish species like *Polypterus*, *Ariusgigas*, *Barbus*, *Bagrus*, *Citharidium* and *Ansorgii* are disappearing over the years.

Potential reasons for the volatility of fish production are as follows

- Immediately on formation of lake, the exploitation of the fisheries was by migrant professional fishermen who came from other parts of the country, who exploited the full potential of the lake by using the model gear such as gill-nets and hooks. Arungbemi (1982) reported that shortly after construction of dam, there was an unprecedented influx of fishermen not only from Kwara, Niger and Sokoto states but also from other savannah areas of Borno, Kaduna and Plateau States and Niger Delta area of Bendel State. He also mentioned that the lake was over-fished by 6,320 fishermen in 1971, whereas Brokensha and Scudder in 1968 estimated that the lake could support only 2,500 fishermen plus their dependents.
- There are reports of indiscriminate catching of fingerlings and the wrong use of nets. Though there are regulations for use of net sizes, they are not in force. Due to the economic benefit of fingerlings in the market, the Kaya village headman reported that some of their fishermen fish them out and sell them on the market illegally. NIFFR has shown that better gear could be used for efficient harvest of lake but it is not extended to all the villages due to shortage of funds.
- Fish movement is completely restricted above and below the dam as there are no fish ladders.
- The oxygen level of the turbid water below Kainji dam is drastically reduced to 0.2mg/l, in which fish survival is doubtful. The oxygen level increases naturally in the rapids downstream, especially at Awuru rapids. However since construction of Jebba dam, the rapids flow has been curtailed thus affecting the natural re-oxygenation of water. The release of water through spillways would increase the oxygen level but is not advisable considering the HEP generation, the main purpose of the dam.

5.4.3 Mitigation

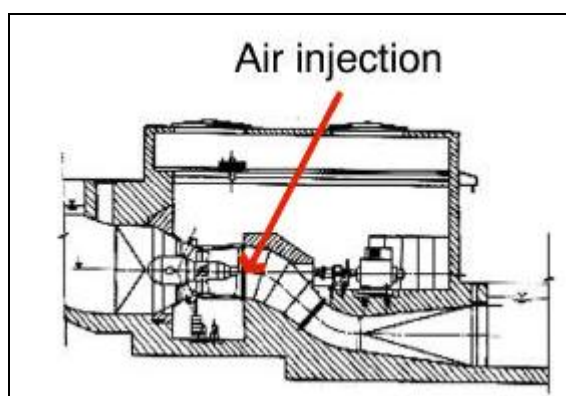
The rural development project funded by GEF and implemented by KLNP, should be extended to all the villages on the river and lake banks. KHEPLC could be engaged as a partner with the LGA to implement this project in the nearby communities.

NIFFR should be used for conducting research on the fishing and creating awareness among the fishermen about the use of right kind of gear nets and efficient ways of fishing.

There are two options to increase the oxygen level at the downstream of the power house:

- i. By introducing air in the upper part of the draft tube air can be introduced into the turbine flow and this represents a very efficient device for water aeration, as suggested by INPG (see Reference 31). This option requires a detailed study as to its cost-effectiveness.

Fig 5.1: Air Injection into the Turbine Flow (Courtesy INPG)



- ii. Aeration of the tailrace as suggested by FAO in their “Dam Design and Operation to Optimise Fish Production in Impounded River Basins”. This again requires a detailed study to check the for aerator size and its cost effectiveness.

Public Health

5.4.4 Social and Environmental Audit Reports (2006 and 2007) Observations and Present General Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The pre-dominance of water related diseases relating to the presence of a reservoir and consumption of non-treated water (No. 1).	Measure 3.1: To provide drinking water to the New Bussa population through the construction of a water processing station Measure 3.2: To sensitise the riparian populations on the control of water borne diseases and their vectors.	The mitigation measures suggested by the CIMA report have not yet been implemented. The current situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

5.4.5 Approach

The World Health Organisation (WHO) states that about one third of the global disease burden in developing countries such as Nigeria could be reduced through available environmental health interventions and strategies (WHO, 2010: Public Health and Environment in the African Region - Report on the work of WHO (2008–2009)). The impacts of works processes at KHEPLC are relevant to the following potential causes of adverse health impacts in the local community:

- lack of access to safe drinking water;
- air pollution (indoor and outdoor);
- poor domestic sanitation facilities;
- inadequate waste disposal;
- access to healthcare facilities;
- absent or unsafe disease vector control; and
- exposure to chemicals and injuries.

Other wider areas of potential exposure to increased impact on health are from climate change, the presence of persistent organic pollutants, electronic waste and radiation.

5.4.6 Existing Conditions

KHEPLC runs a 60 bed hospital that treats both staff members and individuals in the local community. There is also a clinic at the staff offices. There are also state owned health centres to impart primary care to the people. The hospitals provide free consultations but charge for medicines. There is also a health centre within the Kainji staff quarters at New Bussa, with restricted access for the public. The water treatment plant at KHEPLC also provides water to nearby residential areas. However, there is evidence that the majority of the villages surrounding the plant use water directly from the river for household use, and as a drinking water source. The water is also most likely used without prior treatment. The following relevant diseases have been reported to be prevalent in the surrounding areas:

- Malaria
- Enteric fever
- Gastroenteritis
- Cholera
- Bacillary and amoebic dysentery
- Schistosomiasis (Bilharzia)
- Pneumonia
- Chicken pox
- meningitis
- HIV/AIDS

In the case of bilharzia a distinction should be made between intestinal and urinary bilharzia but these figures are not noted in the returns of disease incidence. Other chronic ailments that are reported include diabetes, hypertension and resultant stroke. Incidences of snake bite and dog bites have also been reported.

Although there are very limited data for disease incidence in the locality, available statistics for water borne and water related diseases reported to the KHEPLC hospital for the working year of June 2009 – May 2010 are included in Table 5.2 below.

Table 5.2: Water Related Disease Incidence for PHCN Hospital (June 2009-May 2010)

MONTH	Water Borne Disease	Water Related Disease	Total
Jun 2009	10	4	14
Jul 2009	18	2	20
Aug 2009	16	3	19
Sep 2009	12	2	14
Oct 2009	28	2	30
Nov 2009	21	4	25
Dec 2009	25	3	28
Jan 2010	28	6	34
Feb 2010	30	10	40
Mar 2010	35	7	42
Apr 2010	30	5	35
May 2010	22	5	27
TOTAL	275	53	325

There is currently an established means of communicating HIV/AIDS risks with posters evident in the vicinity of the main offices. Nationally run programmes on HIV/AIDS awareness also exist within the community. These are also largely linked to posters, but also include radio announcements. These have been recommended for implementation by members of the ERSU but are yet to be undertaken.

Photo 5.3: HIV/Aids awareness poster at the Clinic



Table 5.3 shows the major water borne public health challenges facing the communities visited in the Kainji area.

Table 5.3: Major Public Health Issues in the Communities Around Kainji

S/No	COMMUNITIES & LOCATION	MAJOR PUBLIC HEALTH ISSUES
1	Awuru Downstream Kainji	Malaria Typhoid fever
2	Fakun Downstream Kainji	Malaria Typhoid fever
3	Munai Upstream Kainji	Malaria Typhoid Fever Hepatitis Fever Schistosomiasis (Bilharzia) Water Snakes bites
4	Kaya Upstream Kainji	River Blindness (Onchocerciasis)

5.4.7 Mitigation

Hospital Upgrade: the hospital requires upgrading as shown in KHEPLC's Annual Report, 2009.

Drinking Water: ensuring access to safe drinking-water and adequate sanitation, and encouraging personal, domestic and community hygiene are vital to promoting development, poverty reduction and health.

Household-level interventions can make an immediate contribution to the safety component of this target, and would significantly contribute to meeting the incidence of disease where access to water supplies is secure, but household water quality is not assured. This is particularly relevant to areas where water supply is taken directly from the river for domestic use without prior treatment. Suggested methods for water treatment in local communities include:

- **Solar disinfection:** This is undertaken by exposing water in disposable clear plastic bottles to sunlight for a day, typically on the roof of a house. A combination of heat and ultra-violet radiation from the sun are used to inactivate pathogens present in water. To be effective, solar disinfection must be applied to relatively clear water. This method is free and would use an abundant renewable sunlight resource but is not a robust process.
- **Chlorination:** At doses of a few mg/litre and contact times of about 30 minutes, free chlorine generally inactivates greater than 99.99% of enteric bacteria and viruses, provided water is clear. Chlorine can come in a variety of sources, including solid calcium hypochlorite or liquid sodium hypochlorite. Household level chlorination has been implemented most commonly in combination with safe storage and behaviour change techniques, including social marketing, community mobilization, motivational interviewing, communication, and education.
- **Boiling:** If practical, households can disinfect their drinking water by bringing it to a rolling boil, which will kill pathogens effectively. In order to be effective, however, the treated water must be protected from re-contamination. Caution must also be exercised to avoid scalding accidents, especially among young children.

Rapid Epidemiological Waterborne Diseases Survey: This should be carried out in the Kainji area to determine the seriousness of waterborne diseases and to recommend treatment of infected people and determination of the next steps;

Public Awareness:

- Water borne and water related diseases: public awareness schemes for water borne diseases have not been identified at Kainji Hydroelectric Plc. Public schemes on water treatment options (as outlined above) are recommended. The most effective means of undertaking this would be the provision of local training schemes by community workers in local languages.
- KHEPLC should take more targeted mitigation measures against Bilharzia using regular epidemiological monitoring and mass treatment. This is included in the Procurement Service Package 2. The contractor will help the KHEPLC to develop such measures which can be taken up regularly under Corporate Social Responsibility schemes.
- Workers present during the construction phase should also be made aware of safe practices for drinking water and water related disease in worker safety risk assessments prior to project commencement.
- Public awareness schemes for communicable diseases have not been identified at KHEPLC. Public schemes on water treatment options (as outlined above) are recommended. The most effective means of undertaking this would be the provision of local training schemes by community workers in local languages.
- Workers present during construction phase should also be made aware of safe practices for communicable disease in worker safety risk assessments prior to project commencement. These should include a listing of prevalent diseases such HIV/AIDS, meningitis and malaria, for which prophylactics can be sourced before departure.

Waste Management: Exposure to waste from health-care and construction activities is a potential risk to individuals, communities and the environment if not properly managed. It is of particular note that the majority of waste produced by healthcare activities is highly infectious.

When appropriately applied, environmentally-friendly strategies can properly manage waste from source to final disposal. Further details on waste management procedures are included in the waste management sections of this report.

5.5 Cultural and Historic Sites

There are no cultural and historic sites affected due to the proposed works. A paper on the Socio-Economic Impact of HEP Dams on the Host Communities by A. S. Abubakar on loss of historical monument revealed that:

- More than 90% of the host communities have lost their historical sites due to the dams. Yauri, for example, lost her emirate and had to relocate. Some of the host communities that are traditionalists had to abandon their shrines and other areas of worship prior to inundation.
- The Borgu people were known for their rich cultural heritage and deep attachment to the River Niger during the pre-dam period. The rapids along the Niger used to be awe inspiring to the people of Borgu, but with the construction of the dam, the rapids have been inundated.
- At Awuru (upstream of Jebba and downstream of Kainji) an old structure that once served as a port for vessels is completely submerged. Such very important historical relics have disappeared as has the site of the death of the explorer Mungo Park.

5.6 Construction of WRD-SEM Components

5.6.1 Traffic

Heavy equipment and plant for the proposed rehabilitation is expected to be shipped to Lagos and then transported by heavy vehicles along the north expressway to the dam site, where mobile cranes will lift the goods to a location suitable for the in-situ cranes. The condition of the north expressway was particularly poor at the time of the site visit and the goods will need to be well packaged for protection and then well tied down. Were the rail network operating, this transport system would have been preferable, both in terms of security and in terms of a reduced carbon footprint.

Smaller and more sensitive equipment is expected to be delivered to Nigeria by air to Abuja and then transported by road to the site. Again, this road is not in good condition and it is suggested that KHEPLC explore the possibility of using the nearby NAF airstrip for transporting light goods and technicians working on the project.

The additional volume of traffic is not expected to be a factor on both road systems, and the weight of the shipped plant and equipment is not expected to exceed the full 30,000l fuel bowlers currently using this road. Notwithstanding this, it is essential to include within the contract documentation that the contractor is responsible for all aspects of transport including verification of the route and any weight restriction along the route, licensing and taxes.

5.6.2 Contractor's EMP

A full contractor's Environmental Management Plan is included in Appendix K. This will form the basis for enforceable contract provisions.

6. WASTE MANAGEMENT

6.1 Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested at the CIMA report	Present Situation (2010)
The pouring out of liquid waste directly into the river and on the surrounding soils (No. 4). The ignorance of rejects in the waters and on the soils so far as the qualitative and quantitative view is concerned (No. 6). The absence of a plan on management of liquid and solid waste (No. 7). The lack of data enabling to quantify the liquid and solid rejects or prepare a mass report (No. 8). The lack of practice on filtration of exhausted oil by a recycling technique to minimise the volume of reject of exhausted oil. (No. 9). The absence of a programme for collection and disposal of dangerous waste (acids, oil, etc.) (No. 10). The non-security stocking of consumable products and material in the warehouses is a real risk for the safety of workers particularly in case of incident and fire (No. 11).	Measure 3.7: To adopt more secure storage practices in conformity with safety norms, including the separation of the zones of new products from those of the used products Measure 3.10: To develop and implement a dangerous waste collection and disposal program, including the rejection of used batteries. Measure 3.15: To characterise the rejections and to develop a mass summary of each unit of the installation. Measure 3.19: To develop and implement a waste management plan which shall process solid waste, liquid waste, dangerous materials and recycling and which shall integrate spontaneous recycling.	The Environmental Audit 2007 identified and characterised the wastes (Chapter 4) quantities of those wastes were not determined. The same report suggested life cycle analysis method (Chapter 5) for material balance to quantify the materials (including oils, lubricants, chemicals and batteries) purchased, used and wastes generated. Standard operating procedures (SOP) and a detailed material safety data sheet (MSDS) for chemicals and hazardous substances are also suggested but none of the above is implemented. The solid and liquid contamination of open surfaces (apron, floors and workshop spaces) still continues. Domestic solid wastes and sewage management were discussed but not yet implemented. There is no comprehensive waste management plan as suggested by CIMA report. The current situation is elaborated further in the forthcoming sub-sections with mitigation measures.

6.2 Solid Waste

6.2.1 Current Situation

The main solid waste materials are as follows:

- Use of office material such as paper, other stationary and furniture.

- Use and maintenance of machinery within hydroelectric plant, including packaging materials, machine parts and tools.
- Materials used in medical treatment such as syringes, wound dressings and medical drugs

Current site conditions indicate that there is substantial room for improvement of routine waste management procedures at the HEP plant premises and offices of KHEPLC.

There are a limited number of waste paper baskets in the power plant and associated offices. Similarly, there are no lidded bins for the disposal of refuse (such as food packaging waste) that arise from daily activity within the plant and offices. Anecdotal information indicates that office waste is currently burned outdoors in a location close to the offices.

The workrooms within the plant and operating areas do not currently have a well managed house-keeping procedure. Litter can be seen at various locations around the plant, and waste materials from cleaning processes are not appropriately disposed of – the existing bins contain waste materials which are allowed to overflow and litter is allowed to accumulate within several areas of the plant. Waste oil spills from these areas are absorbed with sawdust and re-used within the golf course.

A number of full plastic containers are also present within the generator room, and do not have clear labels to identify their contents. Anecdotal evidence shows that these are degreasing agents. The workshop area within the plant also contains a drainage channel on the workroom floor that drains directly into the River Niger.

There is an integrated purifying plant used for the recycling of all transformer oils, and spent oils and other materials are removed for disposal via the stores. The stores comprise an organised system of filing for smaller items, comprising metal storage racks for spare parts, tools, plumbing materials and other hardware used within the plant. However, larger items such as vehicles and oil drums are stored outdoors on open grassed areas. There is also an unpaved oil storage area with fuel dispensers for vehicles, with two associated underground fuel storage tanks with an approximate volume of 33,000 litres, as well as a surface storage tank.

The sewage from the powerhouse and associated offices is currently released into the River Niger without prior treatment while wastes from the hospital are currently placed within a hand-dug pit and burned.

6.2.2 WRD-SEM Project Impacts

a) Construction

Sanitary waste will be generated at the power plant consisting of human excreta or “night dirt” generated by the sewage system, and in any portable toilets (‘porta-loos’) that may be available for use by construction staff.

Refuse/rubbish (i.e., living area waste, kitchen waste, cafeteria waste, cleaning waste etc) will consist of the various wastes generated by the people who live at the Project-Camp and from the waste generated by the kitchen and cafeteria operations. The kitchen crews and the camp management will be responsible for making sure that camp generated refuse is properly managed. Wind can blow this refuse around the camp and animals and vectors can create unhealthy conditions. Therefore, effective housekeeping actions will be employed throughout the life of the Project.

Non hazardous wastes (such as food packaging, stationary, packing materials etc.) will be generated as part of the construction process. This waste does not pose a hazard to workers, but can be blown around the jobsite and beyond the jobsite perimeter. Therefore, effective

housekeeping actions should be employed throughout the life of the rehabilitation works to prevent this occurring.

Dunnage or containers used to protect goods and their packaging from moisture, contamination and mechanical damage (such as wooden crating, packing materials, plastic shrink wrap, metal straps) will be generated. Often, this waste consists of plywood and 2"x4" wood attached to or surrounding equipment. The size varies from small pieces of scrap wood to full sheets of plywood and other lumber. In addition, there will be a large volume of metal "tie-straps" that are used to hold the dunnage together and to hold bundles of materials together. When not properly stacked and managed, the dunnage can become a safety hazard and a housekeeping mess. Staff working on machine maintenance are responsible for maintaining housekeeping in those areas.

Hazardous waste in small quantities will be generated as part of normal construction activities. KHEPLC and its subcontractors should manage these wastes in an environmentally responsible manner and in accordance with best industry practices KHEPLC and their subcontractors are responsible for the proper identification, storage, and disposal of their hazardous waste.

A Hazardous (dangerous) Waste is defined as the following:

- Material in question is inherently "waste like" appears on the dangerous waste source list as contained in Schedule 11 of the National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 (Federal Environmental Protection Agency, 1991); or
- is a residue from the management of waste listed in Schedule 11 and Schedule 12; or
- originates from the sources listed Schedule 12 of the National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 (Federal Environmental Protection Agency, 1991)

KHEPLC should have a copy of this definition at the site for reference of site staff.

Hospital waste: There is a wide variety of biomedical waste generated within the clinic and hospital, comprising general waste (referred to above as refuse), pathology waste, infectious waste, pharmaceuticals, radioactive waste and sharps. Such materials require treatment prior to disposal to prevent the spread of infectious disease.

b) Operation

Wastes generated during the operational phase of the project will be the same or very similar to those already discussed in section 6.1.1. An Overall Waste Management Plan has been developed and is included in Appendix D.

6.3 Liquid Waste

6.3.1 Present Situation

The type, control and management of liquid waste has been discussed in the section covering water quality in section 5.3 above.

6.4 Conclusions and Recommendations

Current site conditions indicate that there is room for substantial improvement of routine waste management protocols at the hydroelectric dam premises and offices at Kainji. Activities necessary to mitigate environmental impacts during dam operation are:

- the provision of lidded bins for office and site use;
- collection and suitable disposal of office waste and site refuse;
- pipe sealing materials for machinery;
- documentation for re-use of dunnage and other packaging materials associated with maintenance equipment;
- provision of containment/barrier surfaces (such as concrete slabs or pallets) in the 'Stores' area to prevent incidental loss of oils to surrounding ground; and
- provision of sewage treatment facilities for domestic sewage produced at the site.

The incineration of medical waste using appropriate equipment (in order to minimise environmental impact) is also recommended.

A summary plan for construction phase waste management is included above, and in waste management protocol in Appendix D.

Discussions with management indicate that all waste disposal activities are contracted out according to a directive from FME that they should procure registered contractors for these activities. Consequently there are no equipment requirements.

7. HEALTH AND SAFETY

7.1 Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested at the CIMA report	Present Situation (2010)
The non respect of safety measures by the workers at the workshops and units (No. 2). The lack of material and human resources for the health and safety department as well as dysfunction which restricts the efficiency (No. 16).	Measure 3.3: To provide all the workers with safety equipments and require them to wear them on the worksites Measure 3.22: To develop a reference document for health and safety management. This document must contain the mission of the department, its short term and long term objectives as well as the procedures and activities associated with health and safety and summary of the work performed each year. Measure 3.25: To make sure that the basic equipment for the fire control is in place and to have the plant analyze by an industrial safety specialist. He must determine the equipment required as well as the right place for each piece of equipment. Measure 3.27: To create and make operational a workers committee in charge of health and security at the work site, headed by the safety department and the focal points of each of the directorates of the enterprise, which, <i>inter alia</i>, shall be responsible for making sure that the employees wear the safety equipment on the work site. Measure 3.32: To organise for the employees training sessions in health and safety at the worksite. Measure 3.33: To organise campaigns so as to sensitize the words in safety using various means.	The Environmental Audit 2007 mentioned that the management provides adequate PPEs to the staff but few of the staff failed to use PPEs. This situation still continues. The same report highlighted the lack of working fire engine, functional central fire alarm system, public address system and regular fire drills. This situation is still same. The Health and Safety officer at KHEPLC prepared a draft safety policy and basic H&S document for his reference with mission and vision but not detailed enough to cover all H&S aspects. So there is no comprehensive health and safety management plan. Health and safety posters have been prepared and posted at important places. ERSU committee was formed as an institutional measure to look into H&S issue as a part of general Environmental and Social aspects. The employees received H&S training as part of this assignment. The current situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

7.2 Approach

The current situation, as it concerns the management of Occupational Health & Safety which is the responsibility of Kainji Hydroelectric Power plc (KHEPLC), has been evaluated on the basis of requirements to meet OHSAS 18001:2007. This standard utilises the 'process approach', which is common to other existing International Operational Standards (ISOs) and business management systems, of 'Plan, Do, Check, Act' (PDCA), which can be applied to any process. As a repetitive process to check the next action, a simple four step method to test information before making a major decision is given:

Plan – Establish the objectives and processes necessary to deliver the results in accordance with the organisation's OH&S Policy

Do – Carry out or implement your plan by performing the steps

Check – Check the results; measure and monitor against policy, objectives, legal and other requirements and report the results

Act – Act on the decisions based on those results and continually improve performance

7.3 Policy, Organisation and Responsibilities

There is no evidence that a Health & Safety policy is in effect in the facility. While there is an understanding that Health & Safety considerations should be given attention and a safety officer is appointed and there is also a draft safety policy, there is no published document communicating management's commitment to Health & Safety. A policy, while demonstrating, management commitment also defines implementation and maintenance approaches to Health & Safety. These are the basic norms for an H&S Management System and should be prominently displayed.

A proposed safety section establishment chart was seen during the field visit but it has never been given effect. Consequently, there is no clear appreciation of who is responsible for safety within the organisation and everything concerning safety is viewed as the responsibility of the safety officer; overall AGM (Operations) is in charge of OHS and E. In a European context H&S is the responsibility of the Executive with certain activities delegated to a safety officer or safety team.

It is essential that KHEPLC ensure that persons in the workplace take responsibility for all aspects of OH&S over which they have control.

7.4 Health and Safety Issues

The existing fire engine (see photo below) is also an old one and not functioning well.

Photo 7.1: Old Fire Engine at Kainji Power Station



The general conditions of the fire fighting conditions are very poor and not updated (see photos below).

Photo 7.2: Hose Reel Box Without Hose Reel



Photo 7.3: Poorly Kept Fire Fighting System



There is a palpable lack of care for safe use of electricity throughout the facility (See photo below). Several instances of naked electricity cables were observed and exposed and damaged electrical points are widely evident. The laxity with which electricity is handled needs to be addressed.

Photo 7.4: Exposed Wiring



Workers were observed carrying out work without appropriate Personal Protective Equipment (PPE) (See Photo below). This included workers engaged in hazardous tasks. When interviewed, they confirmed that they were given the PPE by the company but had different reasons for not using them. These included discomfort when wearing PPE and interference with the smooth flow of work.

Photo 7.5: Little / No Enforcement of Proper Use of PPE



Housekeeping was fair in the administrative building but not so good on the generator and turbine floors. Packing crates were left on the floor and stacks of disused air conditioning units (and other fire hazards) were left lying around.

Photo 7.6: Dumping of Hazardous Wastes



Too many shafts and chutes are left uncovered throughout the facility. While rudimentary attempts (see photo below) are made to cordon off some of the shafts with netting and tape, these are supposed to be temporary measures which have been allowed to become near permanent features of the workplace. The situation is even more dangerous within the dam structure itself. With exposed shafts running as far as several stories down along poorly lit corridors, immediate remedial action needs to be taken.

Photo 7.7: Rudimentary Steps to Cordon off Uncovered Chutes



Lighting is generally poor in most of the operational areas of the facility.

7.5 Existing Safety Procedures

KHEPLC have an Emergency Response Plan which was developed by the Emergency Response Committee made up of the safety officer, representing the organisation, as well as other representatives of the stakeholders in the community including the army, the Road Safety Corps, etc.

The plan is inadequate to the extent that it covers only the peripheral arrangements for dealing with some ten different emergencies including flood, fire, dam collapse and 'mass release of chemicals' in about two pages of actual arrangements. The plan has never been tested, the employees are basically unaware of it, and the last time there was a fire drill was several years ago during the training of some officers in basic fire awareness.

Although management claims to have full documentation and up to date records available these were not made available to us. We saw no formal documented and standardised procedures in evidence for activities and operations undertaken by the organisation. Some informal direction is provided during job training for new employees assigned to particular sections by the heads of the section but this is not standardised or codified. Also we saw no formalised first aid arrangements although there is a clinic on the facility and a hospital located outside.

7.6 Risk Control

There is no recorded identification of foreseeable and significant risks for hazardous activities undertaken by individuals or departments within the organisation. No risk identification and control documentation was in evidence. Existing means of risk control, where evident, was informal, not documented and without standardisation. It relied on the resultant evaluation and risk perception of individuals with varying levels of knowledge and experience.

No risk assessments are carried out for tasks hence there is no documented RA which would show risk ratings prior to, and following risk mitigation. There are consequently, no Safety Method Statements (SMS) that would arise from a structured RA. While the team was on site, work could be observed being carried out on the generator floor. There was no RA /SMS to guide the safe execution of these tasks and the same situation prevailed on the dam crest.

Additionally, the process of risk control is expected to extend to any individual or organisation that may carry out work for or on behalf of the KHEPLC, where the KHEPLC would be deemed responsible and therefore liable. This relates particularly to contractors carrying out work on KHEPLC property or sub-contractors carrying out work on behalf of the organisation.

This is an area of serious concern as there were no evidential controls, monitoring or measurement of the performance in the management of contractors. In view of the rehabilitation work that is about to commence, the rectification of this should be given high priority. The present situation represents an area of high financial risk to KHEPLC as well as a serious risk of harm to contractors or anyone who may be affected by their activities without any agreed or pre-determined controls in place. While the Safety Officer claims that he makes the effort to monitor contractors to ensure work is carried out safely, there is no evidence of this, and in any case, it would still be a risky substitute for proper systematic controls.

7.7 Existing Training and Safety Records

KHEPLC allocates a training budget which is never implemented. A formal induction process is not undertaken by new employees or staff who have been reassigned to new departments. No First Aid training is provided and only the firemen have basic fire awareness training. No management staff have any appropriate training in Health & Safety.

Record keeping is quite inadequate and what little there is not in any acceptable format. No accident/incident report book could be produced and near misses generally go unreported. Near miss reporting is considered to be an essential part of risk management and performance improvement.

Records of investigations into previous incidents and accidents were difficult to come by even though serious incidents have occurred in the not too distant past. These included at least one near drowning and a near electrocution of a Youth Corp worker.

Since safety considerations are not part of criteria for selecting contractors, contractor's safety records are not vetted before they are commissioned. In risk aware corporations, insistence on safe working methods for all contracted parties working on site is seen as good practice to reduce financial and economic losses resulting from preventable accidents.

7.8 Communications

KHEPLC have some posters at few locations indicating the importance of safety. One such poster is given in photo below.

Photo 7.8: Safety Awareness Poster



Good communication is required across the whole workforce and KHEPLC should ensure that all employees are informed of policy and procedure, whether initially on first joining the organisation or by subsequent communication through reminders of safe working practices and involvement through consultation in the safety process.

A behavioural change programme is not in effect though attempts are made to affect perception through the use of posters and handbills. This however is inadequate. A more structured procedure is required for transmitting information about safety decisions to the staff.

A Safety Committee meeting is held once a month at which workers are represented by their heads of departments. This is commendable as it provides a good platform for addressing safety issues. It is however doubtful if the full benefits of these meetings are being realised due to the failings in the system.

An important communication tool which should be commended is the Safety Tool-Box Talk which is run by the Safety Department. The frequency of this however needs to be increased to make it more effective and the topics need to be more varied.

One exercise that is executed unfailingly is the submission of a monthly safety report to the Nigeria Electricity Regulatory Commission (NERC). This provides a format for reporting accidents and other safety issues to the Commission and also encourages KHEPLC to keep some records.

7.9 Inspections

Though internal HSE inspections are not embedded in KHEPLC as a standard, the SO regularly carries out informal inspections and tries to make corrections where he notices safety infractions. This is however not formalised and no records were available for inspection.

Results do not appear to be not used in an appraisal process or as part of an incentive scheme, all of which would aid the behavioural change programme where it in place. The apparent lack of inspections also extends to contractors.

While inspections of plants and machines are carried out regularly (this was observed during the visit), the age of most of the equipment makes the need for Planned Preventive Maintenance more pressing to avoid injuries to workers.

7.10 Health

Pre employment health assessments are undertaken as standard by staff since it is a civil service requirement. However, periodic health surveillance is not carried out to determine the impact of environmental or work conditions on workers.

The facility has a zero tolerance policy on drugs, alcohol and smoking. Shifts are normally restricted to eight hours although essential staff can be reached at all times of the day.

A clinic is located on the facility and a hospital is also available but located off site. The clinic is however of a standard capable of dealing with emergencies.

More could be done in the area of evaluating and controlling physical hazards like noise, vibration, physical exertion (for instance, the elevator to the crest of the dam does not work and staff have to climb up 13 flights of steps to access the crest).

7.11 Proposals for Change

7.11.1 Occupational Health and Safety

The success of any Health and Safety Management System (HSMS) depends on commitment from all levels, and especially from Senior Management. It is strongly recommended that the senior management, following findings that reflect lack of knowledge and understanding of Occupational Health & Safety, undertake an induction on safety. This could include a workshop and discussion forum which would take in the requirements of OHSAS18001:2007 as well as relevant legislation particularly the Factories Act and on the proposed OH&S Bill 2008. This will help drive the behavioural change that is required from the top.

Further to the above, it is recommended that management review current organisation and considers the development of a bespoke OH&S structure within each organisation and allocates suitable and sufficient resources to enable implementation of any OH&S Management System decided upon.

The Health and Safety Management System framework (Appendix C) should be adopted through initial guidance and subsequent independent application, develop specific systems which reflect the full extent of operations and activities, and comply with current and forthcoming legislation.

Arrangements should be made for KHEPLC to obtain a multi-user licence for the use and distribution of OHSAS 18001:2007 and its associated documents, namely:

- OHSAS 18002:2008 – Guidelines for the implementation of OHSAS 18001:2007
- OHSAS 18004:2008 – Guide to achieving effective occupational health and safety performance....in order to instigate development of the systems approach to OH&S.

KHEPLC should appoint a suitably competent OH&S Officer (in the alternative, properly train and certify those in place), with responsibility for reporting on all OH&S matters within the Plants Chief Executive. Existing staff with safety responsibilities are not registered with the Nigerian Institute of Safety Professionals (NISP) or any other national or international safety organisation.

7.11.2 Audits

Audits should be undertaken, internally and externally, in order to measure the development and process of continual improvement required by the standard and legislation.

External Low Level Audits should be undertaken three months after the workshop presentation to ensure that the plants are staying on track with the requirements of the Standard and to provide further guidance where required or requested.

An External Full Audit should be undertaken six months following the workshop to measure conformity and development. And a further External Full Audit should be undertaken twelve months following the Workshop to measure conformity and improvement.

Thereafter, internal auditing should be undertaken three monthly for a further year in order to facilitate development and familiarity with the policy and procedures of the organisation and the audit process. In all audits, the audit team should involve a representative of KHEPLC in order to participate and gain experience in the audit process.

Thereafter, it is recommended that internal audits be undertaken annually, to be no more than three months and no less than six months before the external Annual Audit.

7.11.3 Equipment Requirements and Additional Work

Arising out of this study the following equipment should be procured under the WRD-SEM Project. In addition a budget is proposed for making KHELPC compliant with the identified standards and undertaking audits over the first two years.

Table 7.1: Health and Safety Requirements for KHEPLC

S/N	ITEM	BUDGET (US \$)
1	Complete automated fire detection and suppression system including all accessories to be installed in the entire facility. A new integrated system should cover both the operational and administrative areas.	75,000
2	New fire truck with Breathing Apparatus and fire resistant coveralls, Fire hard hats, etc	350,000
3	Ambulance	75,000
4	Atmospheric testing meters for confined space work x 2	5,000
5	Other PPE – hard hats, coveralls, Gloves, safety shoes, goggles, ear protection, etc+	20,000
6	Pedestrian protection and barriers. They should be portable and put in use wherever the need arises. This will be especially in areas where there are manholes and shafts that are presently loosely protected with makeshift barriers, sometimes using fire extinguishers and webbing.	10,000
7	OHSAS compliance and establishment of an audit system	15,000
	Total	550,000

7.11.4 Short-Term Training

Three short-term courses are proposed the fundamental principle of risk control, which forms the bedrock of OH&S, is the proper assessment of risks and the recommendation of proper control measures; this is an essential starting point for senior managers.

A Fire Warden course is a necessary component of any fire management arrangement. Furthermore, it is a legal requirement in both the Factories Act and in the extant OSH Bill 2008. Consequently, this course has been recommended for the lower cadre of staff.

A course on Working Safely in Confined Spaces will be run on the third training day.

Outlines of these courses are given in Appendix C. The following training courses are proposed for delivery in conjunction with the stakeholder forum:

- Risk Assessment
- Fire Warden Training
- Confined Space Working

Full details of these courses are given in Appendix F

8. COMMUNITY RELATIONS AND MANAGEMENT

8.1 Social and Environmental Audit Reports (2006 and 2007) Observations and Present Situation

Audit Result (Page 70-71 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The sub-valuation of potentialities for development of socio-economic activities around the reservoir (water crops, fishing, stock farming, etc.) (No. 12). The persons shifted at the time of construction still have the bitterness vis-a-vis the project despite all the years which have passed (No. 21).	Measure 3.11: To finance income generating support actions around and downstream of the dam (off-season irrigated crops: market gardening and rice cultivation, fishing for example) to reduce poverty Measure 3.12: To develop a basic infrastructural program (roads, water, electricity, etc.) for the populations of the same region in order to enhance the living conditions in the villages. This program must be supported by a community development program. Measure 3.13: To develop and implement reforestation sub-projects. Measure 3.14: To get the populations out of the spillway perimeter and to develop jointly with the populations located downstream, a land development plan.	The section 6.3.3. of Environmental Audit 2007 report mentioned that <i>'the KHEPLC was identified to have relatively positive impact on the surrounding communities; as the infrastructures like road, electricity and blockhouse were made available to the people as a result of existence of KHEPLC in the area. Also the income level of people in the area was identified to have relatively increased, because of the influx of people in the area that has resulted to increased business activities. The level of the employment in the area has relatively increased.'</i> The above report only highlighted the positive side of the socio-economic aspects. However the current situation in the surrounding villages has been changed after HYPPADEC (see the section 8.3.3 below.) The current situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

8.2 Methodology

Secondary information available on social issues in and around the dam was reviewed. A rapid assessment was made of the social situation in and around the Kainji Dam where KHEPLC has experienced social problems. The main aim of the assessment was to prepare a ToR for a detailed social survey. There are around 200 villages potentially impacted by either Kainji, Jebba or both dams and a survey of these villages has never been undertaken and is beyond the scope of this study.

Social investigations comprised visits to some four villages at each dam but there was no primary data collection of socio-economic information as agreed early on in the study.

Small group discussions and interviews were conducted with the village chiefs and other prominent villagers. The discussions covered their livelihoods, problems due to dam

operation, flood management issues, flood warning communication, relationships with the dam management and local government, infrastructure development, public health issues and environmental issues (See Appendix E).

The outcome of the rapid assessments are presented in the following sections and we used the outcome to prepare a mitigation plan to improve the relationship between the communities and the dam management. For example we suggested improved grievance mechanisms and flood warning communication.

Since the social study requires a detailed survey, the development of a social monitoring system has not been developed and thus it is included in the procurement plan (service contract procurement package 2).

Prior to the implementation of the detailed survey a further rapid social assessment will be carried out to strengthen the social aspects of the ESMP. The outputs from the assessment will be contained in an addendum to the ESMP.

8.3 Current Situation

8.3.1 History since Construction

Oyedipe (1982) reported that communities displaced by Kainji Dam were left with poor infrastructural facilities and structural changes required for the rural socio-economic system to cope up with the fast development of New Bussa and other towns and the influx of temporary migrant fishermen.

Oyedipe (1983) studied 26 villages 15 years after the construction of Kainji Dam. Some of his findings are as follows;

- Farm land - Nine out of 26 villages complained about the farm land. They used to be on fadamas along the River Niger before construction but have now moved to uplands which are less fertile.
- Water supply - Six out of 26 villages seriously complained about the water supply. The displaced people were resettled above the 144m contour line, which was considered as well above the flood level. However it reduced access to water and increase time required to collect it. The 139 resettlements were provided with 195 wells which were not sufficient to supply the villages during the dry season.
- Roads and markets – 20 out of 26 resettlements said the roads were better than before but they liked water transport rather than the road transport, as they are not motorable during the rains.
- Economic activities – The villagers were primarily dependent on agricultural production for their subsistence and fishing for their income. The agricultural extension service provided was not sufficient as the inhabitants moved to highland farming, which they are not used to. The cost of living rose because of extra money circulating in the area. Water transporters were resettled in New Bussa and Karabonde, which are far away from the lake, and they were not provided with any compensation for their loss of income.
- Houses – provision of good quality housing was a great improvement but was undermined by structural defects and poor insulation.

Oyedipe concluded that 'On the whole, the authorities appear to have done their best in the circumstances, on all fronts in the innovation inputs'.

Details of the previous and current vocations of the four villages visited during field investigations are given below together with the main community needs.

Table 8.1: Community Issues at some of the Villages near Kainji Reservoir

	COMMUNITIES & LOCATION	TRADITIONAL VOCATION	PRESENT VOCATION	MAJOR AMENITIES NEEDED
1	Awuru Downstream Kainji (See Photo 8.1)	Fishing	Subsistence Farming (sparing) & Reduced fishing	▪ Drainage System / Flood Control ▪ Market Stalls ▪ Access Road ▪ Housing ▪ Health Facility ▪ Potable Water ▪ Employment / Acquisition of modern fishing techniques.
2	Fakun Downstream Kainji (See Photo 8.2)	Fishing	Subsistence Farming (sparing) & Reduced fishing	▪ Relocation logistics aid ▪ Site Clearing ▪ Access roads ▪ Plot demarcation Survey ▪ Potable Water Supply ▪ Schools ▪ Employment / Acquisition of modern fishing techniques.
3	Munai Upstream Kainji (See Photo 8.3)	Fishing	Subsistence Farming (sparing) & Reduced fishing	▪ Flood Control ▪ Access Road ▪ Housing ▪ Health Facility ▪ Toilet / Latrines ▪ Employment / Acquisition of modern fishing techniques.
4	Kaya Upstream Kainji	Fishing	Subsistence Farming (sparing) & Reduced fishing, Motorcycle transport Petty Trading	▪ Potable Water Supply ▪ Employment / Acquisition of modern fishing techniques.

Photo 8.1: Discussion with Awuru Villagers



Photo 8.2: Fakun Village – Village Head and Community Leaders



8.3.2 Current Problems

The socio-economic conditions of most of the villages (eg. Awuru, Kaya) have not improved over the years due to continued subsistence farming, declining fishing, poor awareness of livelihood diversification and poor maintenance of houses, settled area and access roads. There are specific problems such as Awuru village, where the lack of drainage facilities is the main cause of all problems.

Photo 8.3: Dilapidated House at Awuru Village



The socio-economic conditions of some of the settlements like Monnai are better than others due to proximity to New Bussa, which helped them to get electricity, water supply and jobs.

Photo 8.4: Meeting with Monnai Village Chief



Fakun village, located within 1000 m of the power house, experiences vibrations and a layer of oil on the river whenever the generators are stopped. Due to its proximity to the river, the fishing activities are affected by the drastic variation in the water level caused by operation of number of turbines. The Government has provided a resettlement site for the entire Fakun village but progress is very slow. There is no logistical support such as site clearing, access roads, plot demarcation nor provision of basic needs to move to the new location.

There is a general prevalence of poverty and palpable socio-economic helplessness in all the communities. There is an overriding absence of workable alternative livelihood options for all the close communities, who were resettled during the dam and power house construction.

Power supply is restricted to few villages in and around New Bussa. This is due to the fact that supply to New Bussa is delivered from the Transformer dedicated to the Power Station. This transformer is already overloaded. Government has however awarded contracts for the construction of a Transmission substation linking New Bussa with the national grid which will take the burden off the Power Station transformer.

8.3.3 Role of CBOs, NGOs and Local Institutions

As many of these issues have not been addressed by KHEPLC due to funding difficulties, the Niger State Government established the Hydroelectric Power Producing Areas Development Commission (HYPPADEC). The details of HYPPADEC are as follows:

Hydroelectric Power Producing Areas Development Commission (HYPPADEC)

HYPPADEC is made up of 5 states, namely Niger, Kwara, Kebbi, Kogi and Plateau. The Bill was initiated in 2005 and is approved by the senate and waiting for the approval of the President. The commission is planned on the model of Niger Delta Development Commission (NDDC). The NGOs, Community Action for Popular Participation (CAPP), Coalition of Dam Communities (CDC) and Federation of Borgu Youths (FBY) a CBO with the funding from National Endowment for Democracy (NED), are behind the initiation of the Bill.

It is expected that after being signed into law, the Commission would require some time for stabilising the process of operation, such as appointment of key management board members, state representatives, deployment of officers from the various relevant ministries, etc.

The funds for the Commission are:

25% of the total revenue generated by any company, authority, or undertaking from the operation of any hydro-electric power generation in a member state of the Commission

Between 25 and 50 percent of the money due to member states of the Commission from the ecological funds

In turn, the Commission is expected to conceive, plan and implement in accordance with a set of rules, regulate projects and programmes for the development of Hydro-Electric Power Producing Areas in the areas of transportation, health, education, agriculture, housing, urban development, water supply, electricity and telecommunications.

The present KHEPLC Public Relations Officer (PRO) was appointed in 2004 to look into the above issues. However he is saddled with other primary administrative duties such as dealing with visitors and issue of flood warning.

There is no well established grievance mechanism to sort out the social issues. However, the KHEPLC has formed a technical committee, by including all the stakeholders (NGOs, CBOs, close communities, youth forums) to discuss the issues and grievances of close communities on a quarterly basis. The first meeting was conducted in January 2010. Earlier the affected people do not inform the management directly about the grievances as they inform only to the village or community chiefs, who takes the issue with the LGA or the dam management.

8.4 Mitigation

8.4.1 Public Consultation

An initial stakeholder forum was conducted at the KHEPLC's conference hall on 28th January 2009. The forum was attended by World Bank representatives, NBA staff, representatives from FMAWR, FME, project staff of PHCN and KHEPLC, Borgu Emirate Council representative, Borgu Local Government, Federation of Borgu Youth, representatives from Nassarawa, Anfani, Awuru, Fakun and New Bussa villages and the press.

The main aim of the stakeholder forum was to introduce the WB Project to stakeholders including the close communities and to create a forum to discuss the social issues of all the close communities. Public Consultation, in line with WB OP4.10, was announced during the meeting, to be part of the current study, and to include discussion of the Environmental and Social Management Plan (ESMP). The same stakeholders were invited and additionally NGOs such as CAPP, CDC and HYPPADEC.

The Public consultation took place on 10th August 2010 and is reported in Appendix L.

8.4.2 Social Survey

An important outcome of the August 2010 public consultation at both Jebba and Kainji was the need for a thorough understanding of the communities affected by the dam. It is understood that up to 200 communities may have been affected by the construction of either one of the dams and that the needs of only a very small minority, mainly in the immediate vicinity of the dams, have been voiced or responded to in anyway by KHEPLC or JHEPLC.

Consequently we have included proposals for a social survey in the ESMP to provide a baseline both for future CSR activities and also to provide a focus for the new ESUs socially based work programme.

8.4.3 Floodplain Mapping

The floodplain mapping both upstream and downstream and demarcation of floodplain in the ground (in conjunction with local communities) will help the communities to restrict the activities and thus avoid losses during flooding. The implementation of improved flood warning system will further reduce the losses during flooding.

8.4.4 Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) needs to be taken up seriously by KHEPLC. Even if the HYPPADEC is formed, it will take years for them to have an effective role in solving the problems of the close communities. The CSR is part of the ToR of proposed ESU.

CSR is essentially, the deliberate inclusion of public interest into corporate decision-making and the honouring of a triple bottom line: People, Planet, and Profit. CSR-focused businesses proactively promote the public interest by encouraging community growth and development, and voluntarily eliminating practices that harm the public sphere, regardless of legality.

For example Bacita Sugar Company (Josephdam group), which was privatised in late 1990s, currently engages in CSR activities with their host communities (mainly Bacita town). They are:

- Free electricity supply
- Access road maintenance
- Provision of tractor for farmlands and site clearance works, and
- Water supply

Its importance has been realised by KHEPLC who have formed a technical committee, headed by the CEO, to discuss the social issues every three months.

Current KHEPLC CSR projects are

- Admission of non-staff children into KHEPLC staff primary school

- Free consultation in KHEPLC hospital
- Scholarship award
- Rehabilitation of roads
- Provision of 11KV breaker to the new LGA constructed line
- Water supply

The CSR activities should be discussed in the quarterly Technical Committee. Some of the immediate activities that can be considered are:

- Remove or lower fees for the non-KHEPLC staff in the school and the hospital
- Provide boreholes to the communities
- Develop special electricity tariffs for the resettled communities after provision of a separate line as expected by the NGOs.
- Creating drainage facilities in Awuru

Awareness programmes should be conducted in all communities on various issues as below.

- Awareness of effective fishing techniques. Partial financial support may be provided.
- Awareness of alternative livelihood options. Participate at minor level in the Federal, State and Local Government sponsored infrastructural development, rural development, poverty alleviation and micro-credit projects.
- Awareness of public health issues. Distributing leaflets on public health issues.
- Awareness of the benefit of the dam, powerhouse and its related activities

8.4.5 Grievance Mechanisms

There is a need to institute a strong grievance mechanism within the enhanced communication system. This would be achieved by developing a flow of communication as follows:

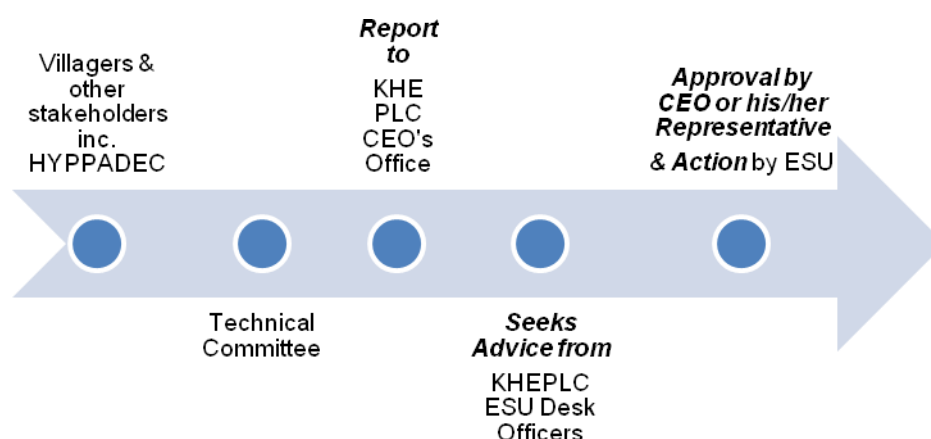
- An unhindered flow of communication should be developed between KHEPLC and all stakeholders, by maintaining interactive links. This should include regular interactive forums, sensitisation programmes, etc., which should be well publicised in order to attain maximum participation.
- The interactive forums should not be less than monthly, while frequency may be increased as the need arises. At these forums, it is expected that representatives of all stakeholders would be in attendance, to discuss issues relating to the community related activities of KHEPLC.
- Similarly, KHEPLC should ensure the installation of an effective early flood warning communication system and its workability, and the facilitation of necessary training programmes for relevant officers in the organisation.
- There should be transparency and interactive communication between all the organizations involved.
- The ESU should operate in close liaison with the communities and their representatives. ESU personnel should be equipped to feel the yearnings of the

communities, and be proficient in conveying the same to KHEPLC top management for appropriate decision making.

- KHEPLC should develop a strategy to project the advantages of the dams eg. irrigation, tourism, etc., and should communicate same to the riparian communities and other stakeholders.
- HYPPADEC should play a facilitative role in grievance reporting, when the Bill establishing it, is signed into law.

The proposed flow chart of the recommended grievance mechanism is given below.

Fig 8.1: Flow Chart of the recommended Grievance Mechanism



SECTION 3: JEBBA DAM

9. MANAGEMENT OF THE DAM

9.1 Social and Environmental Audit Report (2006) Observations and Present Situation

Audit Result (Page 141-142 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The reservoir management mode leads to periodical floods downstream with risks for material and corporal damages (No. 29). The occupation of lands located downstream of the spillway for agricultural and habitation needs, despite the real risk in the event of flood and dam breaking (No. 39). The flood evacuation warning system not adapted to emergency of dam breaking situations (No. 41). The insufficiency of the continuous monitoring of the environmental and social impacts associated with the operations of the installations (No. 43). The population is not at all involved in the management of environmental and social risks likely to results in floods and dam breaking (No. 48). The auscultation and inspection of dykes and dam are not adequate (No. 50). The urgent activities relating to maintenance and repair of dykes and dams are not conducted in due time, often because of lack of human and material resources (No. 51). The lack of funds to conduct the repair or expansion activities such as repair of leakage of the spillway (No. 52). And The existing safety measures such as switching off of a piece of equipment for servicing are not documented (No. 27).	Measure 4.4: To set a perimeter of safety downstream from the crest gate of flood in which any dwelling is prohibited. The existing dwellings must be relocated Measure 4.6: To put in place a warning system which indicates the evacuation of floods and which can make alarm from a site located at tend of kilometres. To put in place a sensitisation campaign for the surrounding and involved populations. Measure 4.8: To conduct urgent maintenance activities on the dykes and dams: treatment of insects, filling of cracks and control of vegetation. Measure 4.9: To replace the sounding equipment and monitoring instrumentation for dams and dykes by automated equipment within the shortest deadlines to ensure the stability of the works and the safety of the population downstream. Measure 4.14: To pull out the populations from the area of flood evacuation and develop, in consultation with the populations upstream of the river. Measure 4.16: To analyse the dam safety as well as to conduct a study of breaking of the dam and assess the consequences downstream. To develop a plan for the management of the reservoir in the event of high flood as well as a manual for the surveillance of the installations. Measure 4.17: develop an emergency plan to deal with breakage threat. Measures 4.18: To develop a participatory plan for the management of the flood and inundation evacuation downstream. Measure 4.20: To develop a reservoir management plan, using short, mid, long terms forecasting based on the hydrological data of the river Niger upstream and the meteorological forecasting. To be proactive rather than reactive. Measure 4.31: To organise a training session for senior PHCN experts in environmental management, dam safety and safety of hydroelectric installations.	None of the measures suggested by CIMA were taken up so far by JHEPCL except the regular maintenance work of the dam against excessive vegetation (measure 4.8). The current situation of the dam structures, hydropower facilities, hydrology and flood management is elaborated further in the forthcoming sub-sections with specific mitigation measures.

9.2 Condition and Maintenance of Structures

9.2.1 Introduction

Jebba Dam comprises the civil dam structures, the bottom gated spillway, the hydroelectric powerhouse with turbines, generators, and a navigation lock, with monitoring and control systems to all these, and M&E appurtenant works. These all make up a continuous structure of about 2,000m crest length. The site plan is presented in Fig 9.1 below. Technical details of the dam are given in Table 9.2.

The civil dam structures include a main rock-fill dam and a saddle dam, and four auxiliary dams comprising an embankment dam and three gravity concrete structures.

The Jebba Dam stores and safely releases water to generate hydroelectric power, provide flood protection and, originally, support navigation.

Fig 9.1: Jebba Site Plan

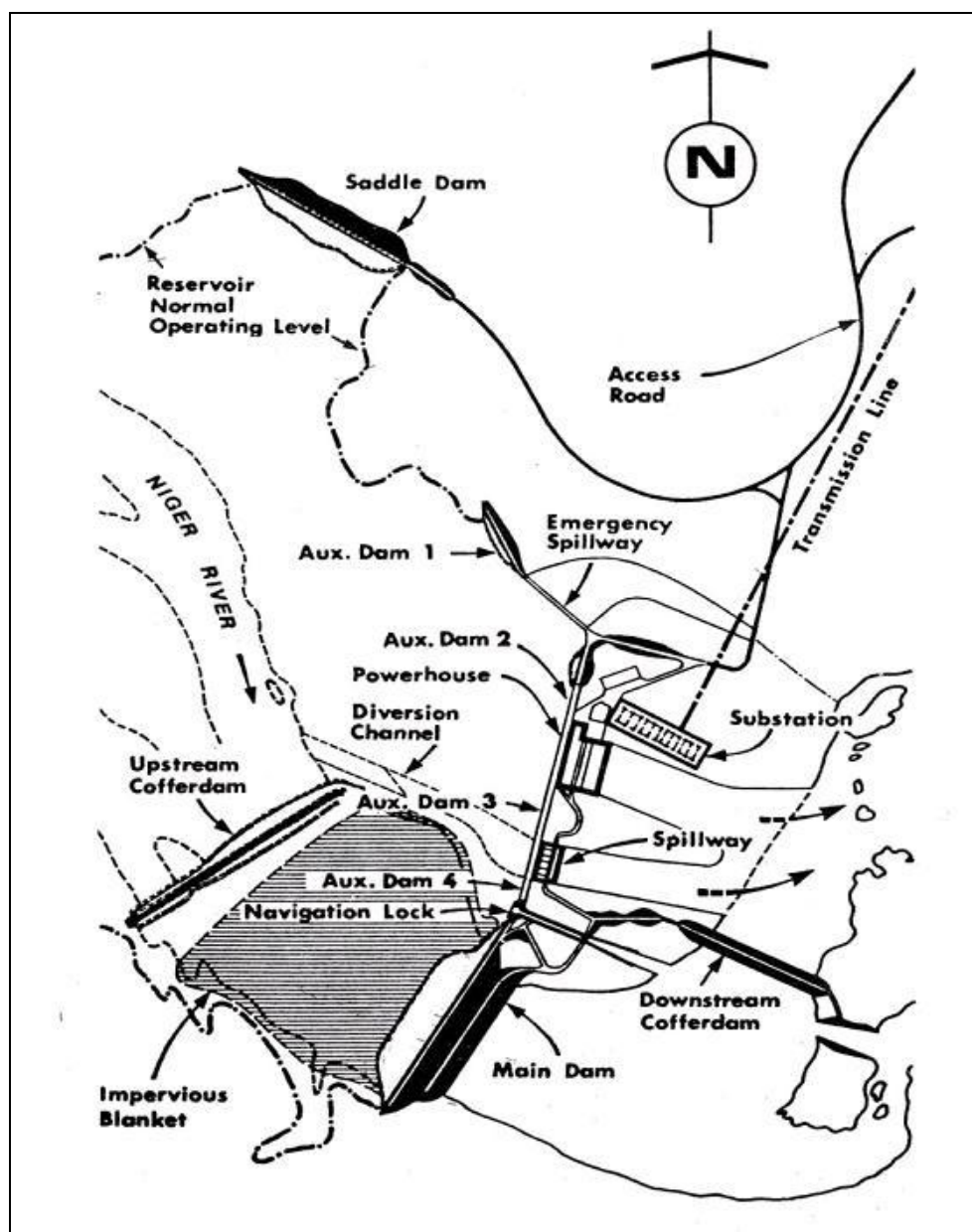


Table 9.2: Jebba HEP Plant – Technical Details

Date of Commissioning	16-Apr-85							
Dams	Type	Excavation (m ³)		Volume (m ³)		Length (m)	Crest el. (m)	Height (m)
		Rock	Soft	Concrete	Earthfill			
Main dam	Rockfill with earth core					670	108	40
Saddle Dam	Rockfill with earth core					540	108	29
Auxiliary 1	Rockfill with earth core					275	108	14
Auxiliary 2, 3, & 4	Concrete Gravity					337	108	26.5
	TOTAL		3,950,000	485,000	4,050,000	2000		
Spillway		Dimensions						
	Type	Length (m)	Height (m)	No.	Combined Capacity (m ³ /s)	Sill Elevation (m)		
	Radial gates in underflow chute	12	9.5	6	13,600 (El 103.0)	70		
	Emergency free overflow	220		1	16,400 (El 106.0)	103.15		
Intake Gates		Dimensions						
	Type	Length (m)	Height (m)	No.				
		10	12.4	6				
Penstocks		Dimensions						
	Type	Diameter (m)		No.				
	Steel lined	10		6				
Navigation		Length (m)	Width (m)					
		200	12.2					
Power House		Length (m)	Width (m)					
		206	36					
Generation	Unit No	Unit Power (MW)						
	1	96.4						
	2	96.4						
	3	96.4						
	4	96.4						
	5	96.4						
	6	96.4						
	Capacity (tonnes)							
Crane	450							

9.2.2 The Dam

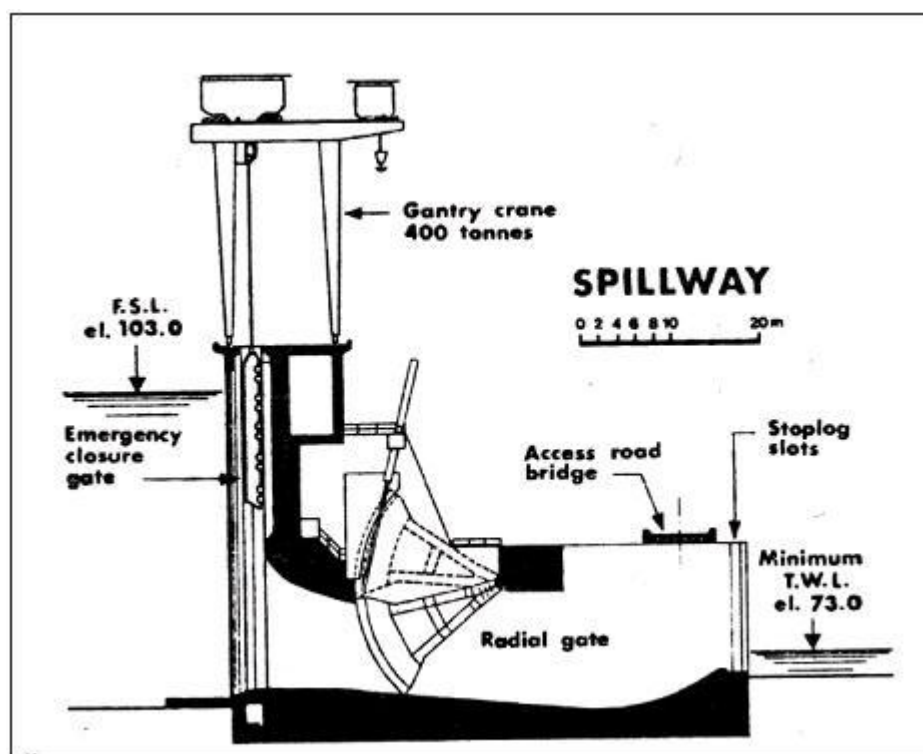
The main rock-fill dam is founded on 40-60m deep alluvial deposit foundation of pre-treated and vibro-compacted loose unconsolidated sand. The rest of the structures were founded on bedrock. The dam structures are all generally in reasonable condition apart from:

- Some minor general clearing of shrub and trees on the rock-fill of the saddle dam,
- Instrumentation to the main dam,
- Leakage and seepage on the left abutment of the spillway concrete structure, and
- Erosion to the side walls and excavations of the spillway return channel.

9.2.3 The Spillway

The spillway is a concrete gravity structure with six radial gates 12m x 9.5m controlling underflow sluice-ways with upstream emergency gates and provision for downstream stop logs. An emergency spillway on the left abutment appears to be in acceptable condition. The cross section of the Jebba spillway is presented in the Fig 9.2 below.

Fig 9.2: Cross Section of Jebba Spillway



The flood discharge in the order of 2000 cumec during Oct 2010 is shown in photo 9.1 below.

Photo 9.1: Flood Discharge Through the Spillway of Jebba Dam on 7th Oct 2010



Operation of the spillway radial gates is essential for the dam's safety. Consequently their maintenance is critical. However, the 2010 Annual Report states in Section 1.3.0.0 that water spilled for lake control was NIL from which it can be inferred that all discharge was through the turbines and the spillways were not operated during the year.

The requirement for regular operation of all spillway gates is emphasised in the Dam Safety Section below. It is noted that the maintenance schedule being used by JHEPLC of Routine Preventative Maintenance Requiring No Unit Outage includes a Bi-Annual Inspection and Servicing of Radial Gates.

We recommend that each spillway gate is operated through its full opening and closing movements at each inspection by an external expert as recommended in the Dam Safety Protocol in Appendix G.

9.2.4 The Lock

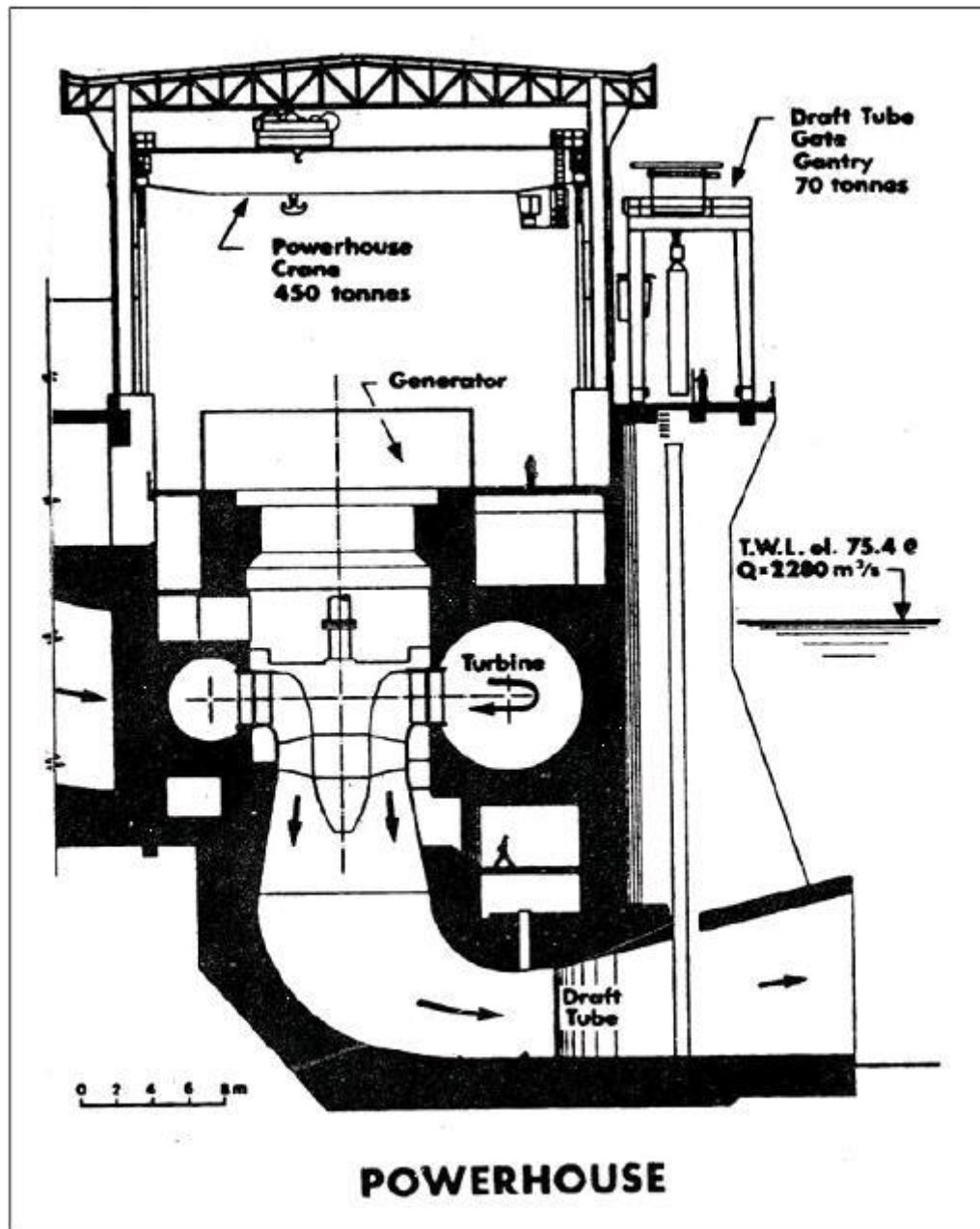
It is understood that the navigation lock is not operable currently. Although not ideal as a spillway facility, the navigation lock provides a means of last resort should spillway gates fail. We recommend that:

- The lock is rehabilitated as soon as possible to provide this emergency spillage capacity in the event of an extreme hydrological event,
- Once rehabilitated, the lock is maintained and demonstrated to be operable annually and at each Dam Safety Inspection.

9.2.5 Powerhouse

The diagrammatic section of the Jebba powerhouse is presented in the Figure 9.3 below.

Fig 9.3: Diagrammatic Section of Jebba Powerhouse



9.2.6 Trash Screens & Gates

Lifting and/or closing intake gates and cleaning trash screens are included in Jebba's Routine Preventative Maintenance Requiring Short Unit Outage and would be subject to checks during the required independent expert inspections.

9.2.7 Instrumentation

The sample framework of Dam Safety Protocol in Appendix G requires that an owner of a dam such as Jebba installs, monitors and maintains instrumentation to adequately monitor the performance of the dam. Jebba has satisfactory instrumentation installed but during the June 2010 site visit, the need for rehabilitation of some of this was identified. The original construction soils laboratory is now used as an Instrumentation Workshop.

Photo 9.2: Instrumentation Workshop



The main dam is a rock-fill structure that includes 66 no. remote-controlled piezometers (Photo 9.3). The 2010 Annual Report, in section 2.5.2.2 advises that no readings were recorded from these during the previous year because the readouts in the terminal building were not operable. Section 11 of the Dam Safety Protocol in Appendix G calls for an owner of a dam such as Jebba Dam to monitor, maintain or replace instrumentation installed at a dam to ensure continuity of readings.

Photo 9.3: Remote-controlled Piezometers Terminals



The main dam is founded on treated alluvium material and has a non-positive upstream blanket foundation extending 450m from the toe. Visible seepage is not possible while the dam's toe is submerged. Although there are pressure relief wells on the downstream berm these remote-controlled piezometers could provide essential data to monitor the condition of the embankment and the upstream blanket.

We recommend that:

- the remote-controlled piezometers are reinstated,
- their terminal boards are rehabilitated, and
- regular data collection for these piezometers is reinstated.

The inclinometers (Photo 9.4) continue to be read but an improved hook would assist with this.

Photo 9.4: Headworks of Inclinator



9.2.8 Flows through the Dam

Of particular concern is the fluctuating but apparently increasing flow from drain hole AD53 in Auxiliary Dam 3 on the left abutment. Potentially related to this is a spring that has developed over the last ten years through tar macadam surfacing to the level area downstream of this drain hole.

During the site visit on 17th June 2010 a simple procedure for measuring flow from the drain hole itself was suggested and a location was identified where this flow plus that from the spring could be measured to monitor this leak/seepage.

A small amount of particle residue was visible in a channel downstream of the darn AD53. It was reported by JHEPLC that this drain is cleaned of this sediment regularly but additional sediment then settles in the same place.

Whilst the seepage itself might not be a serious loss of water, any increase in flow from the drain itself gives some cause for concern. This increase in flow, when combined with the presence of material possibly being washed through the drain, indicates the possibility of internal erosion taking place.

If this is the case the problem must be addressed as it may be the first indication of serious degradation to the cut-off or foundation of this part of the dam.

Observation of excavated in-situ sidewalls (Photo 9.6) close to the spring (Photo 9.5) during the site visit on 17th June 2010 showed heavily jointed rock that, should it be present under the structure, might open when the spillway is operated and vibrations are transferred into the foundation.

Photo 9.5: Level Area Downstream of Drain AD53 with Spring



Photo 9.6: Side Wall Excavation to the Level Area Downstream of Drain AD53 (showing heavily jointed material).



Whilst remedial works might include grouting the foundation, such works would run the risk of sealing drain holes and introducing unacceptable uplift pressures on to the structure.

To protect the drains from blockage by further grouting it would be beneficial to identify the seepage path from the reservoir through the foundation, preferably the depth as well as the plan location, prior to any grouting.

We recommend that:

- the seepage path is located by a reputable procedure such as willowstick,
- any necessary remedial works are designed to ensure the drains are not blocked, and
- remedial works are carried out.

It cannot be understated that the safety of the dam is paramount to the continuing operation of the HEP, and the dam's ability to safely pass an extreme event flood. Dam Safety Instrumentation and the capability of the dam safety team to carry out their monitoring duties and analyses are essential. The capability of the dam safety team to successfully carry these out requires suitable equipment, transport, offices, computer facilities and workshops to maintain their equipment.

In summary the following deficiencies in the instrumentation and monitoring equipment were noted

- Instrumentation
 - Terminal boards for the main dam remote-controlled piezometers
- Monitoring equipment
 - Pneumatic piezometer read out loggers
 - Lifting hook for Inclometers
 - Equipment to measure seepage flows from Drain AD53
- Support facilities
 - Improved office IT equipment
 - Light repair tools for the workshop
 - 4 wheel drive twin cab
 - Working lights to all tunnels and adits
- External dam safety requirements
 - Identify the seepage path to Drain AD 53 and beyond to the spring in the downstream area by a reputable procedure such as willowstick
 - Design remedial works to this seepage/leak and carry them out.
 - There was a report about bed load accumulation on the upstream side of the dam, which consist of wood logs, remnant of cut trees and sediments. PHCN has already initiated steps to clear the bed load near the dam.

9.2.9 Storage of Documentation

Much of the original design information on Jebba Dam is probably available but it is not centrally located and not easily to hand. The drawing offices in Jebba contain numerous cabinets of drawings and documents that would be irreplaceable if lost or destroyed. Other useful documents were located in the library of the National Fisheries Institute.

A particular hazard to these hard copy documents is fire (see Chapter 12).

We recommend:

- All relevant documents are located.
- These documents are classified, registered, scanned and digital copies stored in more than a single location.
- Digital copies are made available to users as and when a local digital network and IT Department is developed.

9.3 Power Generation

9.3.1 Introduction

JHEPLC is one of the power generating companies under the control of The Power Holding Company of Nigeria PLC (PHCN). Income is solely from the sale of electrical power generated by each company and the rate earned per unit of power is set by national government.

Thus the only way to increase revenue and hence the operation and maintenance budget is to increase the amount of power generated and sold. However, a way to reduce the costs of its generation is to improve the load factor of each power generating unit, and the Jebba HEP as whole.

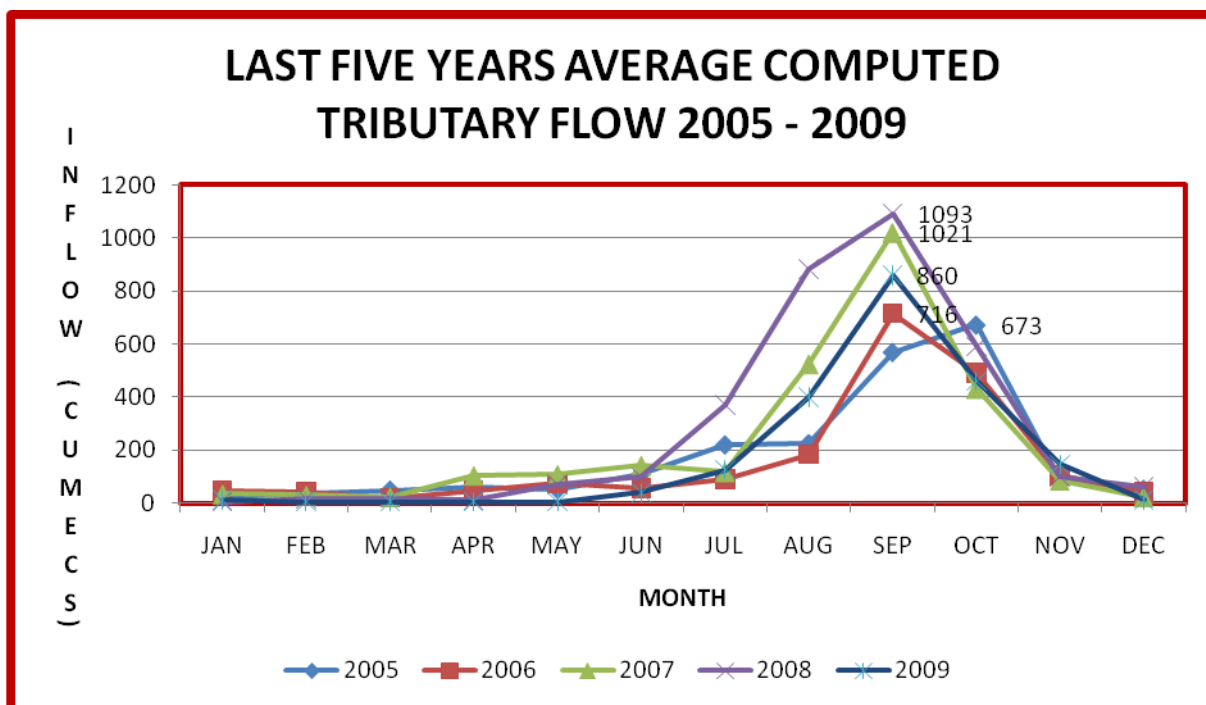
The amount of power generated is controlled by the quantity of water available, and its head, and also the amount of power the grid will accept at any one time.

9.3.2 Joint Operation and Kainji's Use of Rule Curves

In the initial proposal to develop the HEP potential of the Niger River in Nigeria the Jebba HEP was to follow directly after the completion of the Kainji project. Consequently the joint operation of the two schemes has been planned from the start.

Jebba's reservoir storage is significantly less than Kainji's. However, the run-off from the catchment area between the dams has a distinct impact on Jebba's generation, particularly during the high flow period between July and November. Jebba's 2010 Annual Report estimates these flows to be as shown in Fig 9.4.

Fig 9.4: Jebba Inflow Data



During the period that these flows are available to Jebba the releases from Kainji Dam can be reduced and so storage increased in that dam, i.e. the Filling Rule Curve becomes applicable.

A consequence of following this Rule Curve might then be a reduction in generation at Kainji. However, we have recommended that the Rule Curves at Kainji be updated following a review of the hydrology of the Niger River, and such updating will have to include the impact of these flows on the Rule Curves, and hence emergency generation, for both HEPs.

Nevertheless, the day-to-day operations are simplified at Jebba by, generally, a demand lead operation manual, and follows that of Kainji described above, i.e. in effect, the day to day operation is determined by

- availability of water,
- availability of plant, and
- demand, or grid system capacity, defined by National Control Centre (NCC) at Oshogbo.

9.3.3 Power Generation

A summary of power generation at Jebba during 2009 is provided in Table 9.3, taken from the 2010 annual report:

Table 9.3: Jebba HEP Power Generation 2009 (MWh)

	(MWh)
JAN	224509
FEB	216862
MAR	258166
APR	210797
MAY	208931
JUN	184341
JUL	148842
AUG	185801
SEP	276000
OCT	277397
NOV	247355
DEC	237859
TOTAL	2676860

The installed capacity at Jebba HEP plant is nominally as shown in Table 9.4.

Table 9.4: Jebba HEP Plant Nominal Installed Capacity (MW)

Unit No.	1	2	3	4	5	6	Total
Nominal Capacity (MW)	96.4	96.4	96.4	96.4	96.4	96.4	578.4
Nominal power (MWh)	844464	844464	844464	844464	844464	844464	5066784
Generation in 2009	535585	525995	653385	309142	532495	120455	2677057
Load Factor	63%	62%	77%	37%	63%	14%	53%

The load factors for units 1, 2, 3 and 5 were satisfactory. Those for units 4 and 6 were severely impacted by a fire incident in April 2009 that flooded the six units which were all out for the day of 22 April 2009. Unit 4 was back in operation August whilst unit 6 was still out during the site visit on 22 June 2010.

Inevitably these outages lowered the overall load factor but proposed works are intended to remedy this situation.

The staff of JHEPLC are to be commended for maintaining capacity at this plant but, as the plant becomes older, preventative maintenance becomes more important and the capability of the station to remedy outages requires properly equipped workshops and trained staff.

9.3.4 Operation and Maintenance

Following the rehabilitation of plant, it should be fully maintained as defined under the Operation and Maintenance Manuals. We have recommended that all Manuals are located, registered and digitised. These provide the basis for all O&M.

JHEPLC holds maintenance schedules and samples of these are given in the Operation Manual in Appendix H.

9.3.5 Workshop Requirements

Effective maintenance requires workshop facilities, equipment and appropriately trained staff.

The existing main heavy mechanical workshop is generally suitable. However, with some simple modifications an office, allowing full visibility of the workshop, might easily be constructed above the store room.

In addition, we recommend:

- full equipping of this workshop with machinery as identified by the appropriate staff.
- light tools.

The PC&M (Protection Controls and Metering) office and workshop requires improvement and additional suitable equipment if the staff are to respond to the increasing age of the controls and alarms. We understand that the PC&M maintenance staff have identified additional equipment they require to continue their work and we recommend that this is provided under WRD-SEM.

We recommend improved office and workshop facilities for this team and that the valuable manuals within these offices are identified and registered before being digitised.

The vehicle workshop is the original workshop used during construction (Photo 9.7), as is the mobile 60 ton crane (Photo 9.8). Whilst the workshop continues to serve its original purpose well, there must be concern that the original crane is fast approaching the end of its useful life. It is understood the crane would be required to move stop logs into place on the lock, in which case we recommend that the crane is tested and replaced should there be any doubt of its capability to carry out the role.

Photo 9.7 Vehicle Workshop



Photo 9.8: 60T Mobile Crane



There are also an aged 30 ton crane (Photo 9.9) and a forklift that will both require replacing before they become a risk of failing to operate in an emergency, when their operation is often critical.

Photo 9.9: 30T Mobile Crane



It is recommended that these workshops provide a mobile capacity to respond to breakdowns for which we recommend a four by four twin cab vehicle with towing capability and relevant light tools including an air pump.

9.3.6 Control Room

The control room of the plant is in good condition. However, it is based largely on analogue data transfer and readout. Some digitisation has been introduced.

JHEPLC maintenance staff will need some re-training prior to the turbine generator upgrades to make best use of new digital data readouts that will almost certainly be included with the new equipment.

9.4 Flood Management

Flood management at Kainji Dam (Chapter 4) directly affects flood management at Jebba HEP. Kainji's greater flood retention capacity must be used to attenuate the Black Floods and pre-release water to provide additional storage may also be needed. Jebba may not be able to fully utilise this pre-release flow for power generation in which case spillage from Jebba is inevitable.

White Floods from the intermediate catchment may also require releases with similar downstream impacts.

There are two direct concerns with extreme event floods:

- the capability of the structure to safely pass the flood waters without breaching and

- the safety of persons and property around the reservoir and downstream of the dam.

The need for maintenance and regular operation of the spillway gates is discussed above. The emergency spillway provides additional capacity and the navigation lock should be made operable to provide a measure of last resort.

The operation procedures for opening the spillway must follow the Rule Curve discussed above. We have recommended that the hydrology of the Niger River be re-analysed to a short distance below Jebba dam, taking into account the joint operation of both reservoirs to re-define new Rule Curves for emptying and filling of both reservoirs during day-to-day operation as well as for floods.

Kainji HEP collects hydrological data of the Niger River upstream from the dam as described in Chapter 5. Collection of hydrological data for the Niger River tributaries between Kanji and Jebba is carried out by Jebba's team.

The 2010 Annual Report notes that this team manages:

- manual staff gauges set up on these tributaries, the headwater of the reservoir below Kainji, and at different points of the tailrace to monitor the fluctuations of the water level at the tailrace channel,
- automatic water level recorders (AWLR) at both the powerhouse intake and on the Niger at Jebba Rail Bridge,
- a weather station at the dam site to collect hydro-meteorological data.

The staff gauges require regular maintenance following the White Floods and to quickly repair any vandalism.

We recommend that the current procedure of data collection and flood management is maintained. However, we recommend procedures are reviewed following the completion of the recommended hydrological study of the Niger River that includes a flood study, and procedures for improving transfer of data from gauging stations upstream of Kainji.

We also recommend that this study is extended to take into account data collection of the tributaries between Kainji and Jebba, the joint operation of Kanji and Jebba reservoirs, and improved data collection and transfer of inflow data from these tributaries.

We recommended above that Kainji's Flood Rule Curve is used in a simulation exercise to ensure staff are familiar with this procedure. We further recommend that this exercise is also carried out at Jebba.

The EPP incorporates the impact of floods defined in the O&M Plan on persons living both upstream and downstream of the dam, and is described in Appendix I as far as is possible at this stage. The absence of any flood mapping means that a vital component of the EPP is not available. Proposals providing inundation and other mapping are provided under the Environmental Management Plan in Chapter 14.

9.5 Flood Warning Communications

9.5.1 Current System

The existing communication system for Jebba dam is shown in Fig 9.5. There was indication during the field visit that upstream communities may not receive flood warning messages.

Fig 9.5: Existing Flood Warning Communication System at Jebba



The current system is satisfactory as an early warning system but is not suitable for emergency announcements.

9.5.2 Mitigation Measures

Flood warning messages should be extended to all upstream communities.

The flood warnings may be issued using a set of easily recognisable codes. The warnings should be communicated to the concerned at appropriate time (well in advance) and in a realistic manner.

The important issues while developing flood warning communication system are

- Range of communication messages and techniques should be employed (eg. Flood warning codes, flags, communication sirens, use of floodlines, etc.)
- More effective public participation should help build trust and better understanding between the public, community networks and the officials.
- The public cannot be treated as one target group as in reality they are made up of many different groups with different perceptions. For example, the public can be categorised as follows
 - Experienced regular flooders – people who are living on the fringes of the flood plain and having knowledge of flood management. These people must be involved in the flood management. They should be provided with enough

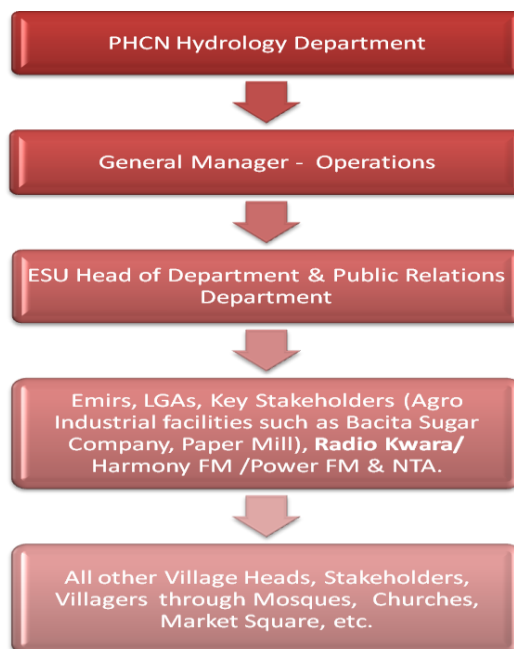
communication systems (eg. Floodline) to provide information and to ensure that they are taking enough steps to avoid damages.

- People with lack of understanding – those who have not been flooded but living in the danger zone have received information and do not understand the risk
- Information deficit – People who are not receiving the information and also those who moves into flooding areas
- Communication deficit – People who are difficult to reach. This may also include those whose physical or mental impairments require more resources to ensure that the message reaches them.
- Not at risk – People who will not be flooded but they need general awareness on flood.
- Third parties - A wide range of trades, institutes and professions, who are all involved with properties in the floodplain.

Identification of target groups & partners in flood management and development of flood warning codes & communication system are included in the service contract package 1.

Figure 9.6 proposes an improved flow of communication from JHEPLC Hydrology Department to villagers.

Fig 9.6: Recommended Flood Warning Communication System at Jebba Dam



In order to enhance the existing communication system and to develop a fully interactive system between the dam and the riverside communities, the communication equipment options explored during field investigation were as follows.

- Satellite telephony (Thuraya)

- Provision of Radio Booster Station
- Regular Radio and Television programmes to be conducted on flood forecast and water level situation report.
- The existing local radio broadcasting facilities
 - Radio Kwara - 99.0
 - Harmony FM - 103.5
 - Niger FM (Power FM)- 100.5

However, the most workable of the options explored are presented below as a result of the fact that more people in rural areas would find a portable radio set affordable, accessible and would require no maintenance from PHCN.

- Provision and enhancement of Radio Booster Station to Kwara Radio – MOD. 10B HARRIS upgrade from 2.5 kHz to 6 kHz. This would cover 150km radius, while the existing coverage is only 20 km radius.

JHEPLC should encourage the general public to listen to bulletins about water levels, discharges and flood flows both upstream and downstream of the dam on daily basis at a particular time.

The cost of broadcasting a five minute programme on the Kwara radio is expected to be in the order of N 10,000 per day per channel. The daily broadcast should have the following features:

- Water levels (upstream & downstream).
- Forecast of flood threat and its timing.
- Recommended steps to be taken in flood prone areas.
- Reasons for any reported anomalies given in layman's language.
- Use of English and local languages (Nupe).
- Aired at prime time as much as possible.
- Publicise JHEPLC's corporate social responsibility activities and other notable achievements.
- Publicise the benefits of the dam and its activities.
- Address any other issue relating to the activities of the dam.
- Programme to be interesting to listeners.
- Clear statement of JHEPLC's commitment to environmental and social responsibilities.

Following preparation of flood plain mapping, the management of KHEPLC should work with the local communities to create a safe emergency assembly point. This point should be well

publicised, villagers should be adequately informed and drills conducted. The safe assembly point should be selected bearing in mind the following features:

- Located on high points and easily accessible.
- To be completely away from the flood plain (to be determined by proposed mapping)
- Equipped with dedicated standby passenger canoes/boats, where necessary (depending on frequency of floods, accessibility of rescue aids, proximity to rescue aid, etc.).
- Conform to conventional safety standards.

10. IMPACTS AND MITIGATION PROPOSALS

10.1 Hydrology and Sedimentation

This aspect of the investigations is covered by section 5.1 *et seq.* above.

10.2 Soil Erosion and Catchment Degradation

10.2.1 Impacts

Villagers use firewood obtained from the land other than the protected areas and thus expose the land to erosion. Cultivation of the periphery of the lake, sometimes even on the flood plain, also increases the risk of erosion.

River bank erosion is visible just below the dam and also at Gungu and Ipata villages (Photo 10.1). The erosion at the tail race is due to the geology and activities during the construction of the dam, whereas the Gungu and Ipata villages are affected by erosion due to natural river meandering and the effects of the upstream bridge on flows.

Photo 10.1: River Bank Erosion at Gungu Village



10.2.2 Mitigation

Catchment degradation, especially of tributary catchments, should be assessed using satellite imagery taken from two different dates, a decade or two apart.

Based on the above catchment degradation assessment, the locations of erosion risk areas can be identified. A catchment management programme could be developed for the risk prone areas with external sources of funding. The programme could be managed through LGAs rather than by JHEPLC themselves.

Erosion at the tail race and at Gungu village should be studied in detail before proposing mitigation measures. This activity will be undertaken as part of WRD-SEM.

10.3 Water Quality

10.3.1 Impacts

Jebba power plant takes water from the river to drive the turbines and discharges water directly into the river without any form of water treatment prior to release. There is relatively little potential for contamination of waters prior to discharge. However, a number of processes within the plant and the associated offices may introduce both chemical and biological agents into the waters. Such activities include:

- Transport, use and storage of chemical agents used for electricity generation:
 - transformer oils;
 - lubricants;
 - electrolyte fluids for battery maintenance;
 - degreasers;
 - fumigants and pesticides; and
 - detergents and other cleaning agents.
- Release of sewage containing biological and chemical agents from sanitary facilities and kitchen areas.

It is also noted that oil from bunds surrounding transformers is collected via a central drain which discharges directly into the river.

The River Niger is currently used purposes other than power generation. These include:

- abstraction for use as a drinking water source by JHEPLC.
- direct use for domestic purposes by individuals in communities local to the river, such as for bathing, household sanitation and drinking.
- irrigation of crops.
- fishing.

The following section examines the existing impacts of these activities on the water quality of the Jebba Lake and River Niger in the light of Nigerian water quality legislation already presented in Chapter 2.

10.3.2 Monitoring

In accordance with current requirements of the Federal Ministry of Environment as outlined in The Nigerian Federal Government Regulation S.I.8 and S.I.9, monthly effluent discharge monitoring and analysis reporting is undertaken at JHEPLC. There are four sampling points at the Jebba plant, namely:

- Jebba camp water treatment intake
- power intake at the dam crest;
- tailrace; and
- Jebba Bridge.

The existing reporting process is undertaken on a monthly basis by Godirra Chemicals Ltd. Their reports detail methodologies for sample analysis, as well as providing an estimate of impact on water quality due to activities by JHEPLC. In addition every three months samples are sent to the Regional Water Laboratory Minna while FME have a mandate to take samples every six months but results are not available to JHEPLC and data collection is irregular.

Water sampling methodologies are not clearly outlined in the Godirra report, but are stated to adhere to standard WHO, United States Environmental Protection Agency and the Federal Ministry of Environment procedures. The impact on water quality is made on the basis of comparison with FEPA 1991 standards although this is not stated in the report.

Analytical results for the following parameters are reported, based on analysis undertaken by a certified laboratory (Unilag Consult – the University of Lagos Consultancy Services):

- pH;
- Temperature
- Conductivity
- Total dissolved solids
- Total suspended solids
- Biological oxygen demand
- Chemical oxygen demand
- Dissolved oxygen
- Total hardness
- Oil/Grease
- Turbidity
- Cations (Ca^{2+} , Mg^{2+} , Na^+ , Ca^{2+} , K^+)
- Anions (PO_4^{3-} , NO_3^- , CO_3^{2-} , SiO_3^{2-} , SO_4^{2-} , Cl^- , HCO_3^-)
- Extractable heavy metals (cadmium, chromium, copper, iron, lead, mercury, nickel, vanadium and zinc)
- Total hydrocarbon content.

10.3.3 Operational Impacts

On the basis of the assessment in the water quality monitoring reports, the impacts on water quality from power generation are minimal. On the basis of an evaluation of reports from February to April 2010, chemical and physical parameters for surface waters from the Jebba dam and immediately downstream remain within the prescribed environmental standards for industrial effluents.

Sewage from the power plant and associated office areas is collected centrally and released untreated to the river at the tailrace. The analytical results show a comparative increase in both heterotrophic bacteria and fungi within the tailrace sample collected, when compared to the intake waters. However, total coliforms, which in conjunction with the presence of faecal coliforms and faecal streptococci, would usually provide an indication of the presence of sewage related bacteria within water, were not detected. The current monitoring regime is not sufficiently robust to fully assess the potential for bacteria to be present and should be extended to include the above named bacterial parameters.

10.3.4 Conclusions and Recommendations on Operational Impacts

Overall impacts on water quality from power generation are minimal. However given the domestic and other uses of river water downstream of the power plant trade effluent standards do not provide the best means of assessment. The compliance with the standards for aquatic waters, as contained within Table 5 of the National Guidelines and Standards for Water Quality in Nigeria, in conjunction with the standards for trade effluents contained within the National Effluent Limiting Regulations is recommended to provide a more suitable means of evaluating water quality.

Sewage from the power plant and associated office should be collected centrally and pre-treated prior to release to the river, or prior to an alternative means of waste disposal. Water quality monitoring should include suitable bacteriological parameters to provide a better means of estimating potential impacts. Such parameters would include total coliforms, faecal coliforms and faecal streptococci, as described in the National Guidelines and Standards for Water Quality in Nigeria.

Similarly oil drained directly to the river must be collected and pre-treated, or otherwise disposed of.

10.3.5 WRD-SEM Impacts

The rehabilitation works under WRD-SEM comprise relatively minor engineering works. During implementation the following activities may have an impact on water quality:

- Release of oils, lubricants and degreasing agents from existing equipment being removed.
- Release of oils, lubricants and degreasing agents during the installation of new equipment.
- Increase in sewage volume due to the presence of additional contractor staff associated with the dam rehabilitation.

These impacts are expected to be minimal, provided appropriate waste management procedures are put into place during the rehabilitation process, such as will be achieved with

adherence to the steps detailed in the appended waste management protocol and plan. In addition to this, the increase in water volume downstream from the dam due to discharge from the spillway, should it be necessary during the rehabilitation works, will also help reduce the predicted impact of release of the substances listed above.

The implementation of management procedures should also ensure that incidental losses of oils, lubricants and other chemical agents be reduced during future operation of the power plant. Similarly, management procedures should be applied to significantly reduce the impact of sewage on water quality.

10.4 Terrestrial and Aquatic Flora and Fauna

10.4.1 Impacts

Abiodu (2009) identified 60 fish species in Jebba Lake. Fish production and fishing activity along the River Niger and the associated floodplains between Jebba and Lokoja is given below (Excerpts taken from FAO, 2010).

- The stretch of the River Niger from Jebba to Lokoja covers a distance of about 300 km with an estimated floodplain area of about 385,500 ha. This floodplain includes lakes (e.g. Lake Ndakolowu), swamps and marsh lands. A frame survey conducted in 1985 identified a total of 1,780 fishing boats (of which 503 were mechanized) and 5,193 fishermen, of whom 1,780 were boat owners and the rest assistants.
- Commercial catch statistics along this stretch obtained in November/December 1985 showed the numerical predominance of Tilapia (25.6%) followed by Synodontis (24.8%) and Labeo (8.3%), Citharinus (6.3%), Schilbe (6%), Mormyrus (5.6%), Bagrus (5.2%), Alestes (4.6%), Gymnarchus (3.3%), Clarias (2.6%), Lates (2.5%), Heterotis (2.2%) and Chrysichthys (1.4%). Other species of lesser economic importance included Auchenoglanis, Clarotes, Malapterurus, Heterobranchus and Distichodus.
- Tilapia also dominated the catch in terms of weight making up 20.1%, followed by Synodontis (15.1%), Citharinus (10.9%), Labeo (9.3%), Mormyrus (7.5%), Gymnarchus (7%), Bagrus (6.4%), Lates (6.3%), Clarias (4.7%), Alestes (4.1%) and Heterotis (3.1%). Other species of lesser importance included Chrysichthys, Schilbe, Clarotes, Auchenoglanis, Malapterurus, Heterobranchus and Distichodus. These made up less than 6% of the total landing of 610 kg of fish in the sampled villages. The estimated daily catch per boat along the stretch was 11.3 kg while the estimated total annual fish landing was 4,431.6 MT.
- Judging from the order of relative importance of species in the catch, no carnivores being dominant, it could be assumed that the bulk of the catch came from the floodplains rather than the main river channel, supported by the fact that the period of the survey coincided with the flood season.

10.4.2 Mitigation

Rural development projects, for example the GEF funded project of KLNP, could be extended to all the villages on the Jebba lake banks. JHEPLC can be engaged as a partner with LGA to implement this project in the close communities.

NIFFR could be contracted to conduct fisheries research and for creating awareness among fishermen about the use of right kind of gear nets and efficient ways of fishing.

The spillway rehabilitation work and the new dam operational procedures, based on the proposed hydrological modelling, will change the flow regime. This will have a low impact on existing flora and fauna and the suggested mitigation measures are sufficient for JHEPLC to support the close communities in the long run.

10.5 Public Health

10.5.1 Social and Environmental Audit Report (2006) Observations and Present Situation

Audit Result (Page 141-142 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The prevalence of the cases of waterborne diseases associated with the presence of the reservoir and consumption of non-processed water (No. 27).	Measure 4.1: To provide drinking water to the population through the construction of a water processing station Measure 4.2: To sensitise the riparian populations on the control of water borne diseases and their vectors.	The mitigation measures suggested by the CIMA report have not yet been implemented. The current public health situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

10.5.2 Present Approach

The World Health Organization states that about one third of the global disease burden in developing countries such as Nigeria could be reduced through available environmental health interventions and strategies (World Health Organization, 2010: Public Health and Environment in the African Region - Report on the work of WHO (2008–2009)). The impacts of works processes at JHEPLC are relevant to the following potential causes of adverse health impacts to the local community:

- lack of access to safe drinking water;
- air pollution (indoor and outdoor);
- poor domestic sanitation facilities;
- inadequate waste disposal;
- access to healthcare facilities;
- absent or unsafe disease vector control; and
- exposure to chemicals and injuries.

Other wider areas of potential exposure to increased impact on health are from climate change, the presence of persistent organic pollutants, electronic waste and radiation.

10.5.3 Existing Conditions

JHEPLC runs a well established hospital and life camp that treats both staff members and individuals in the local community. There are also state owned health centres to impart primary care to the people. The hospital provides paid consultations and charges for medicines to the public but is free for staff. The hospital section has staff strength of 71 distributed between the following departments:

- Pharmacy
- General and Maternity wards

- Laboratory section
- X-ray \ radiodiagnostic section
- Medical records section
- Canteen services section
- Laundry section
- Mortuary section
- Dam site clinic section
- Junior camp clinic
- Public health section.

The posters of Aids awareness are displayed in the powerhouse (See Photo below).

Photo 10.2: HIV/Aids Awareness Poster



Jebba hospital recently acquired a waste incinerator for the safe disposal of medical wastes.

The water treatment plant at JHEPLC also provides water to nearby residential areas. However, there is evidence that communities surrounding the plant, such as Jebba town, use water directly from the river for household use, and as a drinking water source. The water is also most likely used without prior treatment. The following diseases have been reported to be prevalent in the surrounding areas:

- Malaria and Enteric fever
- Gastroenteritis
- Cholera
- Bacillary and amoebic dysentery
- Schistosomiasis (Bilharzia)
- Pneumonia
- Chicken pox and Meningitis

- HIV/AIDS

Although there is very limited availability of statistics for disease incidence in the locality, water borne and water related diseases reported to the PHCN Hospital for the working year of June 2009 - June 2010 are included in Table 10.1 below.

Table 10.1 Staff Hospital Statistic of common illness from June, 2009 to June 2010

Syn- drome Months	Typhoid fever	Malaria Fever	Cholera	Snake Bite	Scor- pion Bite	Fish Bite	Sleep- ing Sick- ness	Bil- harzias	Machine Injuries	Road Traffic Accident by Vehicles	Motor Bike Acci- dent
Jun 09	35	236	15	10	30	5	1	2	12	25	35
Jul 09	53	223	26	10	32	8	0	3	8	15	25
Aug 09	48	362	6	5	18	0	2	2	5	6	8
Sep 09	32	332	0	10	22	0	0	1	7	10	10
Oct 09	28	248	0	7	18	2	0	4	10	5	25
Nov 09	22	210	0	3	10	0	0	3	5	0	2
Dec 09	22	192	0	5	8	0	0	4	5	6	5
Jan 10	26	189	0	5	10	0	0	1	6	9	7
Feb 10	18	218	0	8	6	0	0	0	4	5	6
Mar 10	36	268	0	5	10	0	0	0	5	9	18
Apr 10	25	138	0	9	18	0	0	0	7	0	12
May 10	23	269	0	10	12	0	0	0	6	4	0
Jun 10	18	189	0	6	23	0	0		4	5	3
Total	386	3074	47	93	217	15	3	20	84	99	156

The current means of communicating HIV/AIDS risks is by with posters near JHEPLC offices. Nationally run programmes on HIV/AIDS awareness also exist within the community. These are also largely linked to posters and also include radio announcements.

Table 10.2 shows the major water borne public health challenges facing the communities visited in and around Jebba dam.

Table 10.2: Major Public Health Issues in the Communities around Jebba dam

S/No	COMMUNITIES & LOCATION	MAJOR PUBLIC HEALTH ISSUES
1	Gungu Downstream Jebba	Cholera (during floods) Malaria Typhoid Fever
2	Ipata Downstream Jebba	Malaria Typhoid fever
3	Bukka Upstream Jebba	Measles Onchocerciasis (River Blindness) Malaria Appendicitis Hypertension Stroke
4	Gbajibu Upstream Jebba	Schistosomiasis (Bilharzia) Dehydration,

The poor condition of the primary healthcare centre at Gungu village is shown in the Photo below.

Photo 10.3: Primary Health Care Centre at Gungu Village



10.5.4 Mitigation

Upgrading of the Hospital: The 2010 Annual Report provides a list of requirements for the hospital covering facilities, medical equipment and appointments of staff.

Drinking water: Ensuring access to safe drinking-water and adequate sanitation, and encouraging personal, domestic and community hygiene are vital to promoting development, poverty reduction and health.

Household-level interventions can make an immediate contribution safety and would significantly contribute to reducing the incidence of disease where access to water is secure but household water quality is not assured. This is particularly relevant to areas where water

supply is taken directly from the river for domestic use without prior treatment. Suggested methods for water treatment in local communities include:

- *Solar disinfection:* This is undertaken by exposing water in disposable clear plastic bottles to sunlight for a day, typically on the roof of a house. A combination of heat and ultra-violet radiation from the sun are used to inactivate pathogens present in water. To be effective, solar disinfection must be applied to relatively clear water. This method is free and would use an abundant renewable sunlight resource but is not fully reliable.
- *Chlorination:* At doses of a few mg/litre and contact times of about 30 minutes, free chlorine generally inactivates greater than 99.99% of enteric bacteria and viruses, provided water is clear. Chlorine can come in a variety of sources, including solid calcium hypochlorite or liquid sodium hypochlorite. Household level chlorination has been implemented most commonly in combination with safe storage and behaviour change techniques, including social marketing, community mobilization, motivational interviewing, communication, and education.
- *Boiling:* If practical, households can disinfect their drinking water by bringing it to a rolling boil, which will kill pathogens effectively. In order to be effective, however, the treated water must be protected from re-contamination. Caution must also be exercised to avoid scalding accidents, especially among young children.

Public awareness

- *Water borne and water related diseases:* Public awareness schemes for water borne diseases have not been identified at Jebba Hydroelectric Plc. Public schemes on water treatment options (as outlined above) are recommended. The most effective means of undertaking this would be the provision of local training schemes by community workers in local languages.
- Workers present during the construction phase should also be made aware of safe practices for drinking water and of water related disease through worker safety risk assessments prior to project commencement.
- *Rapid Epidemiological Waterborne Diseases Survey:* This should be carried out in the Kainji area to determine the seriousness of waterborne diseases and to recommend treatment of infected people and determination of the next steps;
- *Communicable diseases:* Public awareness schemes for communicable diseases have not been identified at Jebba Hydroelectric Plc. Public schemes on water treatment options (as outlined above) are recommended. The most effective means of undertaking this would be the provision of local training schemes by community workers in local languages.
- Workers present during construction phase should also be made aware of safe practices for communicable disease in worker safety risk assessments prior to project commencement. These should include a listing of prevalent diseases such HIV/AIDS, meningitis and malaria, for which prophylactics can be sourced before departure.

Waste Management

- Exposure to waste from health-care activities and also construction activities is a potential risk to individuals, communities and the environment if not properly managed. It is of particular note that the majority of waste produced by healthcare activities is highly infectious.

- Further details on waste management procedures are included in the waste management sections of this report.

10.6 Cultural and Historic Sites

There are no cultural and historic sites expected to be affected due to this project intervention. However the following cultural and historic sites are in the vicinity.

- Mungo Park Monument, Jebba
- Juju Rock, Jebba

Villagers have reportedly tended to refuse relocation as a result of ancestral beliefs and attachment to their original locations, where their placentas were buried at birth.

10.7 Construction of WRD-SEM Components

10.7.1 Traffic

Heavy equipment and plant for the proposed rehabilitation is expected to be shipped to Lagos and then transported by heavy vehicles along the north expressway to the dam site, where mobile cranes will lift the goods to a location suitable for the in-situ cranes. The condition of the north expressway was particularly poor at the time of the site visit and the goods will need to be well packaged for protection and then well tied down. Were the rail network operating, this transport system would have been preferable, both in terms of security and in terms of a reduced carbon footprint.

Smaller and more sensitive equipment is expected to be delivered to Nigeria by air to Abuja and then transported by road to the site.

The additional volume of traffic is not expected to be a factor on both road systems, and the weight of the shipped plant and equipment is not expected to exceed the full 30,000l fuel bowzers currently using this road.

Notwithstanding this, it is essential to include within the contract documentation that the contractor is responsible for all aspects of transport including verification of the route and any weight restriction along the route, licensing and taxes.

10.7.2 Contractor's EMP

A full contractor's Environmental Management Plan is included in Appendix K. This will form the basis for enforceable contract provisions.

11. WASTE MANAGEMENT

11.1 Social and Environmental Audit Report (2006) Observations and Present Situation

Audit Result (Page 141-142 of 2006 Report)	EMP suggested at the CIMA Audit Report	Present Situation (2010)
The discharge of liquid waste directly in the river and the neighbouring lands (No. 30). The ignorance of existence of the refuse in the waters and lands both from the qualitative and quantitative points of view (No. 32). The absence of liquid and solid waste management plan (No. 33). The insufficiency of data enabling to quantify the liquid and solid refuse or even to conduct a mass assessment (No. 34). The lack of practice on filtration of exhausted oil by a recycling technique to minimise the volume of reject of exhausted oil. (No. 35). The absence of a programme for collection and disposal of dangerous waste (acids, oil, etc.) (No. 36). The non-secured storage of consumable products and materials in the warehouses and the real risk for the worker's safety, notably, in the event of accident or fire (No. 37).	Measure 4.5: To install the environmental cases with follow-up of the materials used. To find a system of follow-up of the materials with responsibilities and consequences. Measure 4.7: To adopt more safe practices in conformity with safety norms, like separation of new products from used products Measure 4.10: To develop and execute a programme for collection and storage of dangerous waste such as the rejection of worn batteries. Measure 4.15: To categorise the waste and make a mass balance of each unit of the infrastructure. Measure 4.19: To develop and execute a plan for management of waste. The said plan shall deal with solid and liquid waste as well as dangerous matter, recycling and integration of spontaneous recycling.	The solid and liquid contamination of open surfaces (apron, floors and workshop spaces) still continues. Domestic solid wastes and sewage management were discussed but not yet implemented. There is no comprehensive waste management plan as suggested by CIMA report. The current situation is elaborated further in the forthcoming sub-sections with mitigation measures.

11.2 Solid Waste

11.2.1 Current Situation

The main solid waste materials are as follows:

- Office materials such as paper, other stationary and furniture.
- Use and maintenance of machinery within hydroelectric plant, including packaging materials, machine parts and tools.

- Materials used in medical treatment such as syringes, wound dressings and medical drugs

The waste management practices at JHEPLC are generally well established. There are visible waste paper baskets in the HEP plant (see Photo 11.1) and associated offices as well as lidded bins for the disposal of refuse (such as food packaging waste) from daily activity within the plant and offices. These are placed at regular intervals and there is little evidence of litter in the offices and work areas.

Photo 11.1: Waste Bin at Jebba HEP



The workrooms in the plant and operating areas have well managed house-keeping procedure. However, a few large items are present within the generator rooms near the generator that is no longer functioning. There are also a number of unlabelled containers, and open drums that may lead to accidental spills (Photo 11.2).

Photo 11.2: Unprotected Open Oil Drum



It was noted that drums of transformer oil are placed in well controlled bunds with concrete floors but these areas drain (Photos 11.3 and 11.4) directly to the River Niger.

Photo 11.3: Oil Spills into Gutter Which Drains to River Niger



Photo 11.4: Oil Spills into Apron Which Drains to Gutter



The plant uses an integrated purifying plant for recycling of all transformer oils, and spent oils and other materials are removed for disposal via the stores. The stores comprise an organised system of filing for smaller items, with metal storage racks for spare parts, tools, plumbing materials and other hardware used in the plant. Larger items such as oil drums are stored outdoors on canopied concrete storage areas.

Sewage from the powerhouse and associated offices is currently released untreated into the River Niger. There is a disused waste treatment plant and incinerator that previously received sewage and domestic waste from the staff quarters.

11.2.2 ERD-SEM Project Impacts

a) Construction Period

Sanitary waste will be generated at the power plant consisting of human excreta or “night dirt” generated by the sewage system, and in any portable toilets (‘porta-loos’) that may be used by construction staff.

Refuse/rubbish (i.e., living area waste, kitchen waste, cafeteria waste, cleaning waste etc) will consist of the various wastes generated by the people who live at the Project-Camp and from the waste generated by the kitchen and cafeteria operations. The kitchen crews and the camp management will be responsible for making sure that camp generated refuse is properly managed. Wind can blow this refuse around the camp and animals and vectors can create unhealthy conditions. Therefore, effective housekeeping actions should be employed throughout the life of the Project.

Non hazardous wastes (such as food packaging, stationary, packing materials etc.) will be generated as part of the construction process. This waste does not pose a hazard to workers, but can be blown around the jobsite and beyond the jobsite perimeter. Therefore, effective

housekeeping actions should be employed throughout the life of the rehabilitation works to prevent this occurring.

Dunnage or waste from containers used to protect goods and their packaging from moisture, contamination and mechanical damage (such as wooden crating, packing materials, plastic shrink wrap, metal straps) will be generated. Often, this waste consists of plywood and 2"x4" wood attached to or surrounding equipment. The size varies from small pieces of scrap wood to full sheets of plywood and other lumber. In addition, there will be a large volume of metal "tie-straps" used to hold dunnage and bundles of materials together. When not properly stacked and managed, dunnage can become a safety hazard and a housekeeping mess. Staff working in machine maintenance should be responsible for maintaining housekeeping in those areas.

Hazardous waste in small quantities will be generated as part of normal construction activities. KHEPLC and its subcontractors should manage these wastes in an environmentally responsible manner and in accordance with best industry practices. KHEPLC and their subcontractors should be responsible for the proper identification, storage, and disposal of their hazardous waste.

A Hazardous (dangerous) Waste is defined as the following:

- Material in question is inherently "waste like" appears on the dangerous waste source list as contained in Schedule 11 of the National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 (Federal Environmental Protection Agency, 1991); or
- is a residue from the management of waste listed in Schedule 11 and Schedule 12; or
- originates from the sources listed Schedule 12 of the National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 (Federal Environmental Protection Agency, 1991)

JHEPLC should have a copy of this definition at the site for reference of site staff.

Hospital waste: There is a wide variety of biomedical waste generated within the clinic and hospital, comprising general waste (referred to above as refuse), pathological waste, infectious waste, pharmaceuticals, radioactive waste and sharps. Such materials require treatment prior to disposal to prevent the spread of infectious disease.

b) Operation

Wastes generated during the operational phase of the project will be the same or very similar to those already discussed in sub-chapter 11.2 et seq.

A Waste Management Plan during operations has been developed and is included at Appendix D.

11.3 Liquid Waste

The type, control and management of liquid waste have been discussed in the section covering water quality above.

11.4 Conclusions and Recommendations

Current site conditions indicate that JHPLC's waste management procedures are largely adequate for the management of waste generated at the site. Activities necessary to mitigate environmental impacts during dam operation are:

- collection and suitable disposal of office waste and site refuse; and
- provision of sewage treatment facilities for domestic sewage produced at the site.

The incineration of medical waste using appropriate equipment (in order to minimise environmental impact) is also recommended. In addition, a disused waste treatment plant and incinerator is located within the premises – this facility should be rehabilitated, as it still seems to accept sewage from the plant but is not in good working order.

A summary plan for construction phase waste management is included above, and in the attached waste management protocol.

A disused waste treatment plant and incinerator is located within the premises. The facility should be rehabilitated, as it still seems to accept sewage from the plant but is not in good working order.

We understand that all waste disposal activities are contracted out according to a directive from FME that they should procure registered contractors for these activities. Consequently there are no equipment requirements.

12. HEALTH AND SAFETY

12.1 Social and Environmental Audit Report (2006) Observations and Present Situation

Audit Result (Page 141-142 of 2006 Report)	EMP suggested at the CIMA Audit Report	Present Situation (2010)
The failure of workers to respect safety measures in the workshops and units (No. 28). The insufficiency of material and human resources at the health and safety department as well as a dysfunctioning which reduces its efficiency (No. 42).	Measure 4.3: To equip all workers out of safety equipment and to require the obligatory wearing of them in the work premises. Measure 4.22: To develop a provisional document for the management of health and safety. This document should deal with the mission of the department, its objectives in the short, medium and long run as well as all the procedures and activities related to health and safety. It shall include also the annual work assessment. Measure 4.25: To ensure that the fire protection equipment in place and to make an audit of the powerhouse by an Expert in the industrial safety. The expert should determine the required equipment as well as the place of each part of the equipment. Measure 4.27: To create and operate a committee of workers in charge of health and safety at work which shall be steered by the department of safety and focal points from each division of the company. This committee will be, among others, in charge of enforcing the measures on the wearing of safety equipment. Measure 4.32: To organise training sessions for workers on health and safety at work. Measure 4.33: To organise campaign of sensitisation for workers on safety using different means. In addition to the postings, theoretical courses and documentation, video film on accidents for instance can be shown.	There is no comprehensive health and safety management plan. Health and safety posters have been prepared and posted at important places. ERSU committee was formed as an institutional measure to look into H&S issue as a part of general Environmental and Social aspects. Some employees received H&S training as part of this assignment. The current situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

12.2 Our Approach

The current situation regarding the management of Occupational Health & Safety by JHEPLC has been evaluated against OHSAS 18001:2007. This standard utilises the 'process approach', which is common to other existing International Operational Standards (ISOs) and business management systems, of 'Plan, Do, Check, Act' (PDCA), which can be applied to any process. As a repetitive process to check the next action, a simple 4-step method to test information before making a major decision is given:

Plan – Establish the objectives and processes necessary to deliver the results in accordance with the organisation's OH&S Policy

Do – Carry out or implement your plan by performing the steps

Check – Check the results; measure and monitor against policy, objectives, legal and other requirements and report the results

Act – Act on the decisions based on those results and continually improve performance

12.3 Policy, Organisation and Responsibilities

JHEPLC has a Health & Safety Policy which was signed by the Managing Director of the National Electric Power Authority (NEPA) in 2001. Though not comprehensive, it covers the basic H & S requirements. Some of the inadequacies of this policy compared to OHSAS 18001:2007) are:

- It is generic. Corporate policies are required to be specific to the organisation or in the case of a very big organisation, with several facilities, to the specific facility in question.
- No date for review is indicated and it has not been reviewed for ten years. The Managing Director that signed it has not been with the organisation for several years.

Furthermore, for the policy to be effective, it has to be accessible and known to all staff. This is not the case. The only copies available are in the care of the Safety Officer and are not communicated to the other workers.

Unlike at KHEPLC there appears to be a more identifiable hierarchy of responsibility for safety. Though not formalised as a structure, the SO reports to the PM who in turn reports to the AGM (O).

The SO was recently appointed and is not trained or in possession of safety qualifications. He is in the process of getting certified by the Nigeria Institute of Safety Professionals (NISP).

12.4 Existing Safety Equipment

The fighting preparedness of the JHEPLC is evident in the new fire truck and fire tender on site (See photos below). This complements the existence of extensive fire detection and fighting system in all high risk environments on the facility.

Photo 12.1: New Fire Engine at Jebba



Photo 12.2: Fire Tender Equipment



However there are dangerous exposed wires found at few places (see photo 12.3), which needs to be tidied up for better safety of personnel working in the powerhouse and also to avoid fire hazard.

Photo 12.3: Exposed Wiring



12.5 Existing Safety Procedures

The JHEPLC has a Handbook on Unified Standard Safety Code which was published in September, 1992. This is however very outdated and it has not been reviewed in line with operational changes and procedures. Staff are unaware of its existence.

There are no job specific safety procedures and contractors are not vetted for safety compliance with the existing Handbook. A situation where the SO is not involved in assessing contractors' qualifications as far as safety is concerned should be discouraged.

Unlike KHEPLC however, JHEPLC does not have a documented Emergency Response Procedure.

12.6 Risk Control

The Unified Standard Safety Code published by NEPA and operated by the facility provides some risk control measures but is inadequate for a facility like Jebba HEP power plant. No risk assessments are carried out for tasks hence there is no documented RA which would show risk ratings prior to, and following risk moderation or mitigation. There are consequently, no Safety Method Statements (SMS) available to guide new workers in carrying out tasks.

There is a fairly decent, albeit informal, risk control mechanism in place at the facility. However, since the basis of the OHSAS 18001:2007 rests on documentation, there is a need for proper standardisation of risk control measures and procedures.

12.7 Existing Training and Safety Records

There is no budget allocated for safety training for the year. The SO, who actually assumed the position in 2010, attended a week-long orientation course organised in Abuja but has

received no other training since. There is no record that any training in safety has ever been carried out since the facility was commissioned. The absence of a training programme also extends to the fire fighting department.

There are few safety records. The facility however has records of the monthly safety committee meetings. Also seen were copies of the monthly safety reports submitted to the NERC. There appear to be no other records beyond these.

12.8 Communications and Inspections

The facility deserves commendation for efforts made towards communicating Health & Safety advice to workers through the use of posters. Various posters displaying different safety messages can be seen all over the facility. Worthy of note are the anti HIV/AIDS enlightenment messages strategically placed throughout the facility. The effort made to educate the workers, through posters, on fire and fire safety is also noted.

The limitations of these efforts are that posters are a reminder medium. More needs to be done in communicating with workers on safety issues. While safety committee meetings are held, there is no evidence that decisions reached are actioned and that the actions taken communicated to workers.

A behavioural change programme that involves an appraisal process where Health & Safety are the core values should be put in place. A process of continuously recognising and encouraging good H & S practice while discouraging infractions should be maintained.

Inspections are carried out daily and records kept. This is quite commendable and should be maintained.

12.9 Health

As with all government agencies, pre-employment medical tests are carried out on all employees. However, no periodic surveillance is carried out on staff. The facility also operates a no smoking policy and alcohol and drug use are forbidden although no tests are carried out to determine if this is the case.

Quite commendable is the fact that the JHEPLC is constructing more comfortable airconditioned cubicles for its staff who work on the generator floor. This will help reduce the ergonomic issues being faced by the workers.

A First Aid clinic is also maintained on the facility with a staff nurse while there is a hospital at the camp a short distance away. There are however no trained First Aiders. This should be remedied.

Housekeeping in JHEPLC could almost be described as excellent and should be maintained.

12.10 Other Issues

Of prime importance is the need to construct protective rails or guards along the top of the generators. The risk of a fall from a height while working is too high to be overlooked. NO

FURTHER WORK should be allowed from the top of the generators until the protective barriers are put in place.

Risk Assessments should be carried out to determine control measures and work specific safety needs.

12.11 Proposals for Change

12.11.1 Occupational Health and Safety

The success of any Health and Safety Management System (HSMS) depends upon commitment from all levels, and especially from Senior Management. It is strongly recommended that senior management, following findings that reflect lack of knowledge and understanding of occupational Health & Safety, undertake an induction on safety. This could include a workshop and discussion forum which would take in the requirements of OHSAS18001:2007 as well as relevant legislation particularly the Factories Act and the proposed OH&S Bill 2008. This will help drive the behavioural change that is required from the top.

Further to the above, it is recommended that management reviews the current organisation and considers the development of a bespoke OH&S structure within each organisation and allocates suitable and sufficient resources to enable implementation of any OH&S Management System decided upon.

The Health and Safety Management System framework (Appendix C) should be adopted through initial guidance and subsequent independent application, develop specific systems which reflect the full extent of operations and activities, and comply with current and forthcoming legislation.

Arrangements should be made for JHEPLC to obtain a multi-user licence for the use and distribution of OHSAS 18001:2007 and its associated documents, namely:

OHSAS 18002:2008 – Guidelines for the implementation of OHSAS 18001:2007

OHSAS 18004:2008 – Guide to achieving effective occupational health and safety performance....in order to instigate development of the systems approach to OH&S.

JHEPLC should appoint a suitably competent OH&S Officer (or properly train and certify those in place), with responsibility for reporting on all OH&S matters to the plant's Chief Executive.

12.11.2 Audits

Audits should be undertaken, internally and externally, in order to measure the development and process of continual improvement required by the Standard and legislation.

External Low Level Audits should be undertaken three months after the workshop presentation to ensure that the plants are staying on track with the requirements of the Standard and to provide further guidance where required or requested.

An External Full Audit should be undertaken six months following the Workshop to measure conformity and development. And a further External Full Audit should be undertaken twelve months following the Workshop to measure conformity and improvement.

Thereafter, internal auditing should be undertaken three monthly for a further year in order to facilitate development and familiarity with the policy and procedures of the organisation and the audit process. In all audits, the audit team should involve a representative of JHEPLC in order to participate and gain experience in the audit process.

Thereafter, it is recommended that internal audits be undertaken annually, to be no more than three months and no less than six months before the external Annual Audit.

12.11.3 Equipment Requirements and Additional Work

Arising out of this study the following equipment should be procured under the WRD-SEM Project. In addition a budget (Table 12.1) is proposed for making KHELPC compliant with the identified standards and undertaking audits over the first two years.

Table 12.1: Health and Safety Requirements for Jebba HEP

S/N	ITEM	BUDGET (US \$)
1	Ambulance	75,000
2	Atmospheric testing meters for confined space work x 2	5,000
3	Other PPE – hard hats, coveralls, Gloves, safety shoes, goggles, ear protection, etc+	10,000
4	Guardrails for generators	20,000
5	OHSAS compliance and establishment of an audit system	10,000
	Total	120,000

12.11.4 Short-Term Training

Three short-term courses were delivered during August 2010. The fundamental principle of risk control, which forms the bedrock of OH&S is the proper assessment of risks and the recommendation of proper control measures; this is an essential starting point for senior managers.

A Fire Warden course is a necessary component of any fire management arrangement. Furthermore, it is a legal requirement in both the Factories Act and in the extant OSH Bill 2008. Consequently, this course has been recommended for the lower cadre of staff.

A course on Working Safely in Confined Spaces will be run on the third training day. Outlines of these courses are given in Appendix F.

13. COMMUNITY RELATIONS AND MANAGEMENT

13.1 Social and Environmental Audit Report (2006) Observations and Present Situation

Audit Result (Page 141-142 of 2006 Report)	EMP suggested by CIMA Audit Report	Present Situation (2010)
The destruction of vegetation around the reservoir for domestic needs leading to a degeneration of forest from one year to the other (No. 31) The under-rating of potentials for development of socio-economic activities around the reservoir (recessional cropping, fishing, animal rearing, etc.) (No. 38). The persons displaced during the construction still have bitterness vis-a-vis the project despite the passage of time (No. 47).	Measure 4.11: To finance income generating supportive actions around and upstream of the dam (irrigated dry-season crops: market gardening crops, rice and fishing for example). Measure 4.12: To develop a basic infrastructural program (roads, water, electricity, etc.) for the populations of the dam region in order to enhance the living conditions in the villages. This program must be supported by a community development program. Measure 4.13: To develop and execute sub-projects for vegetation regeneration. Measure 4.14: To pull out the populations from the area of flood evacuation and develop, in consultation with the populations upstream of the river, a land exploitation scheme.	The current social situation is elaborated further in the forthcoming sub-sections with specific mitigation measures.

Methodology

Secondary information available on social issues in and around the dam was reviewed. A rapid assessment was made of the social situation in and around the Kainji Dam where KHEPLC has experienced social problems. The main aim of the assessment was to prepare a ToR for a detailed social survey. There are around 200 villages potentially impacted by either Kainji, Jebba or both dams and a survey of these villages has never been undertaken and is beyond the scope of this study.

Social investigations comprised visits to some four villages at each dam but there was no primary data collection of socio-economic information as agreed early on in the study.

Small group discussions and interviews were conducted with the village chiefs and other prominent villagers. The discussions covered their livelihoods, problems due to dam operation, flood management issues, flood warning communication, relationships with the dam management and local government, infrastructure development, public health issues and environmental issues (See Appendix E).

The outcome of the rapid assessments are presented in the following sections and we used the outcome to prepare a mitigation plan to improve the relationship between the communities and the dam management. For example we suggested improved grievance mechanisms and flood warning communication.

Since the social study requires a detailed survey, the development of a social monitoring system has not been developed and thus it is included in the procurement plan (service contract procurement package 2).

Prior to the implementation of the detailed survey a further rapid social assessment will be carried out to strengthen the social aspects of the ESMP. The outputs from the assessment will be contained in an addendum to the ESMP.

13.2 Current Situation

13.2.1 History since Construction

The effect of resettlement after the construction of Jebba Dam on the community is still vivid in the local memories (Gbajibu and Bukka villages). The most common problems in those villages are the same as for the Kainji villages – no water supply, poor access roads, no alternative livelihood and costly electricity. They claimed to have been earlier promised, free of charge by JHEPLC, a supply at the time of resettlement.

The occupations and needs of the villages visited are given in the table below.

S/No	COMMUNITIES & LOCATION	TRADITIONAL VOCATION	PRESENT VOCATION	MAJOR AMENITIES NEEDED
1	Gungu Downstream Jebba	Fishing	Subsistence Farming (sparing) & reduced fishing	Potable Water Employment Erosion Control Flood Control
2	Ipata Downstream Jebba	Fishing	Subsistence Farming (sparing) & reduced fishing	Flood Control Erosion Control Employment
3	Bukka Upstream Jebba (See Photo 13.1)	Fishing	Subsistence Farming (sparing) & reduced fishing	Employment Free Electricity Supply Police Station Potable Water Health Facility Schools Access Road
4	Gbajibu Upstream Jebba (See Photo 13.2)	Fishing	Subsistence Farming (sparing) & Reduced fishing	Schools & teachers, Good access roads, Potable Water Housing Reduction in electricity bill tariffs Employment Skill acquisition centres Acquisition of modern fishing techniques.

Photo 13.1: Bukka Village Group Discussion with Members



Photo 13.2: Gabjibu Village Group Discussion with Members



Jebba Dam is located in both Niger and Kwara states. However since Gungu village (the island) is located in Niger state, there is a perception in Gungu that the Jebba power house belongs to them, which led to a conflict between North and South Jebba.

The poor public relations created restlessness among the close communities and they barricaded the power house for two days in August 2008. Immediately after this incident JHEPLC constituted a 'Technical Committee of Close Communities for Jebba Dam Management' to discuss community issues on a quarterly basis. This action calmed the communities.

The downstream communities, including the Bacita Sugar Company, reported a flooding problem. Bele on the bank of the Niger and adjacent to Bacita sugar plantations was washed away during the 1998 flood. The villagers still live in nearly 200 ha of Bacita sugar plantations area illegally. Flood management is important for all the downstream communities.

13.3 Mitigation

13.3.1 Public Consultation

An initial stakeholder forum was conducted at the KHEPLC's conference hall on 28th January 2009. The forum was attended by World Bank representatives, NBA staff, representatives from FMAWR, FME, project staff of PHCN and KHEPLC, Borgu Emirate Council representative, Borgu Local Government, Federation of Borgu Youth, representatives from Nassarawa, Anfani, Awuru, Fakun and New Bussa villages and the press.

The main aim of the stakeholder forum was to introduce the WB Project to stakeholders including the close communities and to create a forum to discuss the social issues of all the close communities. Public Consultation, in line with WB OP4.10, was announced during the meeting, to be part of the current study, and to include discussion of the Environmental and

Social Management Plan (ESMP). The same stakeholders were invited and additionally NGOs such as CAPP, CDC and HYPPADEC. The Public consultation took place on 10th August 2010 and is reported in Appendix L.

13.3.2 Floodplain Mapping

The South Jebba villagers have shown the flood affected areas including the mark up to which the water level rise during the flood (see photo below).

Photo 13.3: Highest Flood Mark at Ipata Village



The floodplain mapping both upstream and downstream and demarcation of floodplain in the ground will help the communities to restrict the activities and thus avoid losses during flooding. The implementation of improved flood warning system will further reduce the losses during flooding.

13.3.3 Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) needs to be highlighted by JHEPLC. CSR is part of the ToR of the proposed ESU. Currently JHEPLC provide twelve boreholes for the neighbouring communities as part of corporate social responsibility. The locations are:

- 5 - Jebba South
- 2 - Gungu
- 2 - Kara
- 1 - Gana
- 1 - Mazhi
- 1 – Life camp

CSR activities are discussed in the quarterly Technical Committee. Awareness programmes should be conducted for all the communities on various issues as follows:

- Awareness on effective fishing techniques. Partial financial support may be provided.
- Awareness on alternative livelihood options. Participate at minor level in the Federal, State and Local Government sponsored infrastructural development, rural development, poverty alleviation and micro-credit projects.
- Awareness on the public health issues. Distributing leaflets on public health issues.
- Awareness on the benefit of dam, powerhouse and its related activities

Effective implementation of CSR activities depends on the formation of an ESU and the employment of a social scientist.

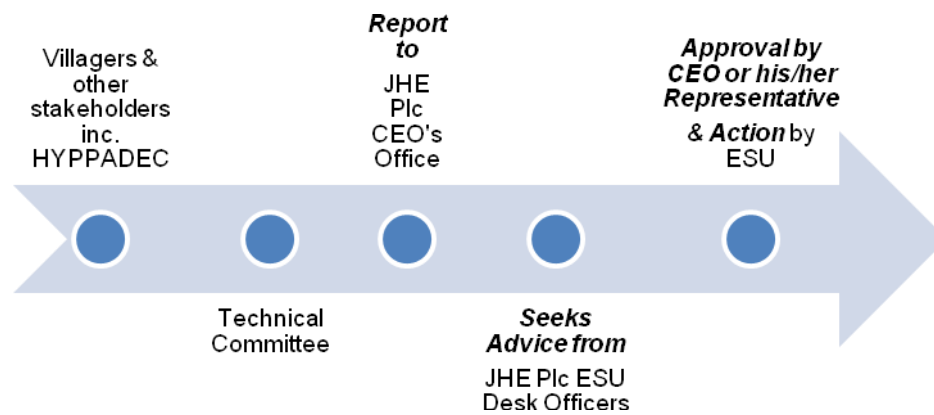
13.3.4 Grievance Mechanism

There is a need to institute a strong grievance mechanism within the enhanced communication system. This would be achieved by developing a flow of communication as follows:

- A free flow of communication should be developed between JHEPLC and all stakeholders, by maintaining interactive links. This should include regular interactive forums, sensitisation programmes, etc., which should be well publicised in order to obtain maximum participation.
- The interactive forums should not be less than monthly, and frequency may be increased as the need arises. At these forums, it is expected that representatives of all stakeholders would be in attendance, to discuss issues relating to the community and activities of JHEPLC.
- Similarly, JHEPLC should ensure the installation of an effective early flood warning communication system and the facilitation of necessary training programmes for relevant officers in the organisation.
- There should be transparency and interactive communication between all the organisations involved.
- The ESU should operate in close liaison with the communities and their representatives. ESU personnel should be equipped to understand community needs, and be able to communicate the same to JHEPLC top management for appropriate decision making.
- JHEPLC should develop a strategy to project the advantages of the dams eg. irrigation, tourism, etc., and should communicate same to the riparian communities and other stakeholders.
- HYPPADEC should play a facilitative role in grievance reporting, when the Bill establishing it, is signed into law.

The flow chart of the recommended grievance mechanism is given in Fig 13.1 below.

Fig 13.1: Flow Chart of the Recommended Grievance Mechanism



SECTION 4: ENVIRONMENTAL MANAGEMENT PLAN FOR KAINJI AND JEBBA POWER PLANTS

14. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Regular operation and maintenance mitigation activities, for effective management of hydropower and allied facilities, have been covered under each of the headings as mitigation measures in the Chapters above. We specifically highlight below some of the activities that are needed.

14.1 Hydrology

1. Development of an hydrological modelling and flood warning system

Purpose:

- To assess the flow available for optimal generation of power at Kainji and Jebba dams.
- To assess the sedimentation of the reservoirs.
- To provide early flood warning for dams operations.
- To prepare a flood warning system to the upstream and downstream riverside communities.

Objectives:

- Develop an interactive hydrological model and a decision support system to predict the inflow into the Kainji and Jebba reservoirs considering the existing and proposed upstream dams and their purposes and any climate change impacts.
- Prepare a revised water level-capacity relationship for both the lakes.
- Prepare floodplain mapping and identify the area affected by floods at various discharge levels in the river.
- Prepare a flood warning system.

Specific Objectives:

- Collect all the existing hydrological data and model for the study.
- Develop a suitable hydrological model to suit for the existing and proposed dams. Study should cover the whole Niger basin and the impact on the downstream effect in the Delta due to changes in the flow regime should be studied.
- Conduct a bathymetric survey of the existing reservoirs to obtain the sedimentation pattern and to provide the water level-capacity relationship of both the lakes.
- Sediment load sampling is implemented in the Niger River at Jidere Bode Gauging station and the main tributaries to the Kainji lake below this station and into the Jebba

reservoir.

- Install a telemetry system at appropriate places, especially to assess the White Flood.
- Interlink the model with the hydrometric stations to predict the flows.
- Conduct a dam break analysis.
- Revise the dam operating rules and flood rule curves based on the hydrological model.
- Develop flood plain mapping using satellite imageries or aerial photos.
- Interlink the model with the appropriate GIS system to predict flooded areas.
- Demarcate the flood plain areas on the ground from the head of Lake Kainji to the point where the Kaduna joins with the Niger. The rehabilitation or resettlement of the people living within the floodplain should be dealt separately by the GoN and it is not part of this assignment.
- Install a flood warning system (Koro and Kwara radio booster stations) by working with the Niger and Kwara States and concerned Local Governments.
- Develop a daily and emergency broadcasting system for both KHEPLC and JHEPLC.
- Preparing the Dam Safety Plans as per the guidelines provided and Conduct Potential Failure Mode Analysis (PFMA) Workshop for Kainji and Jebba Dam operators as per the US-FERC (Federal Energy Regulatory Commission) guidelines.
- Updating Emergency Preparedness Plan (EPP) including identification of safe locations for the lakeside and riverside communities during flooding beyond the maximum flood level.
- Train the appropriate staff (hydrology and ESU units) on hydrological monitoring, hydrological modelling, dam operating rules, flood warning system and Dam Safety Plans.

Methodology

Hydrological modelling and decision support system: Link the available Niger-HYCOS data collection system to forecast the flow into Kainji dam and similarly to forecast the flow into Jebba dam. The model must be a real time decision support model to take decisions based on the inflow and discharges. The development of model is expected to cost approximately US\$450,000.

Bathymetry Survey: The survey using Hummingbird 385 CI depthfinder with internal antenna (temporary mount attached to base of boat) would be cheaper at US\$ 100,000 when compared to use of Echosounder (HydroBat Multibeam Sonar Sensor) which would cost around US\$ 375,000. However the purchase of Echosounder (costs US\$220,000 including training) and conducting the survey by PHCN themselves is an option.

Telemetry System: The telemetry system is required for the inflow measurement from the tributaries, which is not covered under Niger-HYCOS project. The cost provision has been made for establishing two stations one on the major tributary on the u/s of Kainji dam and below the Jidere Bode NBA gauging site and the second one on the main tributary on the upstream of Jebba dam and below Kainji dam. The cost estimation is US\$ 45,000.

Floodplain mapping: The floodplain mapping is required from the headwaters of Lake Kainji to the confluence of Kaduna and Niger rivers. Conducting a LiDAR survey using Fugro Pelagias airborne survey will cost around US\$ 1.5 million, hence we suggest an acquisition of Worldview or GeoEye stereo images for preparation of digital elevation model (DEM) with an horizontal resolution of 2m and vertical resolution of approximately 0.5-2.0m. The cost estimation is US\$450,000

Flood warning communication: The daily broadcasting of water level and discharges in the river and increased frequency of announcement during flood times would be sufficient to issue the flood warning to the community. The only hindrance at the moment is the capacity of Koro and Kwara radio coverage.

- Provision and enhancement of Radio Booster Station – MOD. 10B HARRIS upgrade from 2.5 kHz to 6 kHz. This would cover 150km radius, while the existing coverage is only 20 km radius. This costs approximately US\$21,000 per site, which can be provided by the project. This proposal should be discussed with the respective Governments with respect to implementation since actions will need to be taken through Kwara and Koro radios, which are State Government run.
- Regular Radio and Television programs to be conducted on flood forecast and water level situation report. This costs approximately Naira 10,000 per day for five minutes, which can be taken up through PHCN budget.

Other works: It includes the sediment load sampling, demarcation of floodplain areas in the ground, EPP preparation, revising the dam operating rules, training, etc.

Implementation period: 2.0 years (from Jul 2011 to Jun 2013)

Contract Procedure: This activity can be obtained through a service contract

14.2 Catchment Management

The catchment degradation assessment, proposed below, should be undertaken after the assessment of sedimentation in the reservoir. The bathymetric survey will provide an idea of the locations of sediment deposition and its origin.

2 Catchment Management

<u>Purpose:</u> - To assess the catchment degradation and erosion status and - To reduce the sedimentation of the lakes.
<u>Objectives:</u> - Conduct a study on catchment degradation by assessing the changes in the land use pattern in the last ten years. - Prepare a catchment management plan.
<u>Specific Objectives:</u> - Obtain cloud free Landsat or SPOT imagery data for two years decade apart. - Groundtruth various land use patterns. - Study the land use changes in a ten year period. - Identify erosion risk areas. - Prepare a catchment management plan.
<u>Implementation period:</u> 4 months (from Jan 2011 to Apr 2011)
<u>Contract Procedure:</u> This activity can be obtained through a service contract

14.3 Dam Management

3 Dam Instrumentation at Kainji

The plan proposed below covers mainly the instrumentation requirement

<u>Purpose:</u> For dam safety and maintenance
<u>Objectives:</u> Replacement of the default dam safety instruments
<u>Specific instruments</u> - Instrumentation - Inverted plumbline - float and bath, base with marked steel - Blocked and damaged piezometers downstream of the saddle dam - Terminal boards for the main dam piezometers - Totalising weir below the saddle dam

- Monitoring equipment - Plumb micrometer, base and eyepiece
<u>Implementation period:</u> 4 months (from Jul 2011 to Oct 2011)
<u>Contract Procedure:</u> This activity can be obtained through a supply contract

4 Workshop Facilities at Kainji

The rehabilitation works required for the mechanical workshop and at dam are as follows:

<u>Purpose:</u> For efficient and safe operations in mechanical workshop
<u>Objectives:</u> - The oil and grease engrained flooring is removed and replaced with a suitable workshop floor material - Facility to collect and drain liquid wastes from plant is replaced - New machinery such as - a new digital heavy lathe - a new digital heavy drill press - Additional tool-boxes with tools and new replacement tools - Working lights to all shafts, tunnels and audits.
<u>Implementation period:</u> 4 months (from Jul 2011 to Oct 2011)
<u>Contract Procedure:</u> This activity can be obtained through a supply contract

5 Dam Instrumentation at Jebba

The plan proposed below covers mainly the instrumentation requirement

<u>Purpose:</u> For dam safety and maintenance
<u>Objectives:</u> Replacement of the default dam safety instruments
<u>Specific instruments</u>

• Instrumentation ▪ Terminal boards for the main dam remote-controlled piezometers • Monitoring equipment ▪ Pneumatic piezometer read out loggers ▪ Lifting hook for Inclinometers ▪ Equipment to measure seepage flows from Drain AD53 • Support facilities ▪ Light repair tools for the workshop ▪ Working lights to all tunnels and audits
<u>Implementation period:</u> 4 months (from Jul 2011 to Oct 2011)
<u>Contract Procedure:</u> This activity can be obtained through a supply contract

5 Dam Safety at Jebba

The seepage has been observed at the infiltration gallery and this requires a detailed study for taking a decision on dam safety.

<u>Purpose:</u>
• Dam safety
<u>Objectives:</u>
▪ Identify the seepage path to Drain AD 53 and beyond to the spring in the downstream area by a reputable procedure such as willowstick ▪ Design remedial works to this seepage/leak and carry them out
<u>Implementation period:</u> This proposal is underway

The PC&M (Protection Controls and Metering) office and workshop requires improvement and additional suitable equipment if the staff are to respond to the increasing age of the controls and alarms. We understand that the PC&M maintenance staff have identified additional equipment they require to continue their work and we recommend that this is provided under WRD-SEM. We await a list from PHCN to include in the report.

7 Workshop Facilities at Jebba

The rehabilitation works required for the mechanical workshop and at dam are as follows:

<u>Purpose:</u>
• For efficient and safe operations in vehicle workshop
<u>Objectives:</u>
▪ An aged 30 tonne crane and forklift requires replacement before they become a risk

of failing to operate in an emergency, when their operation is often critical. These workshops need a mobile capacity to respond to breakdowns for which we recommend a four by four twin cab vehicle with towing capability and relevant light tools including an air pump.
<u>Implementation period:</u> 4 months (from Jul 2011 to Oct 2011)
<u>Contract Procedure:</u> This activity can be obtained through a supply contract

14.4 Water Quality

14.4.1 Management

A Quality Management System for water quality monitoring should be introduced as follows:

- The system for water quality monitoring should be fully documented in a quality manual.
- A person with overall responsibility for monitoring should be identified along with the persons responsible for technical aspects of the monitoring process.
- This scheme should be documented in an organisational chart with defined lines of responsibility.
- A clear document control system must be in place, to ensure that only the latest versions of documents and procedures for water quality monitoring are in use.
- All documents and amendments to documents must be authorised.
- Records must be kept to provide an auditable trail from definition of sampling programme to results reporting.

14.4.2 Sampling Design and Process

The sampling schedule should be documented in advance of an assessment period, at frequencies stipulated by the Ministry of Environment. The current procedure with monthly monitoring is considered adequate for water quality management.

The use of a third party contractor for some or all aspects of sampling and analysis is acceptable.

Technical quality of the analytical laboratory is the responsibility of the laboratory themselves, but can be demonstrated by (for example) ISO 17025, an international standard that specifies the general requirements for laboratories to demonstrate their technical competence.

Discharge sample points should be at a location that ensures that the sample is truly representative of the discharge – it should be sufficiently far downstream of the inflow that mixing is complete. The sampling point locations should be agreed, documented and clearly and permanently labelled.

Samples should include one taken in an area of high turbulence and good mixing, usually at the centre of the discharge, in order to prevent the inclusion of solid materials.

Samples in channels should also be collected away from the sides and bottom of the channel to avoid contamination of the sample with sediment and biological growths.

For all samples, sufficient depth of water to submerge the sampling container without disturbing the bed should be ensured, unless sediment samples are required. There should also be sufficient clearance over the side of the bank or structure when suspending the container, to avoid dislodging potentially contaminating material

When sampling from chambers such as manholes, it is necessary to ensure that disturbance of deposits from the cover when the cover is lifted and to prevent contamination of the sample from the chamber walls and any bottom deposits. Sampling staff should be aware that manholes and similar confined spaces can be dangerous and must not be entered unless in accordance with a safe system of work and after appropriate training.

If preservation of samples by refrigeration is required (based on the analytical requirements), transportation and subsequent storage of samples, including retention time in an automatic sampling device, the sample storage environment should maintain a temperature of $5\pm3^{\circ}\text{C}$. This can be maintained using ice packs, refrigerators or other appropriate methods.

The organisation carrying out sampling should have appropriate procedures for demonstrating that this has been maintained. Samples should be transported in cleaned and disinfected, sealed containers, with examination of the samples undertaken as soon as possible after collection. Every attempt should be made to start the examination within 24 hours of sample collection. Where logistics do not allow this, samples may be examined up to 48 hours after collection provided they are kept cool ($1-5^{\circ}\text{C}$) and in the dark.

Sample containers should be appropriate for the determinant and analytical system being employed, as supplied by the analysing laboratory. Sample containers should not be rinsed with sample before filling unless specified in the sampling procedures - preservatives are often added to sample containers before they are dispatched from the laboratory, and these containers should not be rinsed.

Sampling personnel must take note of laboratory requirements regarding the filling of sample containers, for example some tests will require no air space be left after filling to stop loss of volatile components, while others need space left in the bottle to allow addition of extraction solvents when reaching the laboratory, since failure to carry out laboratory instructions on the use of sample bottles may lead to invalid analytical results. This will prevent rejection of improperly presented samples.

Operators should fully document the procedures used in sampling, and should document:

- (a) the precise location of the discharge, spot sampling point and automatic sampler installation as appropriate;
- (b) the sampling process;
- (c) the conditions of storage and transport of samples;
- (d) the types of bottles or containers and their closures;
- (e) the cleaning procedure for each type of bottle, container and closure;
- (f) details of any sample preservation measures;

- (g) calibration and maintenance of automatic samplers, timers and thermometers etc;
- (h) provision of records and information, such as information on the training of those who take the samples or the automatic sampler installation and testing record;
- (i) actions to be taken in the event of automatic sampler failure; and
- (j) quality assurance procedures for sampling activities.

These procedures should be part of the quality management system and should be available to all staff that undertake sampling.

The performance of field measurements should be verified for each batch of samples taken. Control samples should be taken and analysed with the batch of samples they are associated with and may include:

- blank samples;
- spiked samples;
- duplicate samples; and
- reference materials/samples.

14.4.3 Target Areas for Monitoring

PHCN should undertake the following:

- Continue the monthly monitoring regime currently undertaken for waters;
- Include the assessment of bacteriological parameters within the analytical regime – specifically the assessment of total coliforms, faecal coliforms and faecal streptococci;
- Incorporate a comparison of water quality standards for aquatic life within the current monitoring programme, including additional analytical parameters;

Water sampling reporting should also adhere to the following protocols:

- A detailed description of sampling depths, time of sampling, sampling vessels used and the treatment of all samples prior to delivery to the analytical laboratory; and
- A comprehensive chain of custody reporting regime showing treatment of samples following delivery to the analytical laboratory.

The management of sewage effluent and workroom drainage should be included in a waste management review.

There is no budget provided for the water quality component as the monitoring is going on now.

14.5 Terrestrial and Aquatic Ecology

8 Measures Through NIFFR

NIFFR should be involved in mitigation measures for declining fish production. This component can be taken up as part of WRD-SEM project. The KHEPLC and JHEPLC should take care of management of aquatic weed infestation with their own funds.

Purpose:

- To understand why the fish production is declining and taking measures to stabilise the fish production.
- To create awareness among the fishermen about the efficient fishing and to remove the perception that construction of dam hampered the fish production
- To reduce the aquatic weed infestation
- To create awareness among the close communities on alternative livelihood options

Objectives:

- Conduct a fresh study on existing aquatic weed infestation in both Kainji and Jebba lakes
- Study socio-environmental factors that affect the fish production
- Carry out mechanical and biological water weed control measures
- Conduct training to fishing communities to enhance the efficiency of fish production
- Develop a system for financing the fishing communities for the purchase of right kind of gearing net.
- Prepare alternative livelihood options and impart training to the communities

Specific Objectives:

- Prepare a weed infestation map of Kainji and Jebba lakes
- Prepare a plan and implement the mechanical and biological water weed control
- Conduct a survey on existing fish production and find out the causes for declining fish production
- Carry out an awareness campaign in the villages surrounding both Kainji and Jebba lakes about the efficient way of fish production
- Prepare alternative livelihood options for the communities and implementation modalities
- Explore financing opportunities for the fishing communities for the purchase of right kind

of gearing net and boat.

- Explore financing opportunities for the communities to take up an alternative livelihood options
- Create awareness campaign or training programme to selected communities on alternative livelihood options and available financing opportunities.

Contract Procedure: NIFFR should be involved in this activity but the procedure has to be finalised between PHCN and NIFFR.

14.6 Public Health

9 Dam Public Health Awareness Programmes

The hospital upgrade can be undertaken as part of the PHCN/Project budget. However we suggest that public health awareness programmes could be taken up under the Project. The awareness programmes can be taken up with the help of NGOs. The proposal is as follows.

Purpose:

- To reduce the general water borne diseases by creating awareness about healthy practices
- To reduce the spread of both water related and communicable diseases

Objectives:

- To conduct a rapid epidemiological waterborne diseases survey in Kainji and Jebba dam areas to determine the seriousness of the waterborne diseases and treatment of infected people
- Regular awareness programmes about waterborne and communicable diseases are to be conducted for both the staff and the communities

Specific Objectives:

- Prepare pamphlets and leaflets about the common diseases and preventive measures and deliver to the communities just before the spread of diseases
- Carry out a rapid epidemiological waterborne diseases survey in Kainji and Jebba dam areas to determine the seriousness of the waterborne diseases and treatment of infected people
- Conduct regular medical camps in the villages to support the rural communities
- Conduct regular awareness campaigns to the staff

- Conduct pre and post awareness and medical check-up for the contract staff engaged in rehabilitation works

Contract Procedure: Either the work can be taken up through the existing medical facilities at Kainji and Jebba or through a service contract with NGOs.

14.7 Community Development and Social Survey

The ESU should facilitate the LGAs and HYPPADEC, once established, to ensure that the close communities are receiving development activities such as roads, electricity supply, water supply, sanitation, school, health centres and community centres. Wherever it is feasible some of the activities can be undertaken directly after it is discussed in the Technical Committee of the Closed Communities. Budget provision is not made for this activity as it is outside the purview of the WRD-SEM projects.

The PHCN, both at Kainji and Jebba, has to ensure that the boundaries of their estate within township should be demarcated and fenced. This would reduce the tension between the community and the PHCN in the long run. This activity should be undertaken under PHCN's annual budget as it is outside the scope of the WRD-SEM project.

However we suggested a project to identify an alternative livelihood options for the close communities (see sub-chapter 14.5 above).

10 Social Survey

An important out come of the August 2010 stakeholder forum at both Jebba and Kainji was the need for a thorough understanding of the communities affected by the dam. It is understood that up to 200 communities may have been affected by the construction of either one of the dams and that the needs of only a very small minority, mainly in the immediate vicinity of the dams, have been voiced or responded to in anyway by KHEPLC or JHEPLC.

Consequently we have included proposals for a social survey in the ESMP to provide a baseline both for future CSR activities and also to provide a focus for the new ESUs socially based work programme as follows:

Purpose:

- To provide baseline information on up to 200 communities which have been affected by the Kainji-Jebba projects over the last 40 years.
- To provide information for the proposed ESU and PHCN to plan community interventions under either the ESMP or CSR.

Objectives:

- It is believed that the large majority of the affected communities are not reached by any current CSR activities and socio-economic conditions are unknown. The baseline survey will rectify this.
- The socio-economic survey will compliment flood plain mapping in the target area from the head of Lake Kainji to Pategi below Jebba.
- The survey will provide information on population status, socio-economic activities, social

conflicts, public health and other factors.

- The survey will also feed into other areas of support proposed under the EMP notably fisheries and public health.
- The survey should include a Rapid Epidemiological Waterborne Diseases Survey to be carried out in the Kainji and Jebba areas to determine the seriousness of waterborne diseases and to recommend treatment of infected people and determination of the next steps;
- The survey should be participatory in nature using participatory techniques to elucidate village resources, communications, problem ranking etc.
- The survey will be gender sensitive and particularly focus on the need for women's empowerment.
- Provide a guide for livelihood options and a focus for PHCN CSR actions and interventions.

Execution suggestion

- The survey will require a team of approximately six social facilitators (social science graduates with 5 years experience) working under the immediate direction of an experienced socio-economist / sociologist who might be a new member of the ESU.
- The team should be lead by an independent environmentalist / social scientist.
- Duration approximately ten months to be conducted following availability of mapping.
- Field resources required boat and 3 motorbikes.
- Possibly executed in conjunction with NIFFR.

(See procurement document for more details)

14.8 Waste Management

11 Waste Management Kainji

Discussions with management indicate that all solid waste disposal activities are contracted out according to a directive from FME that they should procure registered contractors for these activities. Consequently there are no equipment requirements. However the following facilities are suggested for waste management at Kainji Dam site.

Purpose:

- Efficient waste management at the Kainji dam site

Objectives:

- the provision of lidded bins for office and site use;
- pipe sealing materials for machinery;
- provision of containment/barrier surfaces (such as concrete slabs or pallets) in

the 'Stores' area to prevent incidental loss of oils to surrounding ground; and • provision of sewage treatment facilities for site based domestic sewage. • The incineration of medical waste using appropriate equipment (in order to minimise environmental impact).
<u>Implementation period:</u> 4 months (from Mar 2011 to Jun 2011)
<u>Contract Procedure:</u> This activity can be obtained through a supply contract

12 Waste Management Jebba

Disused waste treatment plant and incinerator is located within JHEPLC premises – this facility should be rehabilitated, as it still seems to accept sewage from the plant but is not in good working order. It is expected to cost around US\$ 150,000 to upgrade the waste treatment plant and the incinerator.

14.9 Health and Safety

The following health and safety equipment should be procured under the WRD-SEM Project. In addition a budget is proposed for making KHE PLC compliant with the identified standards and undertaking audits over the first two years.

13 Health and Safety Kainji including 14 Fire Engine

S/N	ITEM	BUDGET (US \$)
1	Complete automated fire detection and suppression system including all accessories to be installed in the entire facility. A new integrated system should cover both the operational and administrative areas.	75,000
2	New fire truck with Breathing Apparatus and fire resistant coveralls, Fire hard hats, etc	350,000
3	Ambulance	75,000
4	Atmospheric testing meters for confined space work x 2	5,000
5	Other PPE – hard hats, coveralls, Gloves, safety shoes, goggles, ear protection, etc+	20,000
6	Pedestrian protection and barriers. They should be portable and put in use wherever the need arises. This will be especially in areas where there are manholes and shafts that are presently loosely protected with makeshift barriers, sometimes using fire extinguishers and webbing.	10,000
7	OHSAS compliance and establishment of an audit system	20,000
	Total	555,000

15 Health and Safety Jebba

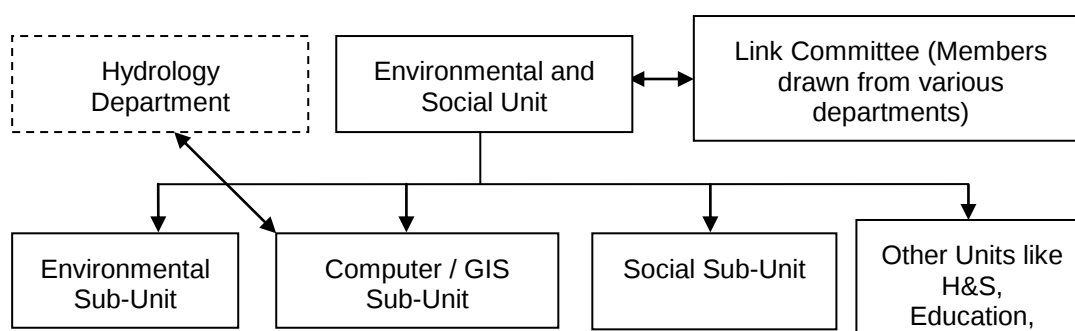
The following health and safety equipment should be procured under the WRD-SEM Project. In addition a budget is proposed for making JHEPLC compliant with the identified standards and undertaking audits over the first two years.

S/N	ITEM	BUDGET (US \$)
1	Ambulance	75,000
2	Atmospheric testing meters for confined space work x 2	5,000
3	Other PPE – hard hats, coveralls, Gloves, safety shoes, goggles, ear protection, etc+	10,000
4	Guardrails for generators	20,000
5	OHSAS compliance and establishment of an audit system	20,000
	Total	130,000

14.10 Development of an ESU

14.10.1 Proposed Structure

The current ERSU situation is discussed in chapter 3 above.. The proposed ESU structure for each dam is as follows.



The ESU should have three new sub-units to cover environment, social and Computer / Geographical Information (GIS) requirements. The environmental unit will cover both dam safety monitoring and external environment aspects. The social unit will cover community affairs and flood warning communication. GIS should be brought under the ESU as GIS is required for monitoring and its inclusion would avoid establishment of another individual unit. The Computer/GIS sub-unit should have a manager and two officers; one for IT hardware and software support and the other specifically for digitisation and GIS aspects. The IS/GIS sub-unit will work closely with the Hydrology Department in relation to data handling.

Though Kainji and Jebba dams have their own ESU, these units should meet regularly to discuss the common issues between the two systems and also to share experiences.

14.10.2 Functions

The new ESU should have full-time staff to deliver the following.

- (a) Implement the complete environmental and social monitoring system suggested in the ESMP.
- (b) Create good relationship between the communities and other stakeholders through conducting regular (quarterly and half-yearly) meetings.
- (c) Report on a regular basis to the management on the environmental and social issues and suggest solutions to problems.
- (d) Issue flood warnings to the public and other stakeholders following the flood warning procedures.
- (e) Undertake corporate social and environmental responsibilities.
- (f) Monitor the contractor's EMP. The details are given in Annex I.
- (g) Identify sources of funding for local community improvement.
- (h) The Computer / Geographical Information System sub-unit should undertake the following:
 - i) Support the Hydrology Department in monitoring inflows and water levels and present them in an appropriate GIS system.
 - ii) Support all departments in IT maintenance.
 - iii) Maintain data related to various departments and link it with the proposed environmental and social monitoring system.
 - iv) Support the Hydrology Department and Social sub-unit to issue the flood warning notice.
 - v) Digitise all drawings and maps that are available in the dam offices.
 - vi) Maintain a library.

14.10.3 Management

The current ESU committee will be the main link between various departments and the ESU. The committee should be renamed as the Link Committee to implement ESU recommendations and to support ESU activities.

The other existing units such as Education, Medical and Fire & Safety units should be brought under ESU.

We do not expect that the establishment of HYPPADEC will improve the relationship between the community and PHCN at least in the immediate future. We think the appointment of a full-time Social Manager would help to tackle the social problems either through HYPPADEC or directly.

Staff Qualifications

The minimum qualification and experience requirements for these managers are as follows

- The ESU Assistant General Manager should have a minimum of Master Degree in environment or social related subjects. He/She should have minimum of 15 years experience in the natural resource management mainly related to water resources monitoring and management. He/She should have prior experience in the corporate sector, monitoring the environmental and social aspects.

- The ESU Environmental Manager should have a minimum of Master Degree in environment related subjects. He/She should have minimum of 10 years experience in the water resource management. He/She should have prior experience in the corporate sector -monitoring the environmental aspects.
- The ESU Social Manager should have a minimum of Master Degree in social related subjects. He/She should have minimum of 10 years experience in the rural development, communication and public relations. He/She should have prior experience in the corporate social responsibility and monitoring of social aspects. He/She should speak Yoruba and Hausa fluently.
- The ESU Computer/GIS Manager should have a minimum of Master Degree in computer science or GIS. He/She should have at least 5-years of experience in GIS development and management. He/She should have knowledge of hardware and software mainly used in hydrology and hydropower generation.
- The proposed Computer /GIS officers should have sufficient qualification and experience in maintaining hardware and software systems, digitisation and GIS systems.

14.10.4 Office Requirements

The ESU should have an enough office space for one Assistant General Manager, three Managers and two officers. The ESU should be provided with a 4x4 vehicle. The staff should have at least one-computer each. The other requirements are sufficient tables, chairs, printers (1 A3 B&W, 1 A3 colour and 1 A0 colour), scanner, digitiser, digital camera, GPS, GIS ArcInfo package and other related software. The budget requirement is as follows.

16 Establishment of ESUs

S/N	ITEM	BUDGET (US \$)
1	4x4 vehicle (2 Nos – one for ESU and one for dam instrumentation department)	70,000
2	Computers 6 Nos.	7,000
3	Printers, scanner, digitiser, digital camera, GPS	20,000
4	GIS ArcInfo and other softwares	20,000
5	Office tables and chairs	5,000
	Sub-Total	122,000
	X 2 for Jebba and Kainji	244,000

14.10.5 Training of Existing Staff

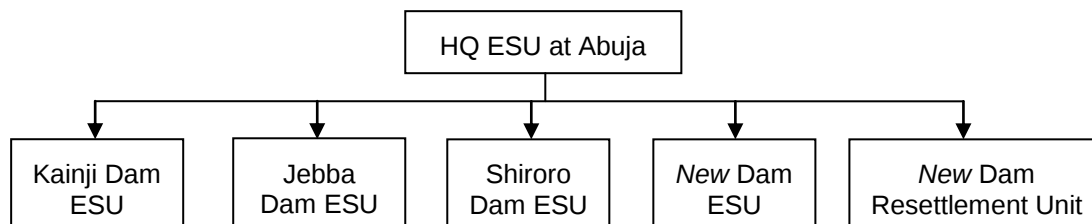
Until the establishment of a full-time ESU the existing ERSU members should be trained in the following areas.

- a) Social aspects
 - a. Corporate social responsibility
 - b. Effective communication with the communities
 - c. Avenues for improving the relationship with the communities

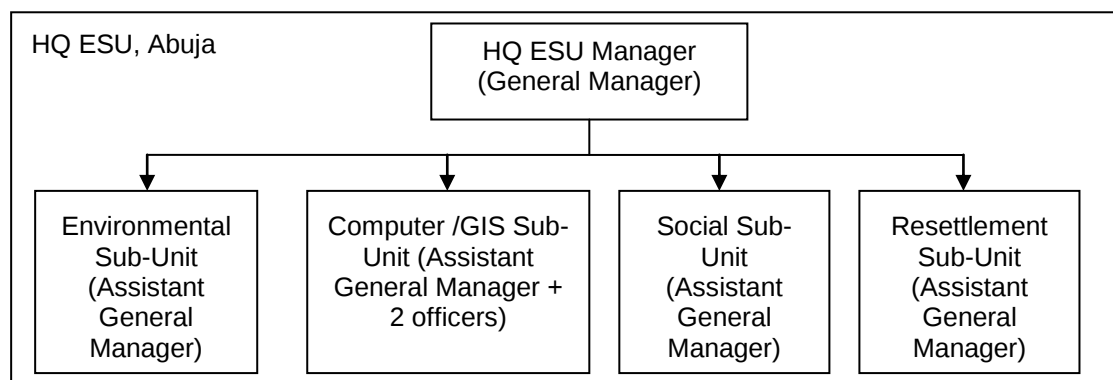
- b) Health and safety
- c) Solid and liquid waste management
- d) Computer training

14.10.6 Institutional Arrangements at Head Office

The ESUs at the dam sites will be managed individually and will be linked with the head office ESU as shown below. The ERSU existing in PMU is the same as what we suggest here but it needs to be reoriented as suggested below.



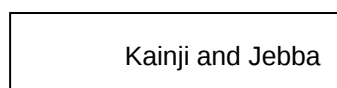
This HQ unit shall have a similar set-up (as shown below) and facilities like dam ESUs. The HQ ESU managers shall monitor the dam units and report to the management on regular basis. Conduct bi-annual meetings with all the dam units to share the experiences and to update their knowledge on the developments in their area of operation.



The proposed institutional arrangement can be revised once the decision on individual dam hydropower management is made. Should individual dam hydropower management be given autonomy or privatised, the HQ ESU component should be diluted.

14.11 EMS 14001

17 EMS Assistance



PLCs require external support to apply and obtain EMS 14001 certification. The process may take two years and so we suggest an engagement of an EMS expert through a service contract to implement the proposals in Appendix A to this report. The input should be for approximately two months, visiting PHCN quarterly, to monitor progress and to provide guidance for EMS 14001 certification. This is expected to cost around US\$ 45,000.

14.12 Summary

Table 14.1 provides a summary of the ESMP mitigation plan discussed above. A number of areas will require further input to finalise the precise requirements but we anticipate that the task objectives can be broadly attained within the budget provided. Some prioritisation of expenditures is required by PHCN to meet overall WRD-SEM project budget constraints.

Table 14.1 Summary of Mitigation Plan

Sl. No	Details
1	Hydrology - Hydrological modelling, bathymetry survey, floodplain mapping, etc.
2	Catchment degradation assessment
3	Dam instrumentation, Kainji
4	Workshop Upgrading, Kainji
5	Dam instrumentation, Jebba
6	Dam Safety, Jebba
7	Workshop Upgrading Jebba
8	Community Support through NIFFR
9	Public Health awareness programmes
10	Social Survey
11	Waste Management, Kainji
12	Waste Management, Jebba
13	Health and Safety, Kainji
14	Fire Engine, Kainji
15	Health and Safety, Jebba
16	SU Office establishment (Kainji and Jebba)
17	EMS assistance

15. PROCUREMENT PLAN FOR THE ESMP

The mitigation measures identified in the previous chapter has been grouped together based on the procurement procedures and availability of funds. The summary of the procurement plan is as follows.

Sl. No.	Topic	Allocated Areas *	Period of Execution	Approximate Cost (mUS\$)
Service Contracts				
1	Studies on hydrology, flood management, catchment assessment, dam safety and instrumentation	CSJK2 + KJ13	24 months	1.830
2	Social survey and community support for both KHEPLC and JHEPLC	CSJK12	10 months	0.150
3	EMS 14001 Assistance for both KHEPLC and JHEPLC	CSJK12	16 months	0.045
4	OHSAS Compliance and establishment of Audit System for both KHEPLC and JHEPLC	CSJK12	7 months	0.050
5	Designing of Waste Management Systems and Equipments for both KHEPLC and JHEPLC	CSJK12	4 months	0.050
	Sub-Total			2.160
Supply Contracts				
1	Hydrological and Meteorological Instruments	KJR3A +KJR3B		0.550
2	Purchase of vehicles for ESU, hydrological divisions and dam instrumentation divisions	CSJK12		0.200
3	Office equipments including computers, printers for ESU, hydrological and dam instrumentation divisions	CSJK12 +KJ13		0.300
	Sub-Total			1.050
	TOTAL			3.210

Note: Some of the instrument design, tendering and implementation of goods and work contracts needs to be taken up during the implementation of service contract 1

* The numbers refer to contract package numbers approved for Component 2 under the WRD-SEM Procurement Plan.

Service Contract Package 1
Studies on hydrology, flood management, catchment assessment, dam safety
and instrumentation

Compo- nents	Details	Estimated Budget	Allocation
1	Hydrological Modelling	0.450	
A	Collection of existing hydrological data and models		CSJK2
B	Develop suitable hydrological model for both the dams. Hydrological study should cover the whole Niger basin and the impact on the downstream effect in the Delta due to changes in the flow regimes.		CSJK2
C	Provide support to prepare tender documents for purchase of required computer hardware and software for modelling (i.e. Update and if required revise the identified ones)		KJ13
D	Identify suitable meteorological and hydrological measurement locations (in tandem with NBA monitoring system) and design installation procedure		KJR3A
E	Provide support to prepare tender documents for purchase of required hydrological measuring instruments (i.e. Update and if required revise the identified ones)		KJR3B
F	Provide support to prepare tender documents for purchase of required meteorological and hydrological instruments (i.e. Update and if required revise the identified ones)		KJR3A
G	Provide training on hydrological modelling, hydrological and meteorological instruments		CSJK2
2	Bathymetric Survey	0.500	
A	Purchase Echosounder (Hydrobat Multibeam Sonar Sensor) instruments and conduct survey		KJR3A
B	Prepare water level-capacity curve		CSJK2
C	identify sediment locations by comparing with previous bathymetric surveys		CSJK2
D	train the staff on how to use Echosounder		CSJK2
3	Flood Plain Mapping	0.450	
A	Obtain or digitize the available topomaps for the reach between Yavuri and Pategi where river Kaduna joins		CSJK2
B	Obtain required aerial photos or satellite imageries		CSJK2
C	Develop floodplain mapping using satellite imageries or aerial photos		CSJK2
D	Provide support to prepare tender documents for purchase of appropriate GIS and database system		KJ13
E	training to ESU and hydrology on flood plain mapping		
4	Dam operations	0.100	
A	Conduct a dam break analysis		CSJK2
B	Revise the dam operating rules and flood rule curves based on the hydrological model and other considerations		CSJK2

Compo- nents	Details	Estimated Budget	Allocation
C	Prepare Dam Safety Plan as per US-FERC guidelines		
5	Updating Flood Warning and Emergency Preparedness Plan	0.100	
A	Demarcate the floodplain areas on the ground from the head of Lake Kainji (Yavuri) to the point where the Kaduna joins with the Niger.		CSJK12
B	Identify the safe locations for the lakeside and riverside communities during flooding beyond maximum flood level.		CSJK12
C	Discuss with appropriate Government authorities (through PHCN) for the resettlement of the communities living within the floodplain		CSJK12
D	Develop a database for properties and residents those who are living in floodplain areas and train the local staff to update it regularly		CSJK12
E	Provide support to prepare tender documents for the purchase of flood warning equipments (update the list provided)		KJR3C
F	Update the emergency preparedness plan (EPP) which is part of the Dam Safety Plans		CSJK12
G	Develop procedures to train the communities on EPP		CSJK12
H	Design and prepare tender documents for flood warning communication systems (radio communication and enhancement of radio booster stations)		KJR3C
I	Train the EPP responsible staff on EPP		CSJK12
6	Catchment degradation	0.080	
A	Purchase required satellite imageries to compare the land use pattern in the last ten years		CSJK2
B	Assess the degradation and erosion risk assessment of the Niger basin catchment (within Nigeria) draining into Jebba reservoir.		CSJK2
C	Prepare a catchment management plan		CSJK2
7	Dam Safety and Instrumentation	0.150	
A	tender document preparation for		
(i)	De-air all hydraulic piezometers in the concrete/Fill Dams at Kainji		KJR4
(ii)	Kainji - Repairs of damaged relief well heads at the saddle dam and encased for protection in reinforced concrete structure with spout provided from which any floe discharges		KJR4 / KR1A
(iii)	Kainji - Totalising weir - Re-establishment of the slopes of the two main upstream drainage channels and downstream drainage channel and provide chain-link security fence for the totalising weir		KR1A
(iv)	Kainji - Geodetic siting of trigonometrical stations located around the Main dam and all the relief wells and standpipes		KJR4
(v)	Jebba - Flushing of drain-holes and decalcifying of walls in the navigation lock, embankment and spillway galleries		JR9
(vi)	Jebba - Construction of access way from crest of saddle dam structure to weir box measurement point		KJR4
(vii)	Jebba - Construction of handrail barrier (1.5m high) at the shoulder of the saddle dam		KJR4

Compo-nents	Details	Estimated Budget	Allocation
(vii)	Jebba - Construction of cut-off wall to protect the let and right abutments of the main dam		JR9
(viii)	Jebba - Construction of access staircase from crest elevation to the instrumentation house of the main dam		JR9
(ix)	Jebba - Construction of double-leaf gate with pedestrian gate at the entrance to the main dam		JR9
	TOTAL	1.830	

Service Contract Package 2 Social Survey and Community Support Programmes

Compo-nents	Details	Estimated Budget	Allocated areas
1	Social Survey	0.075	CSJK12
A	To provide baseline information on up to 200 communities which have been affected by the Kainji and Jebba Projects over the last 40 years		
2	Livelihood Support	0.065	CSJK12
A	To study the declining trend of fish production in the reservoirs and river stretches		
B	To create awareness among the fishermen about the efficient fishing and to remove the perception that construction of dam hampered the fish production		
C	To create awareness among the close communities on alternative livelihood options		
D	To develop a system for assisting the fishing communities to get finance assistance		
3	Health Issues	0.020	CSJK12
A	To create awareness among the public about general water borne diseases and other communicable diseases		
B	To conduct a rapid epidemiological waterborne diseases survey in Kainji and Jebba dam areas to determine the seriousness of the waterborne diseases and treatment of infected people		
4	Corporate Social Responsibility	0.025	CSJK12
A	Assist the KHEPLC and JHEPLC in establishing CSR through developing CSR policies, strategies, implementation procedures and planning community interventions to keep the community happy		
	TOTAL	0.185	

Supply Contract Package 1
- Hydrological, Meteorological, Dam Instruments and related materials

Sl. No.	Details	Total Numbers			Allocation
		Kainji	Jebba	Total	
1	HYDROLOGICAL INSTRUMENTS				KJR3A
	1m Gauge Plates	500	500	1000	
	3m Gauge Plates	200	200	400	
	Current Meters for Large Rivers	2	2	4	
	Current Meters for Small Rivers	2	2	4	
	Acoustic Doppler Current Profiler (ADCP)	2	2	4	
	OTT Swinging Bridge	1	1	2	
	Automatic Levelling Instrument	1	1	2	
	Waders and wellington boots	10	10	20	
	Wellington Boots	10	10	20	
	Life Jackets	10	10	20	
	Electric Hand drilling machine	1	1	2	
	Facom Toolbox	2	2	4	
	Range Finder (Binoculars)	3	3	6	
2	DAM INSTRUMENTS				KJR4
	Bourdon gauge (female version)		2	2	
	Bourdon gauge (male version)		2	2	
	Measuring Jar (non-breakable)		2	2	
	Survey standpipe caps (85mm & 154mm)				
	Drain hole caps		100		
	Digital Extensometer – Tape	1	1	2	
	Digital Extensometer – Rod	1	1	2	
	pH and EC meter	1	1	2	
	Theodolite survey instruments and accessories	1	1	2	
	Range Finder	1	1	2	
3	Health and Safety				CSJK12
	Atmospheric testing meters for confined working space	2	2	4	
	Hard hats	50	50	100	
	Coveralls	50	50	100	
	Gloves	50	50	100	
	Safety boots	50	50	100	
	Goggles	50	50	100	
	Ear Protection	50	50	100	

Supply Contract Package 2 Vehicles

Sl. No.	Details	Location				
		Kainji		Jebba		Total
		ESU (under CSJK12)	Hydrology (under KJR3B)	ESU (under CSJK12)	Hydrology (under KJR3B)	
1	4-wheeler	1	1	1	1	4
2	2-wheeler	2	4	2	4	12
3	Inflatable Dinghy boat with compressor		1		1	2
4	45HP Long Shaft Outboard Engine		1		1	2
5	25HP Normal Shaft Outboard Engine		1		1	2

Supply Contract Package 3 Office Equipment

Sl. No.	Details	Location						Total
		Kainji			Jebba			
		ESU (under KJ13)	Hydrology (under KJ13)	Dam Instru-mentation (under KJR4)	ESU (under KJ13)	Hydrology (under KJ13)	Dam Instru-mentation (under KJR4)	
1	Laptops with professional MS Office	4	5	4	4	5	4	26
2	HP Colour Laser Jet A3	1	1	1	1	1	1	6
3	Photocopier cum printer A3	1	1		1	1		4
4	HP Plotter A0	1	1		1	1		4
5	Desktop Computers	2	3	2	2	3	2	14
6	Office Table	8			8			16
7	Office Chair	20			20			40
8	Computer Tables	2	3	2	2	3	2	14
9	Tables for Printers	2	2	1	2	2	1	10
10	Digital Camera	2	2	1	2	2	1	10
11	GPS	3	4		3	4		14

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APPENDICES

A) ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

Introduction

Atkins was commissioned by PHCN to carry out a Gap Analysis against the requirements of ISO 14001 to assist with them getting started on the process of establishing an Environmental Management System that would be ‘fit’ for certification to this standard.

The purpose of the Gap Analysis was to provide the necessary information upon which an Environmental Management System (EMS) can be devised.

This document presents the findings of the Gap Analysis; together with recommendations for advancing management arrangements to meet ISO14001 requirements, and to achieve operational environmental control and environmental performance improvement.

Part 1 provides a detailed analysis against each clause of the standard (note that we have used the most current version of the standard, ISO14001:2004), current status and actions necessary to achieve compliance with each one.

Part 2 presents a Gantt chart and management programme for establishing an EMS at Kainji and Jebba Hydroelectric projects over a 24 month period.

Both Parts 1 and 2 of the report form the foundation from which PHCN will develop and implement its EMS. The requirements for developing the EMS will also be covered during a series of forthcoming management workshops scheduled for delivery to PHCN in September 2010. To illustrate how we propose to cover each element in the training, we have stated the Workshop and Task Number so that the user can cross reference this document with the training that they receive in September 2010.

WORKSHOP 1 – PLANNING THE ENVIRONMENTAL MANAGEMENT SYSTEM

Task 1 – Environmental Policy

Task 2 – Environmental Aspects & Impacts

Task 3 – Legal & Other Environmental Requirements

Task 4 – Environmental Objectives, Targets & Management Programmes

WORKSHOP 2 – IMPLEMENTING AND OPERATING THE ENVIRONMENTAL MANAGEMENT SYSTEMS

Task 1 – Roles & Responsibilities

Task 2 – Training & Awareness

Task 3 – Communications (Internal & External)

Task 4 – Documentation & Records of the EMS

Task 5 – Operational & Emergency Control

WORKSHOP 3 – CHECKING AND REVIEWING PERFORMANCE OF THE EMS AGAINST DESIRED CRITERIA

Task 1 – Non-conformance & Corrective Actions

Task 2 – Internal Auditing & Compliance

Task 3 – Management Review

Task 4 - Certification

Part 1: Management Arrangements & ISO14001

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
1.1 Policy (ISO 4.2)	Top management shall define the organisation's environmental policy and ensure that, within the defined scope of its environmental management system, it: - is appropriate to the nature, scale and environmental impacts of its activities, products and services, - includes a commitment to continual improvement and prevention of pollution, - includes a commitment to comply with applicable legal requirements and with other requirements to which the organisation subscribes which relate to its environmental aspects, - provides the framework for setting and reviewing environmental objectives and targets, - is documented, implemented and maintained, - is communicated to all persons working for or on behalf of the organisation, and - is available to the public.	The organisation has an existing environmental policy which is signed by the Managing Director/Chief Executive. This is dated 16th January 2002 and is fairly generic in nature referring to environmental excellence and It is also currently under the former company name, National Electric Power Authority (NEPA). At present, this policy would not meet the requirements of ISO14001 and it will require re-drafting, incorporating the specific elements shown in the adjacent cell.	WORKSHOP 1 TASK 1 Draft policy statement following initial environmental review. Management Team to ensure that all requirements are met in policy statement in Workshop 1.
1.2 Planning (ISO 4.3)			
1.2.1 Environmental Aspects (ISO4.3.1)	The organisation shall establish, implement and maintain a procedure(s): a) to identify the environmental aspects of its activities, products and services within the defined scope of the environmental management system that it can control and those that it can influence taking into account planned or new developments, or new or modified activities, products and services, and b) to determine those aspects that have or can have significant impact(s) on the environment (i.e. significant environmental aspects). The organisation shall document this information and keep it up to date.	The IER exercise has identified key environmental aspects that require management and/or performance improvement. These are reported in Part 2 of the IER. This will provide the foundation for compiling a register of environmental aspects and impacts for the site.	WORKSHOP 1 TASK 2 Management to ensure that key or significant aspects and impacts are covered within the scope of PHCN's EMS. A methodology for the rating of significance is to be followed in order to produce a detailed list of significant environmental aspects and impacts. This is to be devised in Workshop 1 Task 2

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	The organisation shall ensure that the significant environmental aspects are taken into account in establishing, implementing and maintaining its environmental management system.		
1.2.2 Legal and Other Requirements (ISO 4.3.2)	The organisation shall establish, implement and maintain a procedure(s) a) to identify and have access to the applicable legal requirements and other requirements to which the organisation subscribes related to its environmental aspects, and b) to determine how these requirements apply to its environmental aspects. The organisation shall ensure that these applicable legal requirements and other requirements to which the organisation subscribes are taken into account in establishing, implementing and maintaining its environmental management system.	PHCN at present does not proactively track and determine the applicability of relevant legal and other requirements that apply to its environmental aspects.	WORKSHOP 1 TASK 3 The management Team(s) to ensure that legal requirements applicable to environmental aspects and impacts are covered within the scope of PHCN's EMS. A register of applicable legal and other requirements, together with methodology for its up-dating and review to be devised in Workshop 1 Task 3.
1.2.3 Objectives, Targets and Programme(s) (ISO 4.3.3)	The organisation shall establish, implement and maintain documented environmental objectives and targets, at relevant functions and levels within the organisation. The objectives and targets shall be measurable, where practicable, and consistent with the environmental policy, including the commitments to prevention of pollution, to compliance with applicable legal requirements and with other requirements to which the organisation subscribes, and to continual improvement. When establishing and reviewing its objectives and targets, an organisation shall take into account the legal requirements and other requirements to which the organisation subscribes, and its significant environmental aspects. It shall also consider its technological options, its financial, operational and business requirements, and the views of interested	There are currently no stated environmental objectives, targets and management programmes in place. Recommendations for performance improvement have been incorporated into the IER exercise and presented in Part 2.	WORKSHOP 1 TASK 4 Management Team(s) to further develop, modify and agree environmental objectives, targets and management programmes. In particular, the Management Team is to ensure that clear responsibilities, actions and necessary resources are allocated to each action item. Environmental objectives, targets and management programmes to be approved by the Board of Directors.

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	parties. The organisation shall establish, implement and maintain a programme(s) for achieving its objectives and targets. Programme(s) shall include a) designation of responsibility for achieving objectives and targets at relevant functions and levels of the organisation, and b) the means and time-frame by which they are to be achieved.		
1.3 Implementation and Operation (ISO 4.4)			
1.3.1 Resources, Roles, Responsibility and Authority (ISO 4.4.1)	Management shall ensure the availability of resources essential to establish, implement, maintain and improve the environmental management system. Resources include human resources and specialized skills, organisational infrastructure, technology and financial resources. Roles, responsibilities and authorities shall be defined, documented and communicated in order to facilitate effective environmental management. The organisation's top management shall appoint a specific management representative(s) who, irrespective of other responsibilities, shall have defined roles, responsibilities and authority for: a) ensuring that an environmental management system is established, implemented and maintained in accordance with the requirements of this International Standard, b) reporting to top management on the performance of the environmental management system for review, including recommendations for improvement.	An outline of the roles, responsibilities and authorities has been constructed as part of the IER process (Appendix A). These detail, in outline only, those members responsible for board representation and EMS Co-ordination. Roles are not defined currently in job descriptions or EMS documentation.	WORKSHOP 2 TASK 1 Management Team(s) to: (i) Identify roles and responsibilities for effective EMS functioning (including specialist skills such as auditing, sampling, analysis, monitoring, reporting etc). (ii) Define key roles and responsibilities for inclusion in job descriptions and briefings to ensure effective communication. (iii) Identify any necessary financial and technological resources necessary to achieve environment policy, objectives and targets. This to include resources for training, investment in plant/equipment, EMS maintenance etc.
1.3.2 Competence, Training and Awareness (ISO 4.4.2)	The organisation shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant	Training needs are currently identified through one-to-one dialogue between staff and line managers. This is through on the job training	WORKSHOP 2 TASK 2 Management Team(s) to identify environmental competencies necessary for effective EMS

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
4.4.2)	environmental impact(s) identified by the organisation is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records. The organisation shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records. The organisation shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of a) the importance of conformity with the environmental policy and procedures and with the requirements of the environmental management system, b) the significant environmental aspects and related actual or potential impacts associated with their work, and the environmental benefits of improved personal performance, c) their roles and responsibilities in achieving conformity with the requirements of the environmental management system, and d) the potential consequences of departure from specified procedures.	and annual appraisals. To date, there has been no formal environmental training that has taken place. At the same time of this study, a full review of training needs is being carried out.	functioning. Management Team(s) to introduce a plan to address the desired competencies through training programmes both for both 'in-house' and agency staff as necessary. As a minimum, training should be carried out for: General environmental awareness (all staff) – 2 hours Senior management environmental briefing (2 hours) Operational controls in operational and office areas (4-7 hours) Environmental auditor training Applicable legal requirements
1.3.3 Communication (ISO 4.4.3)	With regard to its environmental aspects and environmental management system, the organisation shall establish, implement and maintain a procedure(s) for a) internal communication among the various levels and functions of the organisation, b) receiving, documenting and responding to relevant communication from external interested parties. The organisation shall decide whether to communicate externally about its significant environmental aspects, and shall document its decision. If the decision is to communicate, the	Communication is a core element in environmental management. Internal communications procedures are already in place that could be used for environmental purposes. Information is disseminated across management personnel and down to junior officers through internal memoranda. Other media for internal communications include Technical Meetings held daily by the principal officers from all departments to plan strategies and solve management problems. This is also primarily where most of the safety information is	WORKSHOP 2 TASK 3 Management Team(s) to map out an internal and external communications strategy for environmental information. Management Team(s) to determine how existing mechanisms could be used, or if necessary, where new measures may need to be introduced in order to fulfil the strategy. This exercise should concentrate on determining: What environmental information is required? By whom is it required? How often is it required?

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	organisation shall establish and implement a method(s) for this external communication.	cascaded too (i.e. safety alerts and information from the safety department on a regular basis to war or educate personnel on safety issues. There is virtually no formal mechanism for external communication with the public and other stakeholders on environmental and safety aspects, although it was observed that the environmental policy statement was prominently displayed in the reception areas of the Jebba Dam facility.	In what format is it required? Information should related to the significant environmental aspects of the company.
1.3.4 Documentation (ISO 4.4.4)	The environmental management system documentation shall include: a) the environmental policy, objectives and targets, b) description of the scope of the environmental management system, c) description of the main elements of the environmental management system and their interaction, and reference to related documents, d) documents, including records, required by this International Standard, and e) documents, including records, determined by the organisation to be necessary to ensure the effective planning, operation and control of processes that relate to its significant environmental aspects.	Due to the early stages of EMS implementation, there is little by way of environmental documentation in existence at PHCN.	WORKSHOP 2 TASK 4 Management Team(s) to create a documented system comprising of its key elements. This will essentially incorporate: Environmental Policy Manual Management, Operational Controls and Work Instructions Records The structure of all documentation is to be known by all users of the system and accessible by responsible individuals. It is suggested that the system is intranet or server based as well as hard copy so as to maximise access and reduce the need for paper copies which are easily damaged. All 'records' are to be kept safe from damage from theft, fire etc.
1.3.5 Control of Documents (ISO 4.4.5)	Documents required by the environmental management system and by this International Standard shall be controlled. Records are a special type of document and shall be controlled in accordance with the requirements given in 4.5.4. The organisation shall establish, implement and maintain a procedure(s) to a) approve documents for adequacy prior to issue,	There is no current structured means by which environmental documentation is controlled.	WORKSHOP 2 TASK 4 Management team(s) to ensure that all EMS documentation is controlled to ensure that they are legible, dated, reviewed and revised as necessary and that up-dated versions are available at the point of use.

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	b) review and update as necessary and re-approve documents, c) ensure that changes and the current revision status of documents are identified, d) ensure that relevant versions of applicable documents are available at points of use, e) ensure that documents remain legible and readily identifiable, f) ensure that documents of external origin determined by the organisation to be necessary for the planning and operation of the environmental management system are identified and their distribution controlled, and g) prevent the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.		
1.3.6 Operational Control(ISO 4.4.6)	The organisation shall identify and plan those operations that are associated with the identified significant environmental aspects consistent with its environmental policy, objectives and targets, in order to ensure that they are carried out under specified conditions, by a) establishing, implementing and maintaining a documented procedure(s) to control situations where their absence could lead to deviation from the environmental policy, objectives and targets, and b) stipulating the operating criteria in the procedure(s), and c) establishing, implementing and maintaining procedures related to the identified significant environmental aspects of goods and services used by the organisation and communicating applicable procedures and requirements to suppliers, including contractors.	There are currently no formal operational controls for the key environmental aspects identified during the IER.	WORKSHOP 2 TASK 5 Management Team(s) to identify, from the key environmental aspects identified in Part 2, which require improvement (i.e. objective and target) and which require control in order to achieve the environmental policy goals of the company. Operational control procedures are likely to cover Water Use/Conservation Energy Use/Conservation Solid Waste Disposal Liquid Waste Disposal Noise & Vibration Plant Maintenance Ecology Bulk Storage of Fuels and Chemicals Drainage Vehicles Procurement/Suppliers

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
			Sub-contractors <i>Emergencies (spillage, fire, theft, vandalism – see below)</i> It would be beneficial to compile an operational control manual as this will then form a central reference for all operational and emergency (see next item below) controls. Minimum performance criteria will need to be devised in each case (including compliance with legal requirements)
1.3.7 Emergency Preparedness and Response (ISO 4.4.7)	The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them. The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts. The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations. The organisation shall also periodically test such procedures where practicable.	Initial discussions, inspections and documentation review indicated that some emergency provision is made for the protection of health and safety against emergency situations (e.g. crisis management, fire extinguishers etc). There is no current provision for environmental emergencies (e.g. spillage of oils/chemicals, dark smoke, effluents etc).	WORKSHOP 2 TASK 5 Management Teams to identify potentially significant environmental aspects under abnormal and emergency situations. This would include, fire, unforeseen spillages and emergency release of oils and chemicals to surface and groundwaters. Control procedures need to be developed to deal with emergencies, both prevention and cure. These control procedures need to be periodically tested through emergency drills, together with lessons learned. Spill kits will be required as well as secondary containment to high risk areas of the operation(s).
1.4 Checking (ISO 4.5)			
1.4.1 Monitoring and Measurement (ISO 4.5.1)	The organisation shall establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of its operations that can have a significant environmental impact. The procedure(s) shall include the documenting of information to monitor performance, applicable operational controls and conformity with the organisation's environmental objectives and targets. The organisation shall ensure that calibrated or	A statutory environmental audit is carried out every three years (as a statutory legal requirement). The management also engage the services of a consultant to monitor the effluent quality and discharges on a monthly basis (for organic and inorganic contaminants). There is no frequent monitoring of significant aspects such as waste management, housekeeping, spillages/leakages, complaints from the public, sightings of protected species, etc. There should be a review of significant	WORKSHOP 3 TASK 1 Management Team(s) to define <i>what</i> key characteristics of PHCN's environmental aspects require monitoring and measuring and <u>how</u> this will be carried out. A combination of direct and indirect monitoring methods will be necessary. e.g. sampling and analysis of soil and water effluents site inspections of waste storage and

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	verified monitoring and measurement equipment is used and maintained and shall retain associated records.	aspects (following the significance ranking exercise) and procedures established for their monitoring and measurement.	containment The approach to monitoring and measuring environmental impact should be documented.
1.4.2 Evaluation of Compliance (ISO 4.5.2)	Consistent with its commitment to compliance, the organisation shall establish, implement and maintain a procedure(s) for periodically evaluating compliance with applicable legal requirements. The organisation shall keep records of the results of the periodic evaluations. The organisation shall evaluate compliance with other requirements to which it subscribes. The organisation may wish to combine this evaluation with the evaluation of legal compliance referred to in 4.5.2.1 or to establish a separate procedure(s).	Whilst there is a very comprehensive external audit that is carried out of the Kainji dam facility every three years (as required under environmental legislation), PCHN does not currently adopt any form of periodic or regular internal environmental audit process that covers legal compliance.	WORKSHOP 3 TASK 3 Using the register of legal and other requirements devised under 4.3.2, Management Team are to devise a means of checking conformance to the policy, procedures and process of the EMS, to ensure compliance and continual improvement is maintained. The audits will need to be carried out auditors who are trained and competent in evaluating environmental performance within the organisation.
1.4.3 Nonconformity, Corrective and Preventive Action (ISO 4.5.3)	The organisation shall establish, implement and maintain a procedure(s) for dealing with actual and potential nonconformity(ies) and for taking corrective action and preventive action. The procedure(s) shall define requirements for a) identifying and correcting nonconformity(ies) and taking action(s) to mitigate their environmental impacts, b) investigating nonconformity(ies), determining their cause(s) and taking actions in order to avoid their recurrence, c) evaluating the need for action(s) to prevent nonconformity(ies) and implementing appropriate actions designed to avoid their occurrence, d) recording the results of corrective action(s) and preventive action(s) taken, and e) reviewing the effectiveness of corrective action(s) and preventive action(s) taken. Actions taken shall be appropriate to the magnitude of the problems and the environmental impacts encountered.	There already exists a procedure for the reporting and recording on non-conformances with Health and Safety arrangements at the Kainji and Jebba sites. These could be adapted to include environmental non-conformances where they are observed and noted.	WORKSHOP 3 TASK 2 Management Team(s) to modify existing procedures to cover environmental non-conformities.

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	The organisation shall ensure that any necessary changes are made to environmental management system documentation.		
1.4.4 Control of Records (ISO 4.5.4)	The organisation shall establish and maintain records as necessary to demonstrate conformity to the requirements of its environmental management system and of this International Standard, and the results achieved. The organisation shall establish, implement and maintain a procedure(s) for the identification, storage, protection, retrieval, retention and disposal of records. Records shall be and remain legible, identifiable and traceable.	There is no procedure or mechanism that specifies methods of the storage, protection and retention of environmental records which are essential under ISO14001 requirements.	WORKSHOP 2 TASK 4 Management Team(s) to devise procedures for the control of environmental records, including: Waste disposal records (Waste Transfer Notes) Discharge consents Sampling/monitoring records (soil, water, effluent, building materials etc) Letters of correspondence with environmental regulators. Complaints Audit reports Other monitoring records etc
1.4.5 Internal Audit (ISO 4.5.5)	The organisation shall ensure that internal audits of the environmental management system are conducted at planned intervals to a) determine whether the environmental management system 1) conforms to planned arrangements for environmental management including the requirements of this International Standard, and 2) has been properly implemented and is maintained, and b) provide information on the results of audits to management. Audit programme(s) shall be planned, established, implemented and maintained by the organisation, taking into consideration the environmental importance of the operation(s) concerned and the results of previous audits. Audit procedure(s) shall be established, implemented and maintained that address	Whilst there is a very comprehensive external audit that is carried out of the Kainji dam facility every three years (as required under environmental legislation), PCHN does not currently adopt any form of periodic or regular internal environmental audit process that covers legal compliance.	WORKSHOP 3 TASK 3 Using the register of legal and other requirements devised under 4.3.2, Management Team are to devise a means of checking conformance to the policy, procedures and process of the EMS, to ensure compliance and continual improvement is maintained. The audits will need to be carried out auditors who are trained and competent in evaluating environmental performance within the organisation.

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	— the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records, — the determination of audit criteria, scope, frequency and methods. Selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process.		
1.5 Management Review (ISO 4.6)	Top management shall review the organisation's environmental management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews shall include assessing opportunities for improvement and the need for changes to the environmental management system, including the environmental policy and environmental objectives and targets. Records of the management reviews shall be retained. Input to management reviews shall include - results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organisation subscribes, - communication(s) from external interested parties, including complaints, - the environmental performance of the organisation, - the extent to which objectives and targets have been met, - status of corrective and preventive actions, - follow-up actions from previous management reviews, - changing circumstances, including developments in legal and other requirements related to its environmental aspects, and - recommendations for improvement.	The Senior Management Team hold period management meetings at which business performance issued are discussed. To date, this has not included environmental issues specifically and generally has tended to focus on performance of the plant, health, safety and maintenance issues.	WORKSHOP 3 TASK4 Management Team(s) to devise management review process which addresses the environmental performance of PHCN's operations. Outputs from the Management Review process to include: A review of the EMS's suitability, adequacy and effectiveness, Necessary changes to resources in order to achieve stated environmental goals, objectives and targets, and Necessary actions to amend the system in response to changing circumstances (e.g. policy, objectives, targets and other elements of the EMS)

ISO14001 Clause	Requirements	Current Status	Recommended Course of Action
	The outputs from management reviews shall include any decisions and actions related to possible changes to environmental policy, objectives, targets and other elements of the environmental management system, consistent with the commitment to continual improvement.		

Part 2: ISO14001 Implementation Programme for PHCN

TASK	2010				2011												2012									
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
PLANNING THE EMS																										
Environmental Policy																										
Environmental Aspects & Impacts																										
Environmental Legal & Other Requirements																										
Objectives, Targets & Management Programmes																										
IMPLEMENTING & OPERATING THE EMS																										
Roles & Responsibilities																										
Training & Awareness																										
Communications (Internal & External)																										
Documentation & Records																										
Operational Controls																										
CHECKING & REVIEWING THE EMS																										
Non-Conformance & Corrective Action																										
Internal Audit Programme & Compliance Checking																										
Management Review																										
CERTIFICATION PROCESS																										
Stage I Assessment																										
Stage II Assessment																										

 = Key Stage Summary
 = ISO14001 Task

B) CARBON FINANCING

1.0 Overview and Conclusion

On the basis of discussions with PHCN and review of available documentation as described in the following chapter, it is the view of the project team that there is no apparent justifiable reason why the project should not gain approval by the CDM Executive Board under the CDM process. This would permit the project to generate Certified Emissions Reductions (CERs) that can be traded on the carbon markets.

We have reviewed the project for its status and the current level of compliance with UNFCCC requirements. We have set out a series of clear recommendations for the management at PHCN which, when completed appropriately and in accordance with UNFCCC requirements, will ensure that the project is able to generate CERs.

1.1 Status of the Project

On the basis of discussions with PHCN Management Team, it is apparent that the process for securing carbon credits for the Kainji Dam refurbishment project has already begun. We were provided with the following documentation for this part of the report:

- Project Idea Note (PIN)
- Project Design Document
- Letter from Dr Mansur Muhtar of the Ministry of Finance (dated 18th May 2009)
- Letter of approval from DNA
- Draft report of validation by approved UNFCCC DOE

On the basis of the information reviewed (above) and discussions with Mr Pius Njoku, it is apparent that a viable case for a CDM project that will generate CERs for sale on the carbon markets (in whatever form they take post 2012) has been made.

Technically, the project meets the requirements for a CDM project as it is covered by an existing consolidated methodology under the scheme (i.e. *ACM0002 V09 – Consolidated Methodology for Grid Connected Electricity Generation from Renewable Sources*); it will generate both local and global environmental and socio economic benefits; and, according to the Project Idea Note (PIN) and Project Design Document (PDD), would appear to satisfy the requirements for 'additionality'. PHCN has used the 'Tool for Assessment of Additionality' (V05.2) to systematically evaluate the project and it would appear that the project is made viable with the addition of carbon revenues (i.e. without the sale of CERs, the project would not necessarily be a viable proposition from an investment perspective).

Whilst the Kainji Dam refurbishment project has further to go in progressing its registration (i.e. by achieving Validation by a Designated Operational Entity and receipt of a Letter of Approval from the Ministry of Environment) with the CDM Executive Board, the main challenge faced by the team is not so much the availability of CERs per se, but rather timing of available CERs and when their financial value will ultimately be realised. The refurbishment period is estimated to be 3 years from commencement, whereas the PIN and PDD both suggest that CERS will be produced from 2010. We believe that this is unlikely given the time required to complete the work. As a result, the CERS are highly unlikely to be available for sale on the market until after 2012. The successor to Kyoto Protocol has still not been agreed and it remains uncertain whether the CDM process will remain after 2012. Indications from the Copenhagen Accord are, however, that the CDM (or equivalent process) will continue in some form and that there will be a market for high quality carbon offsets.

The PIN and PDD at present imply a crediting period of 10 years, commencing 2010. As the project is not yet officially registered with the CDM Executive Board, it is unlikely that a crediting period will commence this year. This is because, the Conference of the Parties (i.e. the Supreme Body of the UNFCCC) have previously declared that '*certified emission reductions shall only be issued for a*

crediting period starting after the date of registration of a clean development mechanism project activity' (Decision 17/CP.7, paragraph 12 – available from <http://cdmrulebook.org/>).

Before CERs are generated, any CDM project will need (following registration) to have generated at least 3-12 month's worth of emissions monitoring data for successful verification purposes. Only upon successful verification can CERs be issued by the CDM Executive Board for sale.

It remains highly likely that a crediting period of 10 years can still be realised, but simply that it will commence from a date post registration (i.e. once the project is officially registered with the CDM EB and completed). To this end, we have generated a series of recommendations which we believe will enable the project team to fulfil this goal below.

2.0 Preparation for Successful Registration with the UNFCCC

2.1 Project Design Document (PDD)

The PDD document is complete for the proposed refurbishment of the Kainji Dam. This document is a key part of the justification of the project for CDM purposes and is an essential pre-requisite to formal registration by the UN Executive Board.

2.2 Validation Report

To date, there has been no independent validation of the project by an appropriate third party. A validation report will need to be prepared by a Designated Operational Entity (DoE) if the project is to be considered for registration by the CDM Executive Board. A list of approved Designated Operational Entities able to carry out validation of the project and can be seen at <http://cdm.unfccc.int/DOE/list/index.html>.

Recommendation: That the project team appoint a DoE to provide validation services and a validation report for the project as soon as possible.

Estimated Cost: \$50k

Estimated Time-frame: 3-6 months

2.3 Letter of Approval from the Ministry of Environment

It is indicated in the Project Identification Note (PIN) that a Letter of Approval/Letter of No Objection has been sought by PCHN. A letter has been provided by Dr Mansur Muhtar (Honourable Minister of Finance), but it is not considered that this covers all aspects required in a letter of approval. The letter needs to originate from the Designated National Authority (DNA) for Nigeria and should clearly outline that the project will assist in achieving sustainable development. To do this, a satisfactory case will need to be submitted and the PDD is a useful way to do this.

Recommendation: That the project team obtain a formal letter of approval is formal requirement for the validation and hence registration of a project activity under the Clean Development Mechanism (CDM). The parties from which the Letter of Approval should be obtained are:

[Dr Victor A Fodeke \(fmenvccu@yahoo.com; vicfodeke@gmail.com\)](mailto:fmenvccu@yahoo.com)

Head of Special Climate Change Unit

Federal [Ministry of Environment](#), Housing, Urban Development Office of the Honourable Minister
Special Climate Change Unit

9th Floor

Federal Secretariat

Shehu Shagari Way

Garki Environment House

PMB468 Abuja

Nigeria

Phone: (234-9) 780 6468

Fax: (234-9) 523 4119

Estimated Cost: \$negligible

Estimated Time-frame: 3-6 months

3.0 Registration of Project with CDM Executive Board

Officially, the UN Executive Board has eight weeks to consider a request for registration (i.e. completed PDD, Validation Report and Letter of Approval). At the end of the eight week period, the decision is considered final, unless a project review is considered necessary in accordance with the scheme rules. In our experience and knowledge of the CDM process, however, this timescale is far from reality and the process has been known to take up to two years. We would therefore recommend that the process of registration is started as soon as possible and that the project team does everything that it can to ensure the process is completed as soon as possible.

Recommendation: That the application for registration is carried out as soon as possible to enable the project to be considered by the UN Executive Board

Estimated Cost: \$30-50k (Executive Board Fees)

Estimated Time-frame: 8 weeks – 2 years+

4.0 Financials & CER Crediting Periods

The timescale for CER delivery and crediting period is unlikely to commence in 2010. However, according to the CDM Executive Board (17/CP.7, paragraph 12 available from <http://cdmrulebook.org/>), it is evident that '*certified emission reductions shall only be issued for a crediting period starting after the date of registration of clean development mechanism project activity*'. The potential cash-flows from CER revenues, therefore, are likely to be delayed to beyond 2012 which may have an impact upon the project's financial performance.

Recommendation: That the projected emissions be calculated from a realistic start-date post registration.

Estimated Cost: \$ Potentially 2-3 year delay to CER returns on project)

Estimated Time-frame: 3 months (for review of crediting periods)

5.0 Emissions Reduction Purchase Agreement (ERPA)

Having an emissions purchase agreement will provide greater certainty as to the sale of the carbon credits and the price/returns from these over a contracted period, the potential impact upon cashflow and how this might impact upon the financial performance of the project. It is understood that the project is seeking a crediting period of ten years from the commencement of registration at present.

Recommendation: That the project team considers a prospective purchaser for the credits and considers the establishment of an Emissions Reduction Purchase Agreement (ERPA).

Estimated Cost: \$negligible (legal fees in setting up agreement and negotiation time)

Estimated Time-frame: 6 – 12 months

C) OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM

CONFORMING TO OHSAS 18001:2007

Introduction

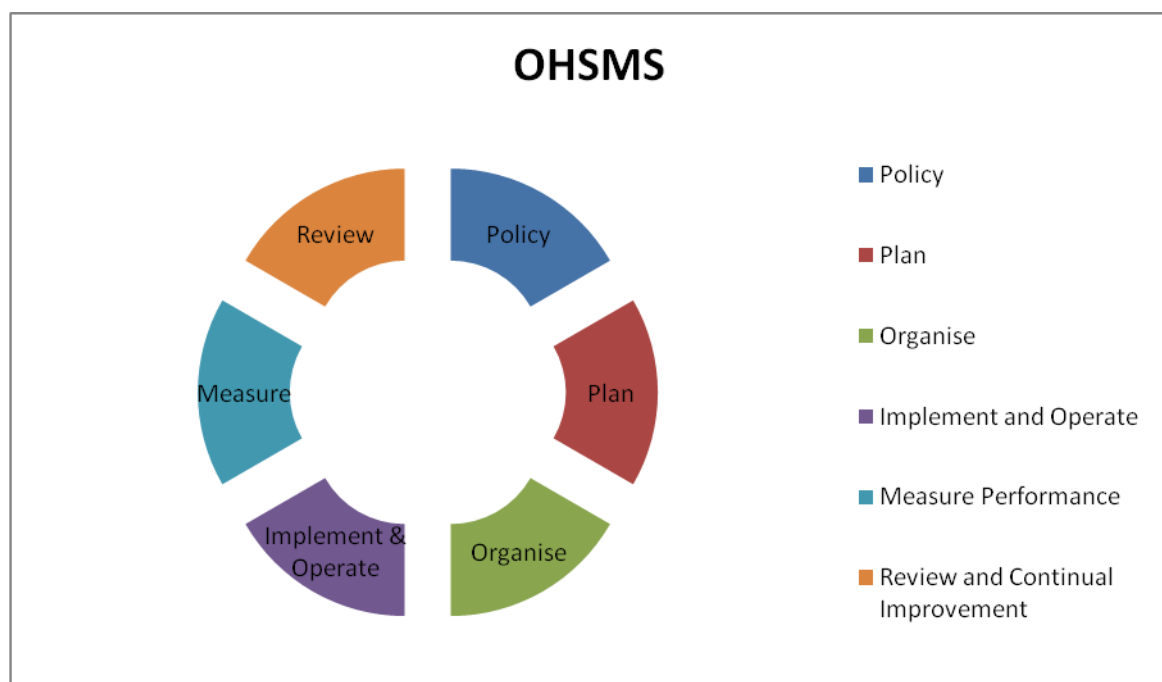
An ideal health and safety management system is based around the principle:

PLAN – Policy, Planning, and Organising

DO – Implementing, Operating

CHECK – Measuring Performance

ACT – Review, Continual Improvement



This process follows the requirements of OHSAS 18001:2007. However specific content must be the responsibility of each individual Power station and should reflect their approach to OH&S.

While 'The Standard' identifies the 6 steps, the recommendations of this framework are that the development of an achievable OHSMS takes a standard approach to the preparation of such a system which is not only logical, but achievable (in the long term) and maintainable.

POLICY:

- Is a Statement of Intent
- Commitment to prevention of injury and ill health, and continual improvement

- Meeting legal and other obligations (eg requirements of the Factories Act and the Occupational Health & Safety Bill which is in the process of becoming law)
- Provides framework for setting and reviewing objectives (Planning)

While it is not being suggested that the current Policy being referenced by the JHEPLC be discarded, its inadequacies as highlighted in the main report render it ineffective in the present circumstances. It is also incompatible with the demands of OHSAS 18001:2007

PLANNING, OPERATING AND IMPLEMENTING (PROCEDURES)

Hazard Identification, Risk Assessing and Determining Controls

- Take account of all activities
- Take account of human behaviour, capabilities and other human factors
- Consider outside activities, and effects on others, including the public
- Consider equipment, materials, machinery
- Legal and other obligations (especially provisions of the Factories Act and Occupational Safety & Health Bill 2008)

ORGANISATION

Top management shall:

- Take ultimate responsibility
- Ensure sufficient resources to establish, implement, maintain and improve
- Define roles, responsibilities and accountabilities
- Appoint a member of Top Management with defined roles for and specific OH&S Responsibility who will be responsible for:
 - Ensuring the System is established, implemented and maintained in accordance with The Standard
 - Ensuring reports are made to Top Management to enable Review and Improvement
- The organisation shall ensure that persons in the workplace take responsibility for aspects of OH&S over which they have control

IMPLEMENT & OPERATE

Legal Requirements

- Arrange for ensuring maintenance of legal standards, access to best practice, ensuring the OHSMS is kept up to date
- Communicate any changes to interested parties (relevant information to be made available to employees, the workforce, contractors, customers and visitors)

Objectives and Programmes

- Establish, implement and maintain documented and measurable (where practicable) objectives in the interest of continual improvement
- Programme for achieving objectives to include:
 - Responsibility (who is in charge)
 - Means (how is it to be achieved)
 - Time scale (when)

Competence, Training & Awareness

- The organisation is to ensure that employees are competent on the basis of:
 - Education

- Training
 - Experience
- That records are kept to demonstrate this
- Identify training needs
- Provide training taking account of
 - Responsibility
 - Language
 - Literacy
 - Ability
 - Risk
- Measure effectiveness of training
 - Keep records
 - Establish, implement and maintain a procedure to make employees aware of
- Consequences of actions and behaviour, including non-conformity
 - benefits of improved personal performance
 - their individual responsibilities

Communication, Participation and Consultation

- Establish, maintain and implement procedures for
 - Worker involvement in hazard identification, risk assessment and controls (the monthly safety committee meetings already going on is a good start)
 - Involvement in accident investigation
 - Involvement in development and review
 - Consultation on changes
 - Representation on OH&S matters

Documentation

- The documentation shall include:
 - The policy, scope and objectives
 - Documents and records required by The Standard for the planning, operation and control

Control of Documents

- Documents shall be controlled:
 - Only approved documents to be used
 - Maintained, reviewed and amended (recorded)
 - Prevent use of obsolete or non-approved documents

Operational Control

- The organisation shall implement and maintain:
 - Operational controls as applicable to the organisation's activities, eg
 - Noise
 - Excavations
 - Use of Power Tools and Machinery
 - Electricity
 - Hazardous Substances
 - Workstations/Display Screen Equipment
 - Working at Height
 - Driving Safely
 - Manual handling

- Controls related to purchased goods, equipments and services (including contractors/sub-contractors)

Emergency Preparedness and Response

- Establish, implement and maintain procedures to:
 - Identify potential for emergency situations
 - Fire
 - Medical and First Aid
 - Flood
 - Responses to those emergency situations
 - Safe Access and Egress
 - Introduction and maintenance of Fire Equipment
 - Alarms
 - Detection
 - Reasonable fire-fighting equipment
 - Evacuation
 - Safe assembly and accounting for everybody
 - Periodic testing of these procedures
 - Periodic review and revision of these procedures where necessary

CHECKING

- Performance Measurement and Monitoring
 - Monitoring effectiveness of controls (record keeping and analysis)
 - Include proactive measures of performance that monitor conformance with The Standard
 - Include reactive measures of performance that monitor ill-health, accidents, near-misses and other non-conformities
 - Recording of data and results to facilitate corrective and preventive action
 - Maintenance and calibration of equipment used in monitoring, where relevant.
- Evaluation of Compliance
 - Ensure continued relevance and conformity to legal and other obligations
- Incident Investigation, Non-Conformity, Corrective Action and Preventive Action
 - Incident Investigation should aim to
 - Establish, implement and maintain procedures for:
 - Determining deficiencies and causation of accidents (root cause analysis)
 - Identify need for corrective action
 - Identify opportunities for continual improvement
 - Communicate results of findings
 - Document and record all such investigations and findings
 - Non-conformity, Corrective Action and Preventive Action
 - Corrective and Preventive Action to follow hierarchy of control
- Control of Records
 - Records to be retained to demonstrate conformity to the requirements of The Standard
- Internal Audit
 - Internal audits to be conducted at planned intervals to ensure Conformity to The Standard
 - Implementation of the Policy and Procedures (including record keeping)
 - Maintenance and update of the OHSMS
 - Effectiveness of the System

- The audits to address:
 - Competencies, responsibilities and requirements
- To be carried out objectively and with impartiality
- Frequency and detail of audits dependent on level of risk and nature of activities

MANAGEMENT REVIEW

- Top Management shall review the OH&S System at planned intervals to ensure continuing suitability and include assessment of opportunities for improvement and the need to change. Records shall be kept of these reviews.

CONCLUSION

It should be emphasised that the foregoing is a framework, based on the requirements for conformity with the standards set out in OHSAS 1800:2007 and should not be taken as a blueprint for achieving 'The Standard'. Meeting the requirements of 18001:2007 is a long process that requires diligent and determined commitment to the principles set out therein. This is achievable in the long term.

The foundation for this however needs to be laid through top management's deliberate decisions and actions aimed at turning things around (especially at KHEPLC).

D) WASTE MANAGEMENT PROTOCOL AND PLAN

Definitions:

“Waste” is defined in Article 1(1)(a) of the Waste Framework Directive (2006/12/EC) and means “any substance or object...which the holder discards or intends or is required to discard”.

“Holder” means “the producer of the waste or the natural or legal person who is in possession of it”. It rests, in the first place, with the producer or holder of a substance or object to decide whether it is being discarded and is waste.

To describe the “recovery” of waste, “...the principal objective is that the waste serve a useful purpose in replacing other materials which would have had to be used for that purpose, thereby conserving natural resources”. “Re-use” and “recycling” are forms of waste recovery.

Relevant Legislation

The following national regulations and guidelines have been referred to in relation to the evaluation of waste management processes at PHCN properties:

- S.I.15 – National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991 - Federal Environmental Protection Agency, 1991.
- National Policy on the Environment - Federal Environmental Protection Agency, 1998
- S.1.8 National Effluent Limiting Regulation of 1991
- S.1.9 National environmental protection (pollution abatement in industries and facilities producing wastes) regulations, 1991

Reference has also been made to the following international guidelines:

- The Site Waste Management Plans Regulations. Statutory Instrument 2008 No. 314 - Department for Environment, Food and Rural Affairs, 2008.
- Non-statutory guidance for site waste management plans. Department for Environment, Food and Rural Affairs, 2008.

In order to fulfil responsibilities outlined in these regulations, PHCN must to ensure that waste is recovered or disposed of in ways which protect the environment and human health, by regulating waste management operations (including collection, transport, treatment, storage and disposal) and enforcing waste management controls in a consistent manner.

PHCN should also provide comprehensive monitoring data to enable the amount of waste arising and the final disposal method to be tracked and recorded for each significant waste stream. This will address the following two aims:

1. **Improving materials resource efficiency**, by promoting the economic use of construction materials and methods so that waste is minimised and any waste that is produced can be re-used, recycled or recovered in other ways before disposal options are explored; and
2. **Reducing unsightly and inappropriate disposal of waste**, by restricting the opportunities available for the inappropriate disposal of waste by ensuring compliance with existing legal controls and providing a full audit trail of any waste that is removed from the site.

Site Waste Management Plans

This document outlines the details of waste management for the site. The plan must be implemented and then updated as site operations or construction proceeds. All waste transactions must be recorded or referenced in the plan to prevent the likelihood of fly-tipping. Finally, once the project is completed, the plan should be reviewed and must record the reason for any deviation from the planned arrangements.

Waste management estimates will be included in the plan, against which you will compare performance as the site operations or construction project progresses. This plan will outline:

- how much waste is likely to be produced on site;
- for each type of waste, the proportion that will be:
 - re-used or recycled on site, or
 - removed from the site for re-use, recycling, recovery or disposal elsewhere.

During the construction phase the principal contractor (for refurbishment works) must update the plan as waste is disposed of, re-used, recycled, or otherwise recovered. This makes the plan a 'living' document that describes the current state of progress against the waste management forecasts contained in the plan.

Waste removal

When waste is removed from the site, the site owner (during the operational phase) or principal contractor (during the construction phase), must show in waste management plan that the organization to whom waste disposal is contracted to you give your waste is authorised to receive it. This will be documented by the completion, exchange and retaining of waste transfer notes when the waste is handed over.

The site owner (during the operational phase) or principal contractor (during the construction phase) must take all reasonable steps to prevent unauthorised handling or disposal by others.

Persons authorised to remove or receive waste may include local government waste collectors or Federal Ministry of Environment registered waste carriers. Checks should be carried out on sub-contractors before they come on-site to ensure they are legally compliant.

In order to secure longer term improvements in materials resource efficiency, performance against the waste management plan should be evaluated following completion of the project.

PHCN is responsible for ensuring that the plan is prepared before construction work begins or for operational purposes. In addition, the rehabilitation works designer should input into the plan on behalf of PHCN, as this will assist in recording any decisions that have been taken at the project outline/design stage. The plan should then be passed to the principal contractor, who must update it as work progresses and ensure that workers on the site are aware of the plan and co-operate with it. This will include providing suitable site induction, information and training. Contractors will therefore need to engage their employees and sub-contractors to ensure that any waste management objectives in the plan are understood and achieved.

Both PHCN and the principal contractor are responsible for reviewing, revising and refining the waste management plan as necessary, in particular, to ensure that roles and responsibilities are clear as the project progresses. They must also ensure that adequate security measures are put in place to help avoid waste being disposed of inappropriately at the site.

Reporting requirements

A site waste management plan (SWMP) will need to forecast how much of each type of waste will be produced on site and how it will be managed. But before this, decisions should already have been

taken on the design, construction method and materials that will reduce the amount of waste. Such decisions should be recorded in the plan before addressing the waste that cannot be avoided.

Methods for reusing or recycling waste on-site before should be considered before the off-site possibilities for re-use, recycling, other types of recovery or disposal are implemented.

The plan also needs to identify the location of the site and the individuals responsible for preparing and implementing it.

Details required in the first draft of a SWMP are outlined below:

Responsibilities

The hierarchy of responsibility for waste management is:

1. PHCN
2. The principal contractor for rehabilitation/construction works
3. Any other person involved in drafting the plan

Site details

These should include:

- Description of the Construction Works
- The location of the construction site
- The estimated cost of the project

Materials Resource Efficiency

The use of materials should be outlined to include:

- Any decision taken before the SWMP was drafted to minimise the quantity of waste produced on site. This may include
 - design specifications;
 - the choice of materials used, or
 - method of construction, such as pre-fabrication.

Preliminary records of decisions taken on materials resource efficiency may begin at the earliest stages of the project, and copies of related documentation can be used to help complete this section of the SWMP.

Waste Management

Management plans will include:

- A description of each waste type expected to be produced during the project or operations;
- An estimate of the quantity of waste that will be produced
- For each waste type, a description of the waste management action proposed
- (including re-use, recycling, other types of recovery and disposal)
- Classification of waste as (as a minimum) inert, nonhazardous or hazardous, with further identification of individual waste streams. This will allow for a waste management route to be determined for each.

- Information about agreed practices for the handling and storage of materials should also be included in the plan.

Further detail is then required on the actual waste management actions. The plan must be updated at least every 6 months to record the types and quantities of waste that are:

- re-used (and whether on or off-site);
- re-cycled (and whether on or off-site);
- sent for another form of recovery (and whether on or off-site);
- sent to landfill; or
- otherwise disposed of.

Figures on the amount of re-use and recycling, and whether this takes place on or off-site, should be provided wherever possible. Details of waste that is sent for any other type of recovery should be kept and may include:

- physical sorting (where this results in recovery of one or more components
- of the sorted waste)
- chemical or biological treatment
- composting
- incineration with energy recovery
- remedial treatment of soil

Records should also be kept for any other type of disposal, including burning without recovery and where it is not possible to record known quantities of mixed waste that are destined for other options.

If significant changes are made during the course of the project, or the plan requires substantial revision, a further plan can be produced.

Waste minimisation

The WMP should improve waste management practices and help to reduce the amount of waste produced (and associated costs). Waste minimisation can be implemented on the basis of the following actions.

Role of the 'Project Manager'

The identification of a waste management project manager for the site operations as a whole, as well as for rehabilitation works should as soon as possible (for the operational phase) and before any action is taken (for the construction phase). The manager should be able to demonstrate a number of actions:

- communication with staff and management;
- the identification of the required resources, information, staff motivation and training when necessary;
- a good knowledge of the contract or operations of the site; and
- the appointment of a team for the implementation of waste management actions.

Management must also recognise that the project leader will require time set aside for waste minimisation activities and make the necessary commitment.

The following actions will be established once the waste management project leader and team (where relevant) have been identified.

Programme Execution

The implementation of the waste minimisation changes require:

- Planning
- Staff education/training
- Monitoring

Planning

To have the greatest impact the programme should be a planned series of events, throughout which all the staff involved must be kept informed of progress. This is likely to involve an outline of re-use and re-cycling initiatives to minimise waste disposal. Appropriate means of disposal should also be outlined and described, with suitable contractors for implementation identified and engaged.

Staff Education/training

Training on waste management can be both formal and involving external trainers, but must also be included in practices such as site inductions, providing a routine means of communication of standard procedures at the site.

Staff should also be given the opportunity to input to the process, since staff undertaking the waste producing processes often can provide practical details and become useful sources of information.

Monitoring

The monitoring of all practical outputs and changes is vital if the success of the programme is to be measured. A clear success indicator can be, for example, a reduced electricity bill, or reduced disposal costs.

Access to the WMP

The WMP should be kept in a location where it is accessible by anyone carrying out a regulatory compliance check.

During the rehabilitation/construction phase, it should be kept in the site works office or where there is no site office, at an appropriate place on the construction site (electronically or on paper). PHCN should ensure that all contractors know where it is kept and it must be made available to any contractor carrying out work described in the plan.

For practical reasons it might be advisable to make multiple copies of the planned waste management actions. Where this occurs, there must be a clearly labelled master copy and all duplicates should be dated and updated accordingly.

Inspection of the WMP

The key aim should be to ensure that, for appropriate sites, a SWMP has been written and implemented. More detailed checks should reveal whether there is documentary evidence of all waste that has been removed from the site, and whether the types and quantities of waste produced have been reconciled against the estimates in the plan.

The site waste management project manager should have knowledge of how the plan has been implemented, down to sub-contractor level, and the way in which the site is managed to accommodate waste storage and recovery.

The Identification of weaknesses in the implementation of the plan should be noted. Evidence of the waste carrier registration and waste transfer or hazardous waste consignment notes for individual movements of waste should be provided either as part of the plan, or should be filed and cross-referenced.

Any decisions to reduce waste through the design of the project and the construction method or materials used should be included in the plan.

Project completion – construction phase

At the end of the project the completed SWMP with records of all waste management actions needs to be reconciled against what was planned before work began. Regular updating during the construction phase should make this a relatively straightforward process.

This final review will also allow for the identification of areas where forecasts were exceeded or missed, and to learn lessons for the next project. The level of cost savings achieved can also be identified at this point.

OPERATIONAL PHASE WASTE MANAGEMENT PLAN

Sanitary waste

It is imperative that the sewage from both Kainji and Jebba Hydroelectric Plc is collected centrally and pre-treated prior to release in to the river, or prior to an alternative means of waste disposal. Prior to the installation of a sewage treatment facility, sanitary waste generated will be handled by a Federal Ministry of Environment approved offsite Subcontractor. Sanitary waste holding tanks will be emptied on a regular schedule based on the volume generated and holding tank capacities.

Refuse

Office waste, rubbish, and food waste generated by staff at Kainji and Jebba Hydroelectric Plc will be accumulated in “waste bins” that will be located at relevant areas within the site workroom and offices. Mobile, lidded bins or “wheelie-bin” are to be located adjacent to the kitchen area as well as at the rear entrance of each property at a distance far enough away to limit odour and vector problems. Aluminium cans, scrap aluminium metal, and glass containers will be segregated from the rest of the rubbish. Waste bins will have covers to protect against refuse blowing away and to eliminate the potential of animals and vectors getting into the refuse. Containers with food waste will be emptied on a regular schedule to protect against odours.

Medical Waste

Hazardous Material Storage

Each subcontractor must submit an initial list of hazardous materials and update this list (including hazardous wastes) along with copies of the Material Safety Data Sheet (MSDS) to PHCN. Whenever materials are brought onto the site or new wastes generated during field activities, the subcontractor must notify the Environmental Department Manager at either Kainji Hydroelectric Plc or Jebba Hydroelectric Plc. The subcontractor will review each listing at least quarterly (every 3 months) while at the Project site. If no changes to the list are required, the subcontractor must provide a written statement of this fact to the Subcontracts Administrator.

Waste Disposal

Table 1 provides a summary of anticipated Project generated wastes and how they will be disposed of.

Non Hazardous Waste

Reuse or recycling alternatives will be sought as per the waste disposal options (see Table 1 below) wherever possible (i.e. where cost effective methods, using the Best Practical Environmental Option and the Proximity Principle, can be met).

Where reuse or recycling is not possible for non-hazardous waste streams, disposal of non hazardous waste will be managed by a suitably appointed Federal Ministry of Environment approved sub-contractor for disposal of waste, in a manner similar to that undertaken at the staff residences.

Hazardous Waste

All hazardous waste generated at the site will be transferred managed by a suitably appointed Federal Ministry of Environment approved sub-contractor for disposal of waste, in a manner similar to that undertaken at the staff residences. The transport of Hazardous Waste will be covered by a Waste Transfer Note (WTN). The WTN will be completed a minimum of three working days prior to the waste consignment date, allowing the receiving facility to determine whether the waste is acceptable at the site. The WTN will contain details of:

Producer

- The producing company name and address
- Contact person and details
- Location of the waste
- Description of the waste
- Hazardous properties of the waste (e.g. Material Safety Data Sheet, Waste Profile Sheet etc)
- Method of storage
- Quantities
- Waste identification number

Carrier

- The waste carrier company name and address
- Contact person and details
- Registration details
- Vehicle type
- Date & Time of transfer
- Name of person driving the vehicle
- Destination of waste

Disposer

- The disposal company and site
- Discrepancies in sections of the WTN
- Contact person and details

Before transferring the waste to another party for transportation purposes, the contractor will check to ensure that:

- Transport vehicles carry any necessary safety equipment.
- The vehicle is in a sound condition and capable of containing any leakages.
- The vehicle has sufficient capacity to carry the waste without overloading.
- Drivers are suitably trained and aware on the potential dangers of their cargoes and what steps to take in the event of an emergency.
- All waste, regardless of its nature will be clearly labeled. The label must clearly identify the contents of all containers and any specific hazards such flammability, corrosivity etc. Labels must be waterproof and indelible.

- Documentation with adequate information on the hazardous properties is carried with each consignment of hazardous waste e.g. MSDS or Waste Profile Sheet (WPS).

The waste disposal contractor will supply the contractor/PHCN with a *Certificate of Final Disposal of Hazardous Waste*, a copy of which should be kept for a period 5 years.

To assist with ensuring that wastes are appropriately segregated for re-use, recycling and disposal, a colour coding system is proposed, as follows:

- Green** – recyclable non-hazardous materials
- Blue** – non-recyclable, non-hazardous materials
- Red** – all hazardous waste materials
- Yellow** – clinical wastes for incineration

These are generic classifications only for the purposes of this project. For certain waste types, there will be specific requirements that need to be met and may warrant further segregation (e.g. certain food items may not be compostible such as bones and may need separate disposal). In each case, the contractor will need liaise with the waste disposal or treatment facility to determine any precise requirements that apply to the sorting and segregation of particular waste streams.

Table 1 summarises the waste disposal options for all types of waste

Table 1 Waste Disposal Options for Different Materials

No	Waste Stream	Storage Method & Container	Disposal Option
Inert & Non-hazardous			
1	Concrete (uncontaminated)	Loose in dedicated bay	Re-use on site or nearby site for foundations
2	Bitumen	Steel drums	FME approved sub-contractor
3	Soil/Sand (uncontaminated)	Loose on site (away from plant & dwellings)	Retain on site for foundations and future use
4	Scrap Metal (uncontaminated)	Large skip	Recycle
5	Timber (materials, pallets etc)	Large skip	Recycle
6	Welding rods	Steel drums	FME approved sub-contractor
7	Cabling	On pallets in dedicated bay	Recycling
8	Packaging (paper, cardboard, plastic)	Covered skip	Recycle
9	Paper/card (uncontaminated)	Covered skip	Recycle
10	Plastics (uncontaminated)	Covered skip	Recycle
11	Glass (uncontaminated)	Lidded/covered bins	Recycle
12	Aluminium Cans	Lidded/covered bins	Recycle
13	Compostible wastes (e.g. grey cardboard, vegetables, salad, green wastes etc)	Covered skip	Composting
14	General non-recyclable camp waste (e.g. food packaging, clothes, containers etc)	Covered skip	FME approved sub-contractor

15	Tyres	Loose in tidy stockpile in dedicated bay	FME approved sub-contractor
Hazardous Wastes			
16	Acids/alkalis (sulphuric acid & caustic)	Sealed metal drums on pallets	FME approved sub-contractor
17	Gas Turbine Cleaning Sludge	Sealed metal drums on pallets	FME approved sub-contractor
18	Oils (lubricating, hydraulic, maintenance) and greases	Sealed metal drums on pallets	FME approved sub-contractor
19	Oily rags/PPE	Sealed metal drums on pallets	FME approved sub-contractor
20	Contaminated soil/sand	Sealed metal drums on pallets	FME approved sub-contractor
21	Contaminated ground/surface water	Bunded bulk storage tank	FME approved sub-contractor
22	Oil contaminated clean-up materials and absorbents (e.g. rags, pigs, filters, sand etc)	Sealed metal drums on pallets	FME approved sub-contractor
23	Oil sludges (interceptor wastes, DAF float, pigging)	Sealed metal drums on pallets	FME approved sub-contractor
24	Biocides (liquids)	Sealed metal drums on drip trays	FME approved sub-contractor
25	Refrigerant gases/liquids (HCFCs, HFCs, ethane) and equipment	Sealed cannisters inside metal drums	FME approved sub-contractor
26	Solvents and solvent containers	Sealed metal drums on pallets	FME approved sub-contractor
27	Chemicals and chemical containers	Sealed metal drums on pallets	FME approved sub-contractor
28	Domestic sewage sludge	Sealed metal drums on pallets	FME approved sub-contractor (construction phase)/ waste treatment plant (operational phase)
Clinical/Medical Waste			
29	Sharps	Sealed plastic containers	Hospital Incinerator
30	Bloodstained dressings/bandages, swabs etc	Double bagged and in dedicated bins	Hospital Incinerator
31	Human anatomical waste	Double bagged and in dedicated bins	Hospital Incinerator
32	Incineration waste	Sealed plastic bags	FME approved sub-contractor
33	Pharmaceuticals	Bagged and in dedicated bins	FME approved sub-contractor

Environmental Compliance Inspections – Rehabilitation/Construction Phase

1. The Project Environmental Manager (PEM), or designee, will conduct regular field inspections to assess and document (in a Field Environmental Inspection Report) site conditions with respect to compliance with all Project environmental requirements and this Environmental and Social Management Plan (ESMP). During normal field operations, inspections will occur weekly and will include the overall site, the contractor residential camp and subcontractor's Waste Storage Areas

(WSA). Subcontractors are responsible to perform daily inspect their WSAs and work areas and document these inspections.

2. Subcontractors will perform daily work area and weekly workshop/office area inspections throughout the life of their contracted work and at the time of demobilization. Copies of the inspection documents will be avail for the PEM.
3. Observations from each inspection will be documented in written form, noting any corrective actions necessary to maintain environmental compliance.
4. Areas to be inspected include, but are not limited to:
 - Site perimeter boundary (e.g., for potential off-site impacts);
 - Buffer areas and protection measures (any impacts/effectiveness);
 - The contractor WSAs (hazardous and nonhazardous) and hazardous materials storage areas;
 - Subcontractor hazardous material and WSAs throughout the site (hazardous and nonhazardous);
 - Vehicle maintenance areas; and
 - Fuel storage and management areas.
5. The results of an inspection of a subcontractor's WSA should be discussed with the subcontractor so that they understand what the concerns are and how the issues can be corrected in a timely manner.
6. The PEM will coordinate with the Construction Superintendent to have identified deficiencies repaired in a timely manner.
7. All completed Field Environmental Inspection Reports will be kept on file in the PHCN onsite Environmental Managers office.
8. A suggested format for the WSA Environmental Inspection Report and Operational Phase Site Waste management Checklist are included below.

Environmental Compliance Inspections – Rehabilitation/Construction Phase

Contractor: _____

Date/Time: _____ / _____

Inspector: _____

Signature: _____

Waste Storage Area			
Container Condition		Yes	No
	Are all containers closed and secured?		
	Are any containers open or improperly secured (i.e., lids, valves)?		
	Are all containers in good condition (i.e. no bulging heads, no major dents, no severe rusting, no leaks)?		
	Have any spills been cleaned up and off containers?		
If any questions are NO, please describe:			
Describe actions taken to correct situation:			
Labelling	Is label legible and visible?		
	Is label marked "Hazardous Waste" or "Nonhazardous Waste" or "In Use" or "Empty"?		
	Is label on side of container with contents marked?		
	Is contractor's name marked on label? Is the date of accumulation listed?		
If any questions are NO, please describe:			
Waste Storage Area			
Is the accumulation area organized, clean, and free of rubbish?			

[illegible]

Site Waste Management Plan Checklist

Site name	
Site address/location	
Waste management contractor: <i>Contractor details, including signature of authorised representative</i>	

Activity stage	Factor for consideration	Tick if 'Yes'	Comment: If 'yes', 'Yes' what action have you taken/do you propose to take? If 'no', why not?
Management/ policy	Has your organisation adopted a waste management policy?		
	Has the client signed the Site Waste Management Plan?		
	Have relevant sub-contractors producing significant wastes streams been identified?		
	Have the identified sub-contractors signed the Site Waste Management Plan?		
Procurement	Has a careful evaluation of materials been made so that over-ordering and site wastage is reduced?		
	Has full consideration been given to the use of secondary and recycled materials?		
	Is unwanted packaging to be returned to the supplier for recycling or re-use?		
	Can unused materials be returned to purchaser or used on another job?		
Project planning	Has responsibility for waste management planning and compliance with environmental legislation been assigned to a named individual within the main contractor organisation and identified sub-contractors?		
	Has a project programme been developed to include likely waste arisings (how much, when, and what types)?		
	Has an area of the site been designated for waste management, including segregation of waste?		
	Have measures been put in place to deal with expected (and unexpected) hazardous waste?		
	Has disposal of liquid wastes such as wash-down water and lubricants been considered?		

Activity stage	Factor for consideration	Tick if 'Yes'	Comment: If 'yes', 'Yes' what action have you taken/do you propose to take? If 'no', why not?
	Have opportunities been considered for re-use of materials on-site?		
	Have opportunities been considered for re-use of materials off-site?		
	Have opportunities been considered for on-site processing and re-use of materials?		
	Have opportunities been considered for reprocessing materials off-site?		
	Have you considered the most appropriate sites for disposal of residual waste from the project?		
	Are there opportunities for reducing disposal costs from waste materials which may have a commercial value?		
Daily operations	Has responsibility for waste management on-site and compliance with environmental legislation been assigned to a named individual?		
	Have toolbox talks been planned for all site personnel about waste management on-site?		
	Are selected waste materials segregated to allow best value to be obtained from good waste management practices?		
	Are containers/skips clearly labelled to avoid confusion?		
	Is there adequate use of transfer notes for waste management contractors and waste management facilities?		
	Is implementation of agreed waste management procedures monitored?		
	Are reports regularly produced regarding waste quantities and treatment/disposal routes, and on costs incurred?		
	During site operations, are barriers to good waste management practice considered and noted for incorporation into environmental management reviews?		
Monthly/ quarterly/annual reporting regime	Has a final report of use of recycled and secondary materials, waste reduction, segregation, recovery and disposal, with costs and savings identified, been completed?		
	Has the waste management report been signed by the relevant sub-contractors?		
	Have key waste management issues been considered for action?		

Site Waste Management Plan Datasheet

Site name	
Site address/location	
Waste management contractor: <i>Contractor details, including signature of authorised representative</i>	
Person responsible for waste management on site (name and job title)	
Person and company completing this form, if different	

Waste types:

Material	Quantity (in m ³ /tonnes)					
	Reused on-site	Reused off-site	Recycled for use on-site	Recycled for use off-site	Sent for off-site contractor disposal	Sent to landfill
Inert						
Hazardous						
Totals (in m³/tonnes)						
Performance score as %						
SWMP Target %						

E) SOCIAL SURVEY RAPID ASSESSMENT

QUESTIONS

Resettlement Issue

- How the resettlement was carried out when the dams were constructed?
- Are they happy with the resettlement, if not why?
- Changes due to the dam construction

Livelihood Pattern

- Present livelihood of the community
- Changes over the past decades
- Impact of the dam on the livelihood – fishing and farming, health issues

Fishing

- Production trend?
- What are the problems in the fishing?
- What do they need to overcome the problem?

Flooding

- Do they receive enough advance information from the Dam site about flooding?
- What are the impact of flood and how they are affected?
- What is their preparation for flooding?
- What do they think as the solution for the flood management?

Flood Warning Communication System

- What is the present method and the problems associated with the existing system
- Discuss about the possibility of regular information from PHCN to the communities through locally operated radio systems.

Facilities in the village

- Housing
- Electricity
- Roads
- Markets
- Water supply and sanitation
- Water quality of the river
- Primary health care
- Education

Level of Exposure on

- Safe drinking water
- Waste management
- Health care
- Governance

Relationship with PHCN

- What is their relationship with the PHCN? Is it positive or negative? Why it is positive or negative?
- How PHCN helps them?
- How the community report their grievances?
- Explain the Rehabilitation project objectives and the possible impact in the communities
- What is their expectation from the PHCN and other Govt. stakeholders?
- Their understanding about HYPPADEC?

Stakeholder Visits

KAINJI DAM	JEBBA DAM
Villages	Villages
Fakun	Gungu
Awuru	Ipata
Monnai	Gabjibu
Kaya	Bukka
Other Stakeholder	Other Stakeholders
New Bussa LGA	Mokwa LGA
Joint Session of Youth Leaders at Kainji Dam including CBOs	Moro LGA
Emir of Borgu	Pategi Sugar Factory
HYPADEC Coordinator Mr. Koshe	

Photos Taken During Discussions with Stakeholders (other than Village Stakeholders)



Photo: Emir of Borgu



Photo: Mokwa LGA Chairman (Hon. Adamu Mohammed Lwafu)



Photo: Moro LGA Representative (Alh. Adebayo Mohammed B.)



Photo: Joint Session with Youth Leaders, CBOs and PHCN Officials



Photo: HYPPADEC Coordinator Mr. Koshe

F) TRAINING CONDUCTED

The following training has been undertaken as part of this assignment.

HEALTH AND SAFETY

1) Risk Assessment

Overview

This course has will help Supervisors and Managers assess the risks in the workplace and put in place appropriate control measures. It will be delivered via classroom based lectures as well as a practical exercise involving the identification of hazards within the workplace and writing a report to management.

Course Content

The syllabus focuses on:

- Outline of current Nigerian legislation
- Principle of health and safety
- Identification of hazards
- Risk evaluation
- Identifying control measures
- Risk management and monitoring.

Outcome

This programme has been designed to produce competent risk assessors who are able to carry out “suitable and sufficient” assessments across a broad range of workplace activities.

Duration

One day

Target Audience

This course will benefit personnel who will assume responsibility for carrying out risk assessments or participating in a corporate risk management programme. Supervisors and Managers are the primary target audience.

2) Fire Warden Training

Overview

This course aims to provide personnel who will be responsible for taking charge in the event of a fire with the requisite skills and knowledge to do so. The Fire Warden training is an integral aspect of the overall fire prevention and fighting arrangement of the organisation.

Course Content

- Basic duties of the fire marshal/warden
- The fire Triangle
- Heat transfer
- Common sources of fire
- Fire extinguishers
- Fire exits, emergency exit routes, signs
- Emergency lighting & fire alarms
- Evacuation procedures
- Practical extinguisher discharges

Outcome

At the end of this course, delegates will be able to demonstrate an understanding of:

- The procedures to be followed in the event of fire
- The principles of combustion
- Basic fire prevention
- Arson prevention
- Personal protection
- Movement in smoke
- Evacuation procedures and the control of personnel

Duration

One day

Target Audience

This course will benefit personnel who will assume responsibility for marshalling staff in the event of a fire. They will also be responsible to act as lookouts and bringing to attention fire hazards or fire-risk situations before fires happen. Any category of staff can attend this training.

A maximum class size of 16 participants is recommended per training session

3) Confined Space Working

Overview

The course will provide participants with an understanding of confined space operations. This will include recognising the types of confined spaces and their associated hazards together with knowledge of the implementation of control measures to eliminate or reduce the risk. .

Course Content

The course will include lecture and practical demonstration and covers the following elements:

- Legislation
- Definition and types of confined spaces
- Confined space hazards
- Safe working procedures
- Atmosphere monitoring
- Breathing apparatus (types and applications)
- Access and ancillary equipment
- Practical demonstrations

Target Audience

The course is suitable for all personnel responsible for the design of safe working practices and overall responsibility and supervision of workers entering into confined spaces.

WASTE MANAGEMENT

1) Waste management – responsibilities and implementation for facility managers

Course Content

Relevant legislation and guidance
Principles of waste management
Waste classification
Workshop – waste classification
Reduction, re-use and recycling
Waste management options (including landfill, incineration and composting)
Waste disposal, storage and containment options

Handling Hazardous Waste
Discussion – Benefits of waste management procedures

Waste minimisation
- Collecting and Analysing Data
- Identifying Opportunities for Reducing Waste

Duration

6 hrs (minus breaks). Mixture of practical and classroom work.

Target audience

Principal managers

2) Waste management – a practical guide

Course Content

Relevant legislation and guidance
Principles of waste management
Waste classification, the 3 'R's' and Waste disposal options
Workshop – Classification of Wastes
Workshop – Identifying waste management requirements

Duration

3 hours minus breaks

Target audience

Managers and engineers

COMMUNITY RELATIONS and COMMUNICATION

1) Corporate Social Responsibility (CSR)

Overview

This course will help the ESU committee members and the management above the PM level to understand the importance of community relations and the corporate social responsibility. This will cover mainly by the classroom based lectures. The experiences from other corporates in the world will be presented and discussed.

Course content

- Importance of community relations
- Corporate social responsibility
- Community management
- Management of the needs of the community
- Preparation of CSR policy and programmes for implementation

Outcome

This programme will give the management and the ESU committee members to prepare a CSR policy and programme on an annual basis.

Duration

Half-day for KHEPLC and half-day for JHEPLC

Target Audience

This course is mainly beneficial to the ESU members, who keep-in-touch with the communities, the Management, who makes decisions and the PRO.

2) Communication

Overview

This course will help the ESU committee members and the members of hydrology departments, who deal with the communities to understand the importance of effective communication techniques mainly on CSR activities and flood warning system. This will cover mainly by the classroom based lectures.

Course content

- Effective communication
- Flood warning communication

Outcome

This programme will give the management and the ESU committee members and the hydrology departments to prepare a flood warning communication on daily basis and to keep the community better informed about the PHCN's role.

Duration

Half-day for KHEPLC and half-day for JHEPLC

Target Audience

This course is mainly beneficial to the ESU members and the hydrology unit members, who keep-in-touch with the communities, the Management, who makes decisions and the PRO.

ENVIRONMENTAL MANAGEMENT SYSTEMS

The following series of workshops (1-3) effectively takes senior management through the key stages of ISO14001 implementation. They are extracts from our 3 day IEMA (Institute of Environmental Management & Assessment) accredited course on EMS implementation and have been proven in delivery to a wide range of clients. We have added a fourth workshop to take delegates through the process of applying for certification with the UNFCCC (United Nations Framework Convention on Climate Change) and securing 'carbon credits' for sale on the carbon market.

WORKSHOP 1: PLANNING THE ENVIRONMENTAL MANAGEMENT SYSTEM

- Task 1 – Environmental Policy
- Task 2 – Environmental Aspects & Impacts
- Task 3 – Legal & Other Environmental Requirements
- Task 4 – Environmental Objectives, Targets & Management Programmes

DURATION: 4 hours

AUDIENCE: Middle/Senior Management

WORKSHOP 2: IMPLEMENTING AND OPERATING THE ENVIRONMENTAL MANAGEMENT SYSTEMS

- Task 1 – Roles & Responsibilities
- Task 2 – Training & Awareness
- Task 3 – Communications (Internal & External)
- Task 4 – Documentation & Records of the EMS
- Task 5 – Operational & Emergency Control

DURATION: 4 hours

AUDIENCE: Middle/Senior Management

WORKSHOP 3: CHECKING AND REVIEWING PERFORMANCE OF THE EMS AGAINST DESIRED CRITERIA

- Task 1 – Monitoring & Measurement
- Task 2 - Non-conformance & Corrective Actions
- Task 3 – Internal Auditing & Compliance
- Task 4 – Management Review
- Task 5 - Certification

DURATION: 4 hours

AUDIENCE: Middle/Senior Management

WORKSHOP 4: CARBON TRADING

DURATION: 3 hours

AUDIENCE: Middle/Senior Management

G) OPERATION AND MAINTENANCE PLAN PREPARATION GUIDELINES

The existing dam Operation and Maintenance manual can be used until the detailed hydrological modelling is undertaken as suggested in Section 2 above and the rehabilitation works undertaken on the dam and powerhouse.

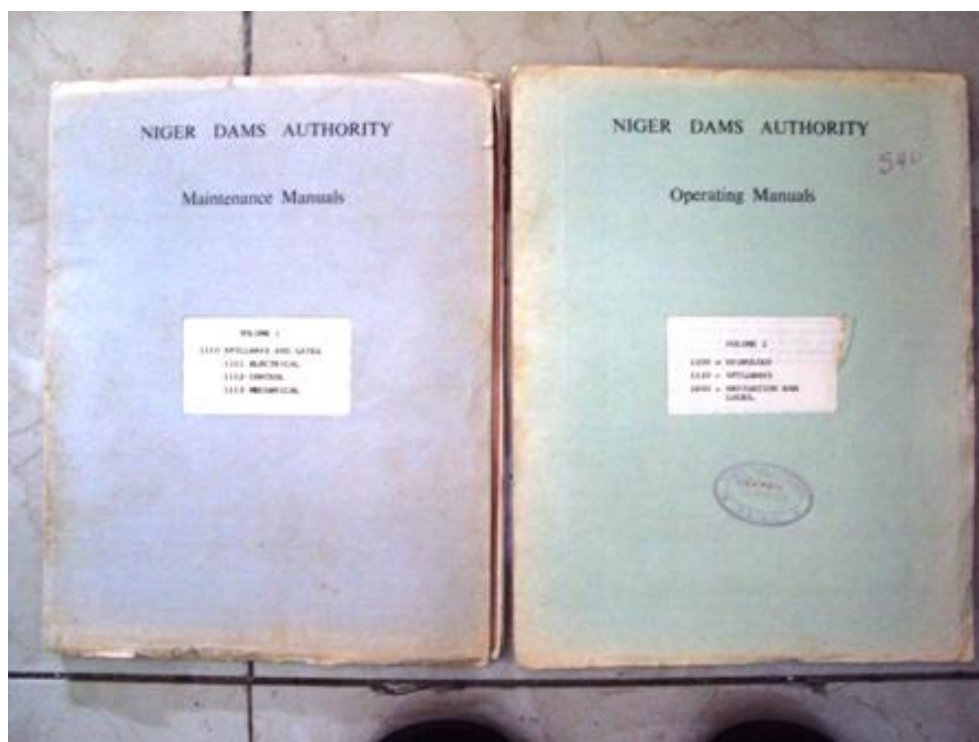


Photo: Cover pages of volume 1 of both Operation and Maintenance Manuals

For updating the O&M Manual, the guidelines provided by the Federal Energy Regulatory Commission (FERC) may also be used for preparation of the Dam Safety Plans. The relevant one is the Chapter 14: Monitoring the Performance of Dams (available at www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide/chap14.pdf). This includes

- Development of a Supporting Technical Information Document (STI)
- Potential Failure Mode Analysis (PFMA),
- Development of Surveillance and Monitoring Plan (SMP),
- Preparation of an Inspection Process and Coordination, and
- Emergency Preparedness Plan (EPP)

The example Operations, maintenance and Surveillance Manual, taken out from Canadian Dam Association may also be used. The inclusion of these examples in this report should not be interpreted as an endorsement of these models over other possible models.

Both the documents include EPP and IP as part of the O&M Plan. However in this document they have been dealt in separate Chapters (5 and 6).

The preparation of revised O&M Plan / Performance Monitoring Programme is proposed in the ESMP implementation plan. This includes a training programme on the above once they are developed.

A. FERC O&M PLAN PREPARATION GUIDELINES

1. Supporting technical Information (STI)

The purpose of the Supporting Technical Information document (STI) is to summarise those project elements and details that do not change significantly. The STI should include sufficient information to understand the design and current engineering analysis for the dam such as

- A detailed description of the dam
- A summary of the construction history of the dam
- Summaries of standard operating procedures
- A description of the geologic conditions affecting the project works
- A summary of hydrologic and hydraulic information
- Summaries of instrumentation and surveillance for the dam and collected data
- Summaries and stability and stress analysis for the project works

The STI is a 'living' document, in that as new data or analysis become available they are appended to the initial STI and outdated material is removed. This document has to be reviewed once in six months but reprinted once in every 15 years.

2. Potential Failure Mode Analysis

A Potential Failure Mode Analysis is a dam and project safety evaluation tool. It is an informal examination of "potential" failure modes for an existing dam or other project work(s) by a team of persons who are qualified either by experience or education to evaluate a particular structure. It is based on a review of existing data and information, first hand input from field and operational personnel, a site inspection, completed engineering analyses, identification of potential failure modes, failure causes and failure development and an understanding of the consequences of failure. Traditional dam and project works safety evaluations have tended to focus on a limited number of "standards based" concerns such as hydraulic capacity of spillways and stability of structures under a set of pre-defined load conditions. PFMAs are intended to broaden the scope of the safety evaluations to include potential failure scenarios that may have been overlooked in past investigations. A Potential Failure Mode Analysis is an exercise to identify all potential failure modes under static loading, normal operating water level, flood and earthquake conditions including all external loading conditions for water retaining structures and to assess those potential failure modes of enough significance to warrant continued awareness and attention to visual observation, monitoring and remediation as appropriate. This section includes the following.

- A brief description of a Potential Failure Mode Analysis;
- A listing of the key goals and outcomes anticipated from a PFMA;
- Guidance for the conduct of a PFMA is given in two ways:
 - A brief statement of the expectations and requirements for a PFMA
 - Detailed, step by step guidance for the conduct and documentation of a PFMA
- A description of the intended application of the results of the PFMA as a support document for conducting the FERC Part 12D Dam Safety Examination with specific emphasis on the development of the Surveillance and Monitoring Plan for the project;

- A description of the process for “updating of the PFMA” by future Independent Consultants; and
- Appendices containing supporting materials and example products from a PFMA.

Procedural Guidance – Potential Failure Mode Analysis Step by Step Guidance

Step 1	Designation of the Potential Failure Mode Analysis Participants
Step 2	Collection of Background Data on the Dam for Review by the Core Team (Licensee with input from the Independent Consultant)
Step 3	Site review including interviews with key owner personnel at the Project.(Core Team)
Step 4	Comprehensive review of all of the Background Data on the Dam by the Core Team
Step 5	Conduct of the PFMA Session (The licensee is responsible for the facilities, the Facilitator for assuring the process is followed, and the Core Team for performing the PFMA)
Step 6	Consideration of Surveillance and Monitoring opportunities and/or Risk Reduction measures for Identified Potential Failure Modes - (Note that the Surveillance and Monitoring Plan for Identified Potential Failure Modes is provided to the owner by the Independent Consultant)
Step 7	Documentation of the PFMA and Surveillance and Monitoring and/or Risk Reduction opportunities (Independent Consultant)

3. Surveillance and Monitoring Plan (SMP)

Monitoring the performance of the dam / project to assure that possible dam failures are avoided or adequate warning time of potential or impending failures is an essential part of a dam safety program. These guidelines:

- Provide a discussion of the various performance monitoring principles and methods used to aid in evaluation of a structure; and
- Present performance monitoring procedures and principles for a number of common adverse responses or conditions that typically are indicators or contributors to potential failure modes. These basic principals and procedures provide general guidance that is then made specific for an individual dam for the potential failure modes identified as part of the PFMA process.

Principles and Methods of Performance Monitoring

- i) Visual inspection
- ii) Instrumentation system
- iii) Comparison of instrument readings to predicted and required action levels
- iv) Consider a way to flag instruments that are trending in an adverse manner and what additional focus should be placed on those instruments
- v) Additions /deletions/duration (how long the instrument should be read)
- vi) Redundancy
- vii) Summary

The surveillance and monitoring procedures set at section 14.4.2 from page 14-34 of Chapter 14 should be taken as guidelines for preparation of SMP for Kainji dam.

H) DRAFT EMERGENCY PREPAREDNESS PLAN

EMERGENCY PREPAREDNESS PLAN (EPP) FOR KAINJI HYDROELECTRIC PLC

1.0 INTRODUCTION

1.1 Kainji Hydro Electric Private Limited Company (KHEPLC)

The Emergency Preparedness Plan (EPP) is a key component of Kainji Hydro Electric Private Limited Company (KHEPLC)'s Kainji Dam and Hydro Electricity Facility safety program. This EPP is prepared to meet the requirement of the dam safety rules and regulations. The EPP is designed to deal with any problem (even though highly unlikely) experienced with the Dam structure. This plan is developed in conjunction with relevant authority bodies responsible for activities during natural disasters in the area in the interest public safety.

1.2 Emergency Preparedness Plan

An EPP is a formal written plan that identifies the procedures and processes that the dam operators would follow in the event of an emergency at a dam. The emergency could be, for example, failure of essential equipment such as flood gates, slope failure having the potential to cause dam failure, or a complete failure of the dam caused by overtopping, earthquake or piping.

An EPP allows for planning by municipalities, local police, provincial agencies, telephone and transportation companies and other parties affected in the event of a dam break flood, and the coordination of efforts between provincial and municipal levels of government. In the event of an emergency, an effective, comprehensive, well-tested EPP will save lives and has the potential to reduce property damage.

1.3 Purpose of the Plan

The purpose of the EPP is to:

- Provide a plan, which facilitates public safety by notifying all appropriate authorities;
- Provide information to all stakeholders to allow for an informed evaluation to be made during emergency events
- Provide plans of action for foreseeable flood emergencies affecting safety of the Kainji Dam, hydroelectric facility and affected property downstream
- Provide for a plan of action to carry out repairs and reduce the impact of any such event where possible.

This plan is intended to assist KHEPLC, JHEPLC, local government authorities, State Authorities, the Federal Government and other agencies in responding swiftly and effectively in the event of an emergency.

1.4 Description of the Facility

Kainji and Jebba hydropower plants are located on the Niger River in Eastern Nigeria, approximately 100 km apart. They have installed hydropower capacity of 760MW and 578MW respectively.

Kainji powerhouse is equipped with eight turbine-alternator groups including four Kaplan type rated at 80 MW, two turbines also Kaplan type rated at 100 MW and two propeller turbines rated at 120 MW. The available head ranges between 23.8 m and 41.2 m according to the water level in the reservoir.

The development perimeter comprises the main concrete gravity dam with earth embanked dams on either side of the main and saddle dams, which closes a secondary valley, and two

gates. The main dam is 550m long with a maximum height of 64m. It comprises the water intakes, the flood evacuator and the abutments. The powerhouse is located downstream of the dam, on the right bank, and at right angles to the water intakes. The reservoir, which presently forms the Lake Kainji, is 136 km long and has a capacity of c15 billion m³.

1.5 Responsibilities

The persons identified in this EPP with primary responsibility for emergency response are listed below.

Assistant General Manager (Production) will be responsible for making immediate decisions regarding operations of the dam during emergency, in coordination with the AGM (Plant Services). He/She will also coordinate with the PM (Generation) regarding immediate decisions on if/when to recommend closure of the hydro-electric plant. He/She will also coordinate with AGM (ESU) to decide if/when/how to inform the public.

Systems Control Centre Operator (who?) must ensure that all key KHEPLC persons to be notified are contacted as soon as possible. Decisions on emergency response are the responsibility of the key personnel noted in this document. The primary responsibility of Operator, at the time of event, is to manage the notification process. This involves coordinating all communications and recording activities of all involved personnel.

Assistant General Manager (Plant Services) will be responsible to deploy resources as required to prevent or delay the incident. This involves coordination with engineers, consultants and contractors.

PM (Generation) will be responsible to take corrective actions to ensure integrity of the power grid system

Assistant General Manager (ESU) will be responsible to ensure overall activities are coordinated. This include liaison with outside agencies and providing information to the PHCN Abuja Office and other relevant Federal Agencies. In certain dam incidents, he can directly contact the Chief Executive Officer of PHCN in Abuja bypassing the protocol.

1.6 Dam Surveillance

The daily operations will be monitored by the PM (PC&M) and PM (Hydrology). This will include remote monitoring of water levels on a real time basis as well as any vibration or movement of the structures or leakages or piping activities. The sire will be inspected by Assistant PM on daily basis and by PM on weekly basis. These visits will involve visual inspections of the dam, surveillance of gallery, spillway, penstock and other structures.

A formal inspection of the dam and hydro-electric facility will be done every fortnight by the AGM (Plant Services). Bi-annual inspections will be done by the staff with civil engineering consultants and/or officials from PHCN (Abuja), Ministry of Power.

1.7 Outside Agencies

A copy of the EPP is provided to all outside agencies involved in the emergency response procedures associated with this dam and hydro-electric facility. A list of Registered EPP Holders is provided in Appendix 1.

- Each listed agency is asked to be involved in the initial training and annual review and intermediate modification of the plan, if any, and therefore minimize potential for incorrect interpretation.
- Each listed agency is asked to assist with the coordination of the duties of the agencies

1.8 Limitations of this EPP

This EPP provides an outline and needs further revision once the hydrological modelling, inundation (flood plain) mapping and dam break analysis are over. This EPP provides an outline only at present for KHEPLC.

2 EMERGENCY IDENTIFICATION

2.1 Potential Serious Situation

A Potential Serious Situation is defined as a hazardous condition at the dam, which, if not attended to, may develop into an emergency situation. Listed below are examples of conditions, which could potentially lead to dam failure if mitigation measures are not taken. Respective inspection checks are also listed.

- Excessive/increase amounts of seepage;
 - Check drains in the gallery for any abnormal increase in quantities of seepage.
- Movement on the dam crest;
 - Check for deflection on the dam crest.
- Spillway Obstruction
 - Check spillway to ensure no blockage due to debris.
- High inflows;
 - Check for water levels that are higher than normal reservoir levels.
 - Check weather forecast for expected amounts of precipitation.
 - Check for rapid rate of rise of water levels.
- Widespread flooding;
 - Perform an aerial site inspection.

Rapid reservoir drawdown could also be a sign of a potential problem. This condition should be detected through continuous water level monitoring by Hydrology Division in coordination with Dam Instrumentation and the ESU.

2.2 Dam Failure

Dam failure is defined as the failure of the dam itself or its foundation, which results in large or rapidly increasing uncontrolled releases of water from the reservoir. It can be identified by the formation of a breach in the dam or foundation. It is impossible to determine how long it will take for a complete failure to occur once a significant breach has formed. Once a significant breach has occurred regular updates of the warning will be issued as long as the threat exists.

3 EMERGENCY RESPONSE

3.1 Technical Information

Response to any emergency arising out of a Dam Incident or Dam Failure will be greatly improved by having information in the hands of responsible persons in order to properly determine risks and possible outcomes. This information will allow the Dam Instrumentation Division and the Hydrology Division to keep abreast of the prevailing hydrological condition and resulting rainfall/runoff patterns.

3.2 Access to the Site

Another important factor in responding to an emergency is access to the site. This access can be severely hampered during major storms. Such storms also cause floods creating a requirement to get to the site. This section provides information on gaining access to the site and the various methods available.

Vehicles: KHEPLC has the following equipment at their disposal to travel to the site

- Four wheel drive SUVs
- Boats
- Van with repair and communication equipments
- Loader

Road Access: KHEPLC is located on the Mokwa – New Bussa Road. The access road is in good condition.

Air Access Generally the only type of aircraft, which could be used in an emergency or non-emergency situation, would be helicopter. Helicopter landing near the dam site is possible. The following is a list of helicopter services in the case of an emergency.

- (to be completed when information available)

3.3 Response During Darkness and Adverse Weather

Periods of Darkness: KHEPLC's emergency response teams are equipped to respond during periods of darkness. Vehicles are equipped with emergency lighting (i.e. spotlights). In addition to the standby diesel generator at the power house has small 5 kW diesel generators available or KHEPLC can be requested to provide additional lighting requirements if necessary.

Periods of Adverse Weather: The response plan is unchanged in principle in periods of adverse weather. KHEPLC emergency response teams are equipped to handle extreme working conditions resulting from adverse weather.

3.4 Power Sources

Powerhouse

Main Power Source (to be completed)

Standby Diesel Generators are available to repair lighting, pumping, operating tools, etc.

Communication Systems

KHEPLC has

- Dedicated telephone line
- VHF Radio
- Cellular Phones

Effect of Dam Failure

A dam failure under extreme flood conditions may cause excessive flooding at the powerhouse. This may result in the loss of monitoring devices and/or communications to the KHEPLC. When the Operator has reason to believe such has happened he will advise the AGM Production so as to implement the appropriate measures.

3.5 Incidental Procedures During Breach

It is important that information relating to any incident including a breach be recorded. Staff shall be assigned to obtain the following information provided they do not compromise their own personal safety;

- Reservoir and dam conditions prior to breach,
- Size and rate of development of the breach,
- Changes in the reservoir level during the breach,
- Spillway and penstock conditions,
- Status of generating unit

In order to assist in the collection of such data, photographic and video records will be made to assist in determining the cause and mode of development of the breach.

3.6 Mitigation Measures

The following describes remedial actions, which may be taken given various conditions.

(a) Cracks in the Dam

The following actions should be taken in the case of excessive cracking in the dam;

- Lower the water level by releasing it through the low level outlet,
- Continue lowering the water level until a safe elevation is reached.
- Continue operating at a reduced level until the repairs can be made.

(b) Failure of Appurtenant Structures such as Outlets or Spillways;

If gates or other appurtenant structures fail, the following actions should be taken;

- Implement temporary measures to protect the damaged structure, such as closing an outlet or providing temporary protection for a damaged spillway.
- Employ experienced professional divers if necessary to assess the problem.

(c) Movement of the Dam on its Foundation

Movement of the dam would be indicated by relative deflections between the surface monuments adjacent to the joints on the crest of the dam. A sliding failure should be dealt with through the following actions;

- Immediately lower the water level until the movement stops,
- Continue to lower the water until a safe level is reached,
- Continue operating at a reduced level until repairs can be made.

(d) Excessive Seepage

If excessive seepage is encountered;

- Lower the water to a safe level,
- Determine source of seepage,
- Continue frequent monitoring for signs of cracking or concentrated seepage,
- Continue operation at a reduced level until repairs can be made.

4 NOTIFICATION

This EPP sets forth the chain of command to be followed (for notification purposes) in response to an emergency situation. The chain of command is shown schematically in the attached Notification Chart (Figure 4.1). Discussed below are the proper notification procedures to be followed in the case of;

- Dam Incident,
- Dam Failure.

4.1 Notification Procedures – Dam Incident

Any employee who learns or suspects for good reason that there is a possibility of a potential dam breach shall immediately report the situation to the Control Room Operator, KHEPLC

and as a Dam Incident. Phone numbers are given in the Communications Directory (Appendix 2). This employee shall provide the Control Room Operator with the following information.

- Name
- Location of the Dam Incident (structure, location on the structure, extent)
- Type of problem
- Risk of deterioration
- Reservoir and tail water elevations
- Prevailing weather conditions
- Other pertinent information

In addition to observed dam conditions that could potentially lead to failure (e.g. cracks, seepage, movement) field personnel should also alert the Control Room Operator, KHEPLC of any other condition, that may develop into an emergency situation (e.g. high inflows, spillway blockage).

The AGM (Production) and the Control Room Operator shall keep a written record of any information provided by the observer on an Emergency Report Form as provided in Appendix 3. Upon a report of a Dam Incident, the Control Room Operator shall immediately contact the AGM (Production) giving as much detail as the observing employee could provide. The AGM (Plant Services) and AGM (ESU) shall immediately be contacted by the Control Room Operator and provided with similar details.

Depending on the severity of the Dam Incident, the CEO shall be contacted by AGM (Production).

When a Dam Incident is reported by someone other than a trained observer the Control Room Operator shall treat it with added caution. The same procedures shall be used and an attempt to verify the caller should be made. When reporting this incident to the AGM (Production) and the Control Room Operator, it should be made clear where the report originated.

It should be noted that in some cases the Control Room Operator could be the original observer of a Dam Incident. Such a situation could arise in the case of rapid reservoir drawdown as indicated by the water level recorder.

Further investigation of a Dam Incident will then determine if the incident is serious enough to upgrade the situation to a further level. At this stage the Dam Incident may be reclassified as a Dam Failure. In such a case, the procedures outlines in section 4.2 below should be followed.

In some cases, alternate contact persons are identified in the notification chart. Alternates have full authority to respond in the absence of the primary contact person.

4.2 Notification Procedures – Dam Failure

The notification process will follow the following four steps in the case of a reported dam failure.

1) Observe and Verify Breach

A trained employee observing a Dam Failure shall immediately report the situation to the Control Room Operator. The Control Room Operator shall then immediately contact the AGM (Production) and AGM (Plant Services). The Control Room Operator shall immediately contact the AGM (ESU). If the AGM (Production) and the AGM (ESU) feel that the report is credible then the CEO shall be contacted by the AGM (Production).

When the Control Room Operator gets a call from an observer (whether employee or other) an Emergency Report Form (Appendix 3) shall be used to record all relevant information. When notification of Dam Failure comes from someone other than a trained employee the Control Room Operator shall treat it with added caution. The AGM (Production) and the AGM

(Plant Services) will make a decision on the credibility immediately, if the observer is not an employee.

Verification of Dam Failure is primarily the responsibility of the AGM (Plant Services), assuming quick access to the site is possible. A Dam Failure may otherwise be called without the benefit of visual verification based on other sources of information (e.g. water level indicators, heavy rainfall.)

2) Initiate Notification Procedures Shown on Figure 4.1

Immediate notification is to be made as shown on the Notification Chart (Figure 4.1). Notification is listed in the order of increasing priority, in an attempt to maximize time available for safe evacuation of threatened downstream populations and for remedial action to minimize flood effects.

It is the responsibility of all parties involved in this process to ensure that their personnel are readily available in such an event.

The AGM (ESU), or other, may specify additional people or agencies that should be notified and initiate action which may reduce downstream hazards. Refer to Communications Directory in Appendix 2 for a complete list of phone numbers.

The Control Room Operator must be fully informed of any change affecting reported condition of the emergency situation and shall complete and distribute a written report of the emergency situation (Emergency Report Form)

3) Evacuation

Evacuation of inhabited areas, which could be inundated, is the responsibility of Rescue agencies such as Police, Fire Fighting Agencies and NEMA. Inundation maps are the guide map in the case of assessing severity of the situation and deciding evacuation procedures.

Evacuation of the employees from the dam and hydro power facilities is the responsibility of the ESU (AGM).

4) Media Contacts

Emergency announcements through the local media will generally be the responsibility of the AGM (ESU).

5 INUNDATION MAPPING

5.1 Mapping

The estimated extent of flooding resulting from the hypothetical breach of the Kainji dam is shown on the inundation maps in Appendix 4.

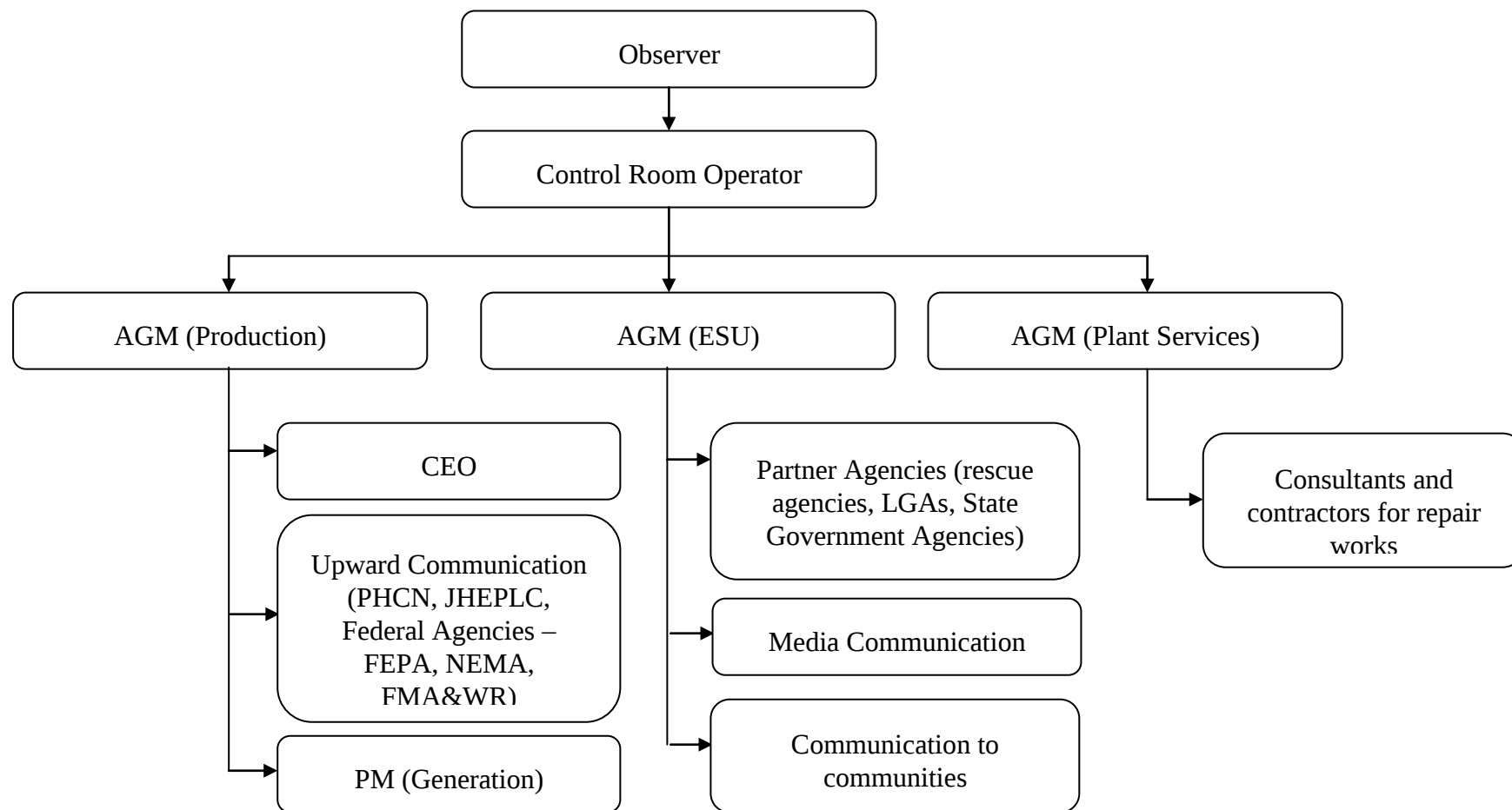
Various dam failure scenarios studied are

- Cover rapid failure times, large breach sizes and conservative antecedent conditions. The potentially inundated area should be determined and the following conditions considered:
 - Design flood failure
 - Extreme flood exceeding the discharge capacity
 - Reduction of discharge capacity during the passage of a large flood (for example, blockage by debris, or malfunction or non-operation of gates).
 - Fair-weather dam failure at full supply level (piping, earthquake)
 - Failure induced by failure of an upstream structure

Inundation maps showing

- the maximum water depth and flood peak arrival time
- the reservoir rim and for areas affected by the backwater effect upstream of the reservoir.
- the flow and water level and inundation area for various discharge levels.

Figure 4.1 Notification Chart



6 MAINTENANCE AND TESTING

6.1 EPP Maintenance

The EPP will be reviewed and revised annually or more often if necessary during the initial years of operation of the Facility. Revisions will also be made as required to reflect personnel changes. Contact persons' names and telephone numbers will be updated at any time that changes take place. Information will also be kept up-to date with regard to the list of materials, equipment, labour and engineering expertise available in the case of an emergency.

Copies of the EPP are to be distributed by the AGM (Production) to all staff and all external agencies that have responsibilities detailed in the plan. Amendments are also to be forwarded to all Registered EPP Holders listed in Appendix 1.

6.2 EPP Testing

Testing is an integral part of the EPP and will be done on a regular basis. Tests may range from a limited tabletop exercise to a full-scale simulation of an emergency event and would include making contact with all persons responsible for initiating action but not initiating an actual evacuation of a town.

All external and local government agencies are to be invited to participate in testing of the EPP procedures. Participation may vary from clerical reporting functions to on-site involvement with simulated emergencies.

6.3 EPP Training

Training shall be provided to ensure that dam personnel involved in the EPP are thoroughly familiar with all elements of the EPP, the availability of equipment, and their responsibilities and duties.

Technically qualified personnel should be trained in problem detection and evaluation and appropriate remedial (emergency and non-emergency) measures. This training is essential for proper evaluation of developing situations at all levels of responsibility which, initially, is usually based on observations on-site. A sufficient number of people should be trained to ensure adequate coverage at all times.

7 COMMUNICATIONS

7.1 Communications Directory

A detailed Communications Directory is provided in Appendix 2. It contains specific contacts, which may be necessary in handling an emergency. The Communications Directory complements rather than replaces the Notification Chart. Contents are grouped as follows:

1. KHEPCL
2. JHEPCL
3. PHCN
4. Emergency Agencies – Police, Fire fighting services, Rescue agencies
5. Government Agencies – Emirs, LGAs and State Governments
6. Central Government Agencies – FEPA, NEMA, FMA&WR
7. Local Emirs, Towns and Villages
8. Private Agencies – KLNP, NIFFR, etc.

7.2 Warning System

Effective warning system such as severity level flags or codes shall be developed and included in this EPP. This warning system should be used to communicate the severity of the situation to the partner agencies of this EPP and to the people through media.

APPENDIX 1 LIST OF REGISTERED EPP HOLDERS

KHEPLC

- 101 AGM (Production)
- 102 AGM (Plant Services)
- 103 AGM (ESU)
- 104 System Control Center (Power Station)
- 105 PM (Generation)
- 106 PM (Hydrology)
- 107 PM (Dam Instrumentation)

PHCN, Other Offices

- 201 CEO, PHCN (Abuja)
- 202 JHEPCL

Federal Ministry

- 301 Federal Ministry of Power
- 302 Federal Environmental Protection Agency
- 303 Federal Ministry of Agriculture and Water Resources
- 304 National Emergency Management Agency

Niger State Ministry

- 401 Commissioner for Local Government, Community Development & Chieftaincy

Kwara State Ministry

- 501 Ministry of Local Government and Chieftaincy Affairs

APPENDIX 2 COMMUNICATIONS DIRECTORY

No.	Organisation	Name and Position	Contact Phone Nos.
1			
2			
3			
4			
5			
6			
7			
8			
9			

APPENDIX 3 EMERGENCY REPORT FORM

1. REPORT

Name and position of person calling in:

Name _____ Position _____ Tel No. _____

Date _____ Time _____

Identification of Dam:

Name _____ Location _____ Reservoir _____

Description of the Problem:

Type of Event: _____ Breach _____ Potential Breach

_____ Structural Damage _____ Other

_____ High Water Levels

Size of Breach _____

Rate of Enlargement _____

Size of Uncontrolled Flow _____

Rate of Increase in Flow _____

Time of Start of Breach _____

Cause _____

Other observations:

Reservoir Water level _____

Water Level Rising/Falling _____

Is the Situation Worsening _____

Current Weather Condition _____

Weather Forecast _____

General Comments: _____

Operator Taking Call: Name _____

Signature _____

2. VERIFICATION

Method of Verification _____ Recognition of Caller
_____ Caller's Demonstrated Knowledge
_____ Corroborative Evidence from Current Weather
Conditions and Water Levels
_____ Obtaining the Observer's Name, Tel. No.,
Location.

3. NOTIFICATION

Time of Notification of;

From _____

Date: _____

Page: _____

APPENDIX 4 FLOOD PLAIN OR INDUNDATION MAPS

(To be developed under proposed procurement service contract package 1)

APPENDIX 5 REVISIONS

Revision No.	Date	Details
001	October 2010	Initial Issue

EMERGENCY PREPAREDNESS PLAN (EPP) FOR JEBBA HYDROELECTRIC PLC (JHEPLC)

2 INTRODUCTION

1.1 Jebba Hydro Electric Private Limited Company (JHEPLC)

The Emergency Preparedness Plan (EPP) is a key component of Jebba Hydro Electric Public Limited Company (JHEPLC)'s Jebba Dam and Hydro Electricity Facility safety program. This EPP is prepared to meet the requirement of the dam safety rules and regulations. The EPP is designed to deal with any problem (even though highly unlikely) experienced with the Dam structure. This plan is developed in conjunction with relevant authority bodies responsible for activities during natural disasters in the area in the interest public safety.

1.2 Emergency Preparedness Plan

An EPP is a formal written plan that identifies the procedures and processes that the dam operators would follow in the event of an emergency at a dam. The emergency could be, for example, failure of essential equipment such as flood gates, slope failure having the potential to cause dam failure, or a complete failure of the dam caused by overtopping, earthquake or piping.

An EPP allows for planning by municipalities, local police, provincial agencies, telephone and transportation companies and other parties affected in the event of a dam break flood, and the coordination of efforts between provincial and municipal levels of government. In the event of an emergency, an effective, comprehensive, well-tested EPP will save lives and has the potential to reduce property damage.

1.3 Purpose of the Plan

The purpose of the EPP is to:

- Provide a plan, which facilitates public safety by notifying all appropriate authorities;
- Provide information to all stakeholders to allow for an informed evaluation to be made during emergency events
- Provide plans of action for foreseeable flood emergencies affecting safety of the Jebba dam, hydroelectric facility and affected property downstream
- Provide for a plan of action to carry out repairs and reduce the impact of any such event where possible.

This plan is intended to assist KHEPLC, JHEPLC, local government authorities, State Authorities, the Federal Government and other agencies in responding swiftly and effectively in the event of an emergency.

1.4 Description of the Facility

Jebba Hydropower Plant is located on the Niger River, in Niger State of Nigeria, adjacent to Jebba town, about 350 km north of Lagos. The Jebba project was completed in 1983 and commissioned in 1984. The features include:

- Main Dam of Zoned Earth and Rockfill 670m long, maximum height 40m;
- Impervious Blanket extending 450m upstream from the heel of the Main Dam;
- Saddle Dam also of Zoned earth and Rockfill 540m long and max. height 29m;
- Auxiliary Dam 1 also of Zoned earth and Rockfill 275m long and max. height 14m;
- Auxiliary Dams 2, 3 and 4 of Concrete Gravity total length 337m and max. height 26.5m;
- The Powerhouse is between the Auxiliary Dams 2 and 3 and has 6 bays equipped with units;
- The installed hydropower capacity is 578.4MW, each unit being 96.4MW;

- Navigation lock is located between the Main Dam and the Auxiliary Dam no.4. It has a usable length of 200m, 12.2m width and maximum lift of 30m;
- The Main Spillway is of concrete and of the Underflow type with Flip Bucket with 6 no. Radial Gates and has the capacity to discharge 13,600m³/s at Normal Operating Level (El. 103m) and 16,400m³/s (including Emergency Spillway) at Max. Operating Pool Level of 106.0m;
- Emergency Spillway of Free Overflow type with Crest length of 220m and Crest Elevation at 103.15m;
- permanent cofferdam downstream of the main dam, closing the old main branch of the River
- The six (6 No.) Turbines has an Outflow Channel 140m wide and 310m long;
- The Spillway has a Stilling Channel 104m wide and 430m long.

1.5 Responsibilities

The persons identified in this EPP with primary responsibility for emergency response are listed below.

Assistant General Manager (Operations) will be responsible for making immediate decisions regarding operations of the dam during emergency, in coordination with the AGM (Maintenance). He/She will also coordinate with the PM (Generation) regarding immediate decisions on if/when to recommend closure of the hydro-electric plant. He/She will also coordinate with AGM (ESU) to decide if/when/how to inform the public.

Systems Control Centre Operator (who?) must ensure that all key JHEPLC persons to be notified are contacted as soon as possible. Decisions on emergency response are the responsibility of the key personnel noted in this document. The primary responsibility of Operator, at the time of event, is to manage the notification process. This involves co-ordinating all communications and recording activities of all involved personnel.

Assistant General Manager (Maintenance) will be responsible to deploy resources as required to prevent or delay the incident. This involves coordination with engineers, consultants and contractors.

PM (Generation) will be responsible to take corrective actions to ensure integrity of the power grid system

Assistant General Manager (ESU) will be responsible to ensure overall activities are coordinated. This include liaison with outside agencies and providing information to the PHCN Abuja Office and other relevant Federal Agencies. In certain dam incidents, he can directly contact the Chief Executive Officer of PHCN in Abuja bypassing the protocol.

1.6 Dam Surveillance

The daily operations will be monitored by the PM (PC&M) and PM (Hydrology). This will include remote monitoring of water levels on a real time basis as well as any vibration or movement of the structures or leakages or piping activities. The sire will be inspected by Assistant PM on daily basis and by PM on weekly basis. These visits will involve visual inspections of the dam, surveillance of gallery, spillway, penstock and other structures.

A formal inspection of the dam and hydro-electric facility will be done every fortnight by the AGM (Maintenance). Bi-annual inspections will be done by the staff with civil engineering consultants and/or officials from PHCN (Abuja), Ministry of Power.

1.7 Outside Agencies

A copy of the EPP is provided to all outside agencies involved in the emergency response procedures associated with this dam and hydro-electric facility. A list of Registered EPP Holders is provided in Appendix 1.

- Each listed agency is asked to be involved in the initial training and annual review and intermediate modification of the plan, if any, and therefore minimize potential for incorrect interpretation.
- Each listed agency is asked to assist with the coordination of the duties of the agencies

1.8 Limitations of this EPP

This EPP provides an outline and needs further revision once the hydrological modelling, inundation (flood plain) mapping and dam break analysis are over. This EPP provides an outline only at present for JHEPLC.

3 EMERGENCY IDENTIFICATION

2.1 Potential Serious Situation

A Potential Serious Situation is defined as a hazardous condition at the dam, which, if not attended to, may develop into an emergency situation. Listed below are examples of conditions, which could potentially lead to dam failure if mitigation measures are not taken. Respective inspection checks are also listed.

- Excessive/increase amounts of seepage;
 - Check drains in the gallery for any abnormal increase in quantities of seepage.
- Movement on the dam crest;
 - Check for deflection on the dam crest.
- Spillway Obstruction
 - Check spillway to ensure no blockage due to debris.
- High inflows;
 - Check for water levels that are higher than normal reservoir levels.
 - Check weather forecast for expected amounts of precipitation.
 - Check for rapid rate of rise of water levels.
- Widespread flooding;
 - Perform an aerial site inspection.

Rapid reservoir drawdown could also be a sign of a potential problem. This condition should be detected through continuous water level monitoring by Hydrology Division in coordination with Dam Instrumentation and the ESU.

2.2 Dam Failure

A dam failure is defined as the failure of the dam itself or its foundation, which results in large or rapidly increasing uncontrolled releases of water from the reservoir. It can be identified by the formation of a breach in the dam or foundation. It is impossible to determine how long it will take for a complete failure to occur once a significant breach has formed. Once a significant breach has occurred regular updates of the warning will be issued as long as the threat exists.

3 EMERGENCY RESPONSE

3.1 Technical Information

Response to any emergency arising out of a Dam Incident or Dam Failure will be greatly improved by having information in the hands of responsible persons in order to properly determine risks and possible outcomes. This information will allow the Dam Instrumentation Division and the Hydrology Division to keep abreast of the prevailing hydrological condition and resulting rainfall/runoff patterns.

3.2 Access to the Site

Another important factor in responding to an emergency is access to the site. This access can be severely hampered during major storms. Such storms also cause floods creating a requirement to get to the site. This section provides information on gaining access to the site and the various methods available.

Vehicles: JHEPLC has the following equipment at their disposal to travel to the site

- Four wheel drive SUVs
- Boats
- Van with repair and communication equipments
- Loader

Road Access: JHEPLC is located on the Kaduna – Ilorin Road. The access road is in very bad condition.

Air Access Generally the only type of aircraft, which could be used in an emergency or non-emergency situation, would be helicopter. Helicopter landing near the dam site is possible. The following is a list of helicopter services in the case of an emergency.

- (to be completed)

3.3 Response During Darkness and Adverse Weather

Periods of Darkness: JHEPLC's emergency response teams are equipped to respond during periods of darkness. Vehicles are equipped with emergency lighting (i.e. spotlights). In addition to the standby diesel generator at the power house has small 5 kW diesel generators available or JHEPLC can be requested to provide additional lighting requirements if necessary.

Periods of Adverse Weather: The response plan is unchanged in principle in periods of adverse weather. JHEPLC emergency response teams are equipped to handle extreme working conditions resulting from adverse weather.

3.4 Power Sources

Powerhouse

Main Power Source (to be completed)

Standby Diesel Generators are available to repair lighting, pumping, operating tools, etc.

Communication Systems

JHEPLC has

- Dedicated telephone line (floodline)
- VHF Radio
- Cellular Phones

Effect of Dam Failure

A dam failure under extreme flood conditions may cause excessive flooding at the powerhouse. This may result in the loss of monitoring devices and/or communications to the JHEPLC. When the Operator has reason to believe such has happened he will advise the AGM Operations so as to implement the appropriate measures.

3.5 Incidental Procedures During Breach

It is important that information relating to any incident including a breach be recorded. Staff shall be assigned to obtain the following information provided they do not compromise their own personal safety;

- Reservoir and dam conditions prior to breach,
- Size and rate of development of the breach,
- Changes in the reservoir level during the breach,
- Spillway and penstock conditions,
- Status of generating unit

In order to assist in the collection of such data, photographic and video records will be made to assist in determining the cause and mode of development of the breach.

3.6 Mitigation Measures

The following describes remedial actions, which may be taken given various conditions.

(a) Cracks in the Dam

The following actions should be taken in the case of excessive cracking in the dam;

- Lower the water level by releasing it through the low level outlet,
- Continue lowering the water level until a safe elevation is reached.
- Continue operating at a reduced level until the repairs can be made.

(b) Failure of Appurtenant Structures such as Outlets or Spillways;

If gates or other appurtenant structures fail, the following actions should be taken;

- Implement temporary measures to protect the damaged structure, such as closing an outlet or providing temporary protection for a damaged spillway.
- Employ experienced professional divers if necessary to assess the problem.

(c) Movement of the Dam on its Foundation

Movement of the dam would be indicated by relative deflections between the surface monuments adjacent to the joints on the crest of the dam. A sliding failure should be dealt with through the following actions;

- Immediately lower the water level until the movement stops,
- Continue to lower the water until a safe level is reached,
- Continue operating at a reduced level until repairs can be made.

(d) Excessive Seepage

If excessive seepage is encountered;

- Lower the water to a safe level,
- Determine source of seepage,
- Continue frequent monitoring for signs of cracking or concentrated seepage,
- Continue operation at a reduced level until repairs can be made.

4 NOTIFICATION

This EPP sets forth the chain of command to be followed (for notification purposes) in response to an emergency situation. The chain of command is shown schematically in the attached Notification Chart (Figure 4.1). Discussed below are the proper notification procedures to be followed in the case of;

- Dam Incident,

- Dam Failure.

4.1 Notification Procedures – Dam Incident

Any employee who learns or suspects for good reason that there is a possibility of a potential dam breach shall immediately report the situation to the Control Room Operator, JHEPLC and as a Dam Incident. Phone numbers are given in the Communications Directory (Appendix 2). This employee shall provide the Control Room Operator with the following information.

- Name
- Location of the Dam Incident (structure, location on the structure, extent)
- Type of problem
- Risk of deterioration
- Reservoir and tail water elevations
- Prevailing weather conditions
- Other pertinent information

In addition to observed dam conditions that could potentially lead to failure (e.g. cracks, seepage, movement) field personnel should also alert the Control Room Operator, KHEPLC of any other condition, that may develop into an emergency situation (e.g. high inflows, spillway blockage).

The AGM (Operations) and the Control Room Operator shall keep a written record of any information provided by the observer on an Emergency Report Form as provided in Appendix 3. Upon a report of a Dam Incident, the Control Room Operator shall immediately contact the AGM (Operations) giving as much detail as the observing employee could provide. The AGM (Maintenance) and AGM (ESU) shall immediately be contacted by the Control Room Operator and provided with similar details.

Depending on the severity of the Dam Incident, the CEO shall be contacted by AGM (Operations).

When a Dam Incident is reported by someone other than a trained observer the Control Room Operator shall treat it with added caution. The same procedures shall be used and an attempt to verify the caller should be made. When reporting this incident to the AGM (Operations) and the Control Room Operator, it should be made clear where the report originated.

It should be noted that in some cases the Control Room Operator could be the original observer of a Dam Incident. Such a situation could arise in the case of rapid reservoir drawdown as indicated by the water level recorder.

Further investigation of a Dam Incident will then determine if the incident is serious enough to upgrade the situation to a further level. At this stage the Dam Incident may be reclassified as a Dam Failure. In such a case, the procedures outlines in section 4.2 below should be followed.

In some cases, alternate contact persons are identified in the notification chart. Alternates have full authority to respond in the absence of the primary contact person.

4.2 Notification Procedures – Dam Failure

The notification process will follow the following four steps in the case of a reported dam failure.

1) Observe and Verify Breach

A trained employee observing a Dam Failure shall immediately report the situation to the Control Room Operator. The Control Room Operator shall then immediately contact the AGM (Operations) and AGM (Maintenance). The Control Room Operator shall immediately contact the AGM (ESU). If the AGM (Operations) and the AGM (ESU) feel that the report is credible then the CEO shall be contacted by the AGM (Operations).

When the Control Room Operator gets a call from an observer (whether employee or other) an Emergency Report Form (Appendix 3) shall be used to record all relevant information. When notification of Dam Failure comes from someone other than a trained employee the Control Room Operator shall treat it with added caution. The AGM (Operations) and the AGM (Maintenance) will make a decision on the credibility immediately, if the observer is not an employee.

Verification of Dam Failure is primarily the responsibility of the AGM (Maintenance), assuming quick access to the site is possible. A Dam Failure may otherwise be called without the benefit of visual verification based on other sources of information (e.g. water level indicators, heavy rainfall.)

2) Initiate Notification Procedures Shown on Figure 4.1

Immediate notification is to be made as shown on the Notification Chart (Figure 4.1). Notification is listed in the order of increasing priority, in an attempt to maximize time available for safe evacuation of threatened downstream populations and for remedial action to minimize flood effects.

It is the responsibility of all parties involved in this process to ensure that their personnel are readily available in such an event.

The AGM (ESU), or other, may specify additional people or agencies that should be notified and initiate action which may reduce downstream hazards. Refer to Communications Directory in Appendix 2 for a complete list of phone numbers.

The Control Room Operator must be fully informed of any change affecting reported condition of the emergency situation and shall complete and distribute a written report of the emergency situation (Emergency Report Form)

3) Evacuation

Evacuation of inhabited areas, which could be inundated, is the responsibility of Rescue agencies such as Police, Fire Fighting Agencies and NEMA. Inundation maps are the guide map in the case of assessing severity of the situation and deciding evacuation procedures.

Evacuation of the employees from the dam and hydro power facilities is the responsibility of the AGM (ESU).

4) Media Contacts

Emergency announcements through the local media will generally be the responsibility of the AGM (ESU).

5 INUNDATION MAPPING

5.1 Mapping

The estimated extent of flooding resulting from the hypothetical breach of the Jebba dam is shown on the inundation maps in Appendix 4.

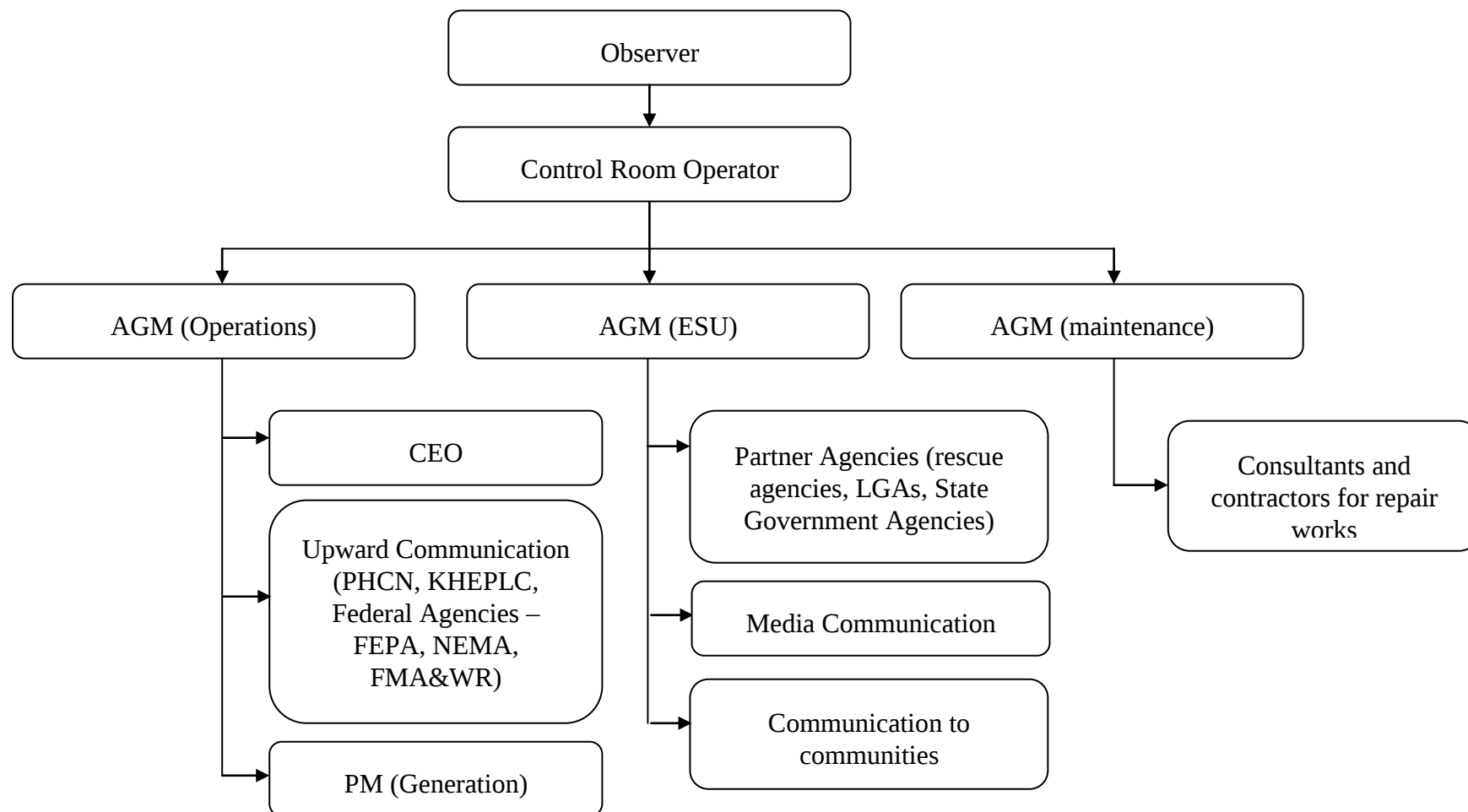
Various dam failure scenarios studied are

- Cover rapid failure times, large breach sizes and conservative antecedent conditions. The potentially inundated area should be determined and the following conditions considered:
 - Design flood failure
 - Extreme flood exceeding the discharge capacity
 - Reduction of discharge capacity during the passage of a large flood (for example, blockage by debris, or malfunction or non-operation of gates).
 - Fair-weather dam failure at full supply level (piping, earthquake)
 - Failure induced by failure of an upstream structure

Inundation maps showing

- the maximum water depth and flood peak arrival time
- the reservoir rim and for areas affected by the backwater effect upstream of the reservoir.
- the flow and water level and inundation area for various discharge levels.

Figure 4.1 Notification Chart



6 MAINTENANCE AND TESTING

6.1 EPP Maintenance

The EPP will be reviewed and revised annually or more often if necessary during the initial years of operation of the Facility. Revisions will also be made as required to reflect personnel changes. Contact persons' names and telephone numbers will be updated at any time that changes take place. Information will also be kept up-to date with regard to the list of materials, equipment, labour and engineering expertise available in the case of an emergency.

Copies of the EPP are to be distributed by the AGM (Operations) to all staff and all external agencies that have responsibilities detailed in the plan. Amendments are also to be forwarded to all Registered EPP Holders listed in Appendix 1.

6.2 EPP Testing

Testing is an integral part of the EPP and will be done on a regular basis. Tests may range from a limited tabletop exercise to a full-scale simulation of an emergency event and would include making contact with all persons responsible for initiating action but not initiating an actual evacuation of a town.

All external and local government agencies are to be invited to participate in testing of the EPP procedures. Participation may vary from clerical reporting functions to on-site involvement with simulated emergencies.

6.3 EPP Training

Training shall be provided to ensure that dam personnel involved in the EPP are thoroughly familiar with all elements of the EPP, the availability of equipment, and their responsibilities and duties.

Technically qualified personnel should be trained in problem detection and evaluation and appropriate remedial (emergency and non-emergency) measures. This training is essential for proper evaluation of developing situations at all levels of responsibility which, initially, is usually based on observations on-site. A sufficient number of people should be trained to ensure adequate coverage at all times.

7 COMMUNICATIONS

7.1 Communications Directory

A detailed Communications Directory is provided in Appendix 2. It contains specific contacts, which may be necessary in handling an emergency. The Communications Directory complements rather than replaces the Notification Chart. Contents are grouped as follows:

1. JHEPCL
2. KHEPCL
3. PHCN
4. Emergency Agencies – Police, Fire fighting services, Rescue agencies
5. Government Agencies – Emirs, LGAs and State Governments
6. Central Government Agencies – FEPA, NEMA, FMA&WR
7. Local Emirs, Towns and Villages
8. Private Agencies – KLNP, NIFFR, etc.

7.2 Warning System

An effective warning system such as severity level flags or codes should be developed and included in this EPP. This warning system should be used to communicate the severity of the situation to the partner agencies of this EPP and to the people through media.

APPENDIX 1 LIST OF REGISTERED EPP HOLDERS

KHEPCL

- 101 AGM (Operations)
- 102 AGM (Maintenance)
- 103 AGM (ESU)
- 104 System Control Centre (Power Station)
- 105 PM (Generation)
- 106 PM (Hydrology)

PHCN, Other Offices

- 201 CEO, PHCN
- 202 KHEPCL

Federal Ministry

- 301 Federal Ministry of Power
- 302 Federal Environmental Protection Agency
- 303 Federal Ministry of Agriculture and Water Resources
- 304 National Emergency Management Agency

Niger State Ministry

- 401 Commissioner for Local Government, Community Development & Chieftaincy

Kwara State Ministry

- 501 Ministry of Local Government and Chieftaincy Affairs

APPENDIX 2 COMMUNICATIONS DIRECTORY

No.	Organisation	Name and Position	Contact Phone Nos.
1			
2			
3			
4			
5			
6			
7			
8			
9			

APPENDIX 3 EMERGENCY REPORT FORM

1. REPORT

Name and position of person calling in:

Name _____ Position _____ Tel No. _____
Date _____ Time _____

Identification of Dam:

Name _____ Location _____ Reservoir _____

Description of the Problem:

Type of Event: _____ Breach _____ Potential Breach _____
_____ Structural Damage _____ Other _____
_____ High Water Levels _____

Size of Breach _____

Rate of Enlargement _____

Size of Uncontrolled Flow _____

Rate of Increase in Flow _____

Time of Start of Breach _____

Cause _____

Other observations:

Reservoir Water level _____

Water Level Rising/Falling _____

Is the Situation Worsening _____

Current Weather Condition _____

Weather Forecast _____

General Comments: _____

Operator Taking Call: Name _____

Signature _____

2. VERIFICATION

Method of Verification _____ Recognition of Caller
_____ Caller's Demonstrated Knowledge
_____ Corroborative Evidence from Current Weather
Conditions and Water Levels
_____ Obtaining the Observer's Name, Tel. No.,
Location.

3. NOTIFICATION

Time of Notification of;

From _____

Date: _____

Page: _____

APPENDIX 4 FLOOD PLAIN OR INDUNDATION MAPS

(To be developed under proposed procurement service contract package 1)

APPENDIX 5 REVISIONS

Revision No.	Date	Details
001	October 2010	Initial Issue

I) INSTRUMENTATION PLAN PREPARATION GUIDELINES

The Instrumentation Plan is a vigilant inspection programme to continually evaluate the safety of dams. We suggest the FERC's 'Instrumentation and Monitoring' guidelines and an example from Canadian Dam Association.

The inclusion of these examples in this report should not be interpreted as an endorsement of these models over other possible models. The preparation of Instrumentation and Monitoring Programme is proposed in the ESMP implementation plan. This includes a training programme on the above once they are developed.

A. FERC MODEL

The FERC Instrumentation and Monitoring Guidelines is presented in Chapter 9 of FERC Dam Safety Guidelines (available at www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide/chap9.pdf).

B. CANADIAN DAM ASSOCIATION EXAMPLE

The example Instrumentation Manual content, taken out from Canadian Dam Association, is presented below.

- Description and location of instruments and monitoring devices
- Initial datum, design limits} calibration requirements, operating ranges
- "Alarm" levels
- Mode and methodology of readings
- Data recording and storing
- Data interpretation

J) CONTRACTOR'S EMP

GENERAL

1. The 'Environmental Management Plan (EMP) for the Contractors' provides a framework for environmental management to be implemented by all contractors working on the site. This EMP aims to provide a framework for environmental management of the site and to ensure that impacts on the environment are minimised. This EMP is a general one applicable to most of the works related to this Project. However for each and every contract, this EMP has to be modified according to the requirement and applicability.
2. The Contractor shall inform himself about such an EMP, and prepare his work strategy and plan to fully take into account relevant provisions of that EMP.
3. The ESU has to check whether the contractor has sufficient approvals, licences and permits to undertake the works. The EMP should provide the list of such approvals, licences and permits and the copies in the Annexure.
4. If the Contractor fails to implement the approved EMP after written instruction by the PHCN (ESU) to fulfill his obligation within the requested time, the PHCN reserves the right to arrange through the ESU for execution of the missing action by a third party on account of the Contractor.
5. Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an EMP. In general these measures shall include but not be limited to:
 - b. Minimize the effect of dust on the surrounding environment resulting from transportation of the equipments, temporary access roads, construction activities, etc. to ensure safety, health and the protection of workers and communities living in the vicinity dust producing activities.**
 - c. Ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.
 - d. Ensure that existing water flow regimes in rivers is maintained and/or re-established where they are disrupted due to works being carried out.
 - e. Prevent bitumen, oils, lubricants and waste water used or produced during the execution of works from entering into rivers, streams, and other natural water bodies/reservoirs, and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.
 - f. Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps (if any) and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.
 - g. Discourage construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities.
 - h. Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.

- i. Ensure that garbage, sanitation and drinking water facilities are provided in workers camps (if any).
 - j. Ensure that the workers are taking enough measures to avoid spreading of HIV/Aids.
 - k. Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.
 - l. Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.
6. The Contractor shall indicate the period within which he/she shall maintain status on site after completion of works to ensure that significant adverse impacts arising from such works have been appropriately addressed.
7. The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan /strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.
8. Besides the regular inspection of the sites by the ESU for adherence to the Contract conditions and specifications, PHCN may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. Federal / State environmental authorities may carry out similar inspection duties. In all cases, as directed by the ESU, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.
9. It is expected that compliance with these conditions is already part of standard good workmanship and state of art as generally required under this Contract. The item "Compliance with Environmental Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable EHS impact.

MITIGATION MEASURES

Component	Potential Impacts	Mitigating Measure	Responsibility
Air Quality - Vehicle and Engine emission	Increased air pollution	○ Reduce or optimise vehicle use ○ Use proper vehicle and maintain the vehicle to standard ○ Sensitise the workforce ○ Impose speed limits for all the vehicles based on the road condition, traffic and location of the road.	Contractor & ESU
Air Quality – dust odour, and other potential air pollution particles such as paints, smoke, etc..	Dust Emission: Increase airborne dust along the roads during dry season	○ Control with water spraying in concerned roads and work sites ○ Dust generated during maintenance activities needs to be controlled. ○ Respiratory protection devices for workers in case if the dust is not controlled ○ Spraying of paint and other materials with the potential to become air borne particulates will not be undertaken during windy conditions. ○ Community notification will be undertaken where appropriate where work is likely to cause dust impact on the public and nearby residents. ○ No burning of vegetation or other materials will be permitted on site. ○ Any vehicle transporting waste or other	Contractor

		materials that may produce odours or dust will be covered during transportation.	
Noise Pollution		○ Affected residents and businesses will be notified when work is likely to cause vibration or offensive noise to impact on the public. ○ Works will be undertaken during normal working hours. Any work that is undertaken on Sundays, Public Holidays or outside normal working hours will require the approval of the Client. ○ All reasonable practical steps will be undertaken to reduce maintenance activity noise and vibration from the site.	
Land Use	Loss of farm land and natural vegetation in the common land Erosion risk	○ Preserve top soil, rehabilitate and revegetate after use ○ An Erosion and Sediment Control Plan will be prepared and implemented and will incorporate appropriate erosion and sediment control measures. ○ Erosion and sediment control measures will be maintained regularly and after rainfall events. ○ Erosion and sediment control measures will not be removed until disturbed areas have been stabilised. ○ Disturbed areas will be stabilised progressively with vegetation during construction, where necessary, and stabilisation will be undertaken after works are complete. ○ Parking areas and turning points for plant and equipment in previously disturbed areas will be identified prior to commencement of works and provided to site personnel to minimise roadside vegetation disturbance.	Contractor
Road Construction	Alter drainage, cutting of slope, loss of vegetation cover, risk of erosion	○ Road design to satisfy national or international standards ○ Construction methods to follow present best practice ○ Slope protection measures with revegetation.	Contractor
Spoil dumps	Creation of sterile fill areas, loss of vegetation cover	○ All stockpile sites will be located in previously cleared and disturbed areas within the site boundaries. ○ No stockpile site will be established within the following areas without prior consultation with the Superintendent. • an environmentally sensitive area • vegetated areas • on floodplains or within 40 m of a watercourse • where it will affect a cultural and/or heritage site. ○ Use spoil as backfill of borrow areas	Contractor
Temporary camps	Alter land-use, loss of land and vegetation cover	○ Submit detail plan for approval before implementation. The plan should cover proper decommissioning and revegetation ○ Provide all the facilities (water supply, sanitation, solid waste management, health facilities) without affecting the environment	Contractor
Wildlife	Loss of habitats and local disturbance to the	○ Reduce the disturbance (noise, dust and animal catch) to the animals	Contractor

	KLNP animals	Organise animal rescue if there is any such incidence	
Aquatic life	Water pollution during construction	- No direct runoff to river from vehicles/engines maintenance areas - No direct runoff to river from toilet and waste disposal sites - Trap sediments on construction sites - Storage areas for fuels, oils and chemicals will be surrounded by an impervious bund that contains 120% of the largest container stored in the Bund. The location of storage areas will not be within 20 metres of any areas of concentrated water flow, flood and poorly drained areas, on slopes above 10° or near any areas of native vegetation. - Drums used as markers will not contain chemicals or fuels. - Refuelling plant and equipment will be undertaken within bunded areas and more than 50m away from waterways. - Cleaning of spray bars or equivalent equipment will be undertaken in appropriate areas and in a manner, which prevents or minimises pollution to waters. - Spill containment equipment kits will be available on site. - Works in waterways will be postponed during or immediately following heavy rainfall or when waterways are running high. Please read the 'Waste Management Plan Appendix E' for more details	Contractor
Workforce and population movement	Increased workers and associated risks	- Provide adequate housing facilities - Discourage anti-social behaviour (gambling, fighting, alcohol, drugs, prostitution) - Awareness campaign for temporary settlement of workers - Provide fair opportunities of work for local population especially women - Recruitment and training of local residents as part of workforce - Provide facilities for the children of the workforce	Contractor ESU / Contractor
Public Health and Safety	Introduction and spreading of diseases	- Carry out workers pre-employment screening - Malaria control for workers - Support health services and facilities to the workforce - Non-formal education campaign for hygiene and prevention of sexually transmitted diseases, HIV/AIDS,	Contractor / ESU Contractor / ESU ESU Contractor / ESU
	Road accident cause by traffic	Proper road system design including speed bumps, workers walking area, heavy vehicle	Contractor

	congestion	parking, if necessary o Control the driver behaviour o Signboard where dangerous areas	
	Work Injury during construction	o Elaboration and enforcement of safety regulation o Implementation of an emergency evacuation procedure	Contractor / ESU /PHCN HQ
Sites of cultural, historical and traditional value	Loss of socially valuable sites	o Report all findings to ESU, if any. o Avoid all graveyards	Contractor / ESU

OTHER ASPECTS

Environmental Induction and Training

Action	Responsibility	Timing
All site staff will be made aware of the site EMP, environmentally sensitive areas and environmental responsibilities. General topics should be: o EHS in general (working procedures); o Emergency procedures; and o Social and cultural aspects (awareness rising on social issues).	Site Manager	Prior to construction

Community Liaison

Action	Responsibility	Timing
Members of the affected community will be notified of the proposed works prior to their commencement, where required.	Site Manager	Prior to construction
Complaints received will be recorded and attended to promptly. On receiving a complaint, works will be reviewed to determine whether issues relating to the complaint could be avoided or minimised. Feedback will be provided to the complainant explaining what outcomes resulted.	Site Manager	Prior to construction During Construction

Demobilisation / Decommissioning

- Proper removal and disposal of construction buildings and structures is required for the contractor's temporary camp, temporary construction and for all crops/trees outside construction area that are removed/destroyed for clearing of carriageway, gravel pits and deviations.

SPECIFIC PLANS

Waste Management Plan

- Provided in the Annexure D.

Contractor's Environment, Health and Safety Management Plan (EHS-MP)

12. In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.
13. However within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works. The Contractor's EHS-MP will serve two main purposes:
 - **For the Contractor, for internal purposes, to ensure that all measures are in place for adequate EHS management, and as an operational manual for his staff.**
 - For the Client, supported where necessary by ESU, to ensure that the Contractor is fully prepared for the adequate management of the EHS aspects of the project, and as a basis for monitoring of the Contractor's EHS performance.
14. The Contractor's EHS-MP shall provide at least:
 - **a description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;**
 - a description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
 - a description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
 - the internal organizational, management and reporting mechanisms put in place for such.
15. The Contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

EHS Reporting

16. The Contractor shall prepare bi-weekly progress reports to the ESU on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor EHS report is given in Annex 1 below. It is expected that the Contractor's reports will include information on:
 - EHS management actions/measures taken, including approvals sought from local or national authorities;
 - Problems encountered in relation to EHS aspects (incidents, including delays, cost consequences, etc. as a result thereof);
 - Lack of compliance with contract requirements on the part of the Contractor;
 - Changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects; and
 - Observations, concerns raised and/or decisions taken with regard to EHS management during site meetings.
17. It is advisable that reporting of significant EHS incidents be done "as soon as practicable". Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendixes to the bi-weekly reports. Example formats for an incident notification and detailed report are given in Annexes 2 & 3 below.
18. Details of EHS performance will be reported to the Client through the ESU reports to the Client.

Annex 1: Example Format: EHS Report

Contract:

Period of reporting:

EHS management actions/measures:

Summarize EHS management actions/measures taken during period of reporting, including planning and management activities (e.g. risk and impact assessments), EHS training, specific design and work measures taken, etc.

EHS incidents:

Report on any problems encountered in relation to EHS aspects, including its consequences (delays, costs) and corrective measures taken. Include relevant incident reports.

EHS compliance:

Report on compliance with Contract EHS conditions, including any cases of non-compliance.

Changes:

Report on any changes of assumptions, conditions, measures, designs and actual works in relation to EHS aspects.

Concerns and observations:

Report on any observations, concerns raised and/or decisions taken with regard to EHS management during site meetings and visits.

Signature (Name, Title Date):

Contractor Representative

Annex 2: Example Format: EHS Incident Notification

Provide within 24 hrs to the ESU

Originators Reference No:

Date of Incident:

Time:

Location of incident:

Name of Person(s) involved:

Employing Company:

Type of Incident:

Description of Incident:

Where, when, what, how, who, operation in progress at the time (only factual)

Immediate Action:

Immediate remedial action and actions taken to prevent reoccurrence or escalation

Signature (Name, Title, Date):

Contractor Representative

Annex 3: Example Format: Detailed EHS Incident Report

The Incident Notification should be followed up by a Detailed EHS Incident Report containing the following information where applicable

- 1. Incident Summary**
- 2. Specific Details**
 - Date
 - Time
 - Place
 - Weather/Visibility
 - Road conditions
- 3. Persons Involved**
 - Name/s
 - Age/s
 - Experience
 - Date joined Company
 - Last Medical Check
 - Current Medical Treatment
 - Evidence of Drugs/Alcohol
 - Last Safety Meeting attended
 - Infringements/Incidents record
- 4. Equipment Involved**
- 5. Description of Incident**
- 6. Findings of Investigation Team Interim/Final**
 - Investigation Team Members
 - Persons Interviewed
 - Recommendations & Remedial Actions
 - Investigation Methodology
- 7. Signature (Name, Title, Date):**
- 8. Attachments**
 - Photographs
 - Witness Statements and Incident Notification Report

K) PUBLIC CONSULTATION AUGUST 2010

1. ANNOUNCEMENTS

Page 18 August 1, 2010

Newswire on Sund

Power Holding Company of Nigeria Plc
Project Management Unit
No 7, Kampala Street Wate II, Abuja
Telephone: +234-94136835, +234-84136835, Website: <http://www.nepams.org>
NEWSPAPER ANNOUNCEMENT

STAKEHOLDERS' FORUM FOR THE PROPOSED REHABILITATION OF KAINJI AND JEBBA HYDRO POWER STATIONS TO BE FUNDED BY THE FEDERAL GOVERNMENT OF NIGERIA IN CONJUNCTION WITH THE WORLD BANK

The Federal Government has obtained a Credit from the World Bank under the Niger River Basin and Water Resources Development and Sustainable Ecosystems Management Project. Part of this Credit is to be applied for the rehabilitation of the Kainji and Jebba Hydro Power Stations, respectively.

The follow jobs will be carried out at the respective Power Stations.

1. KAINJI

- Rehabilitation and enhancement of the Turbine No 2,5,6,7,12 (possibly 9 and 10)
- Rehabilitation of annex services
- Renovation of navigation Lock gate
- Renovation of the monitoring and surveillance equipment
- Enhancement of the flood warning system and development of decision making and management system for the Kainji Dam

2. JEBBA

- Rehabilitation of priority Electro-Mechanic Equipment
- Rehabilitation of water energy dissipation channel for the spillway and injections into the annex dam
- Calibration of monitoring and surveillance equipment
- Protection of water sheets against invasive tree stems
- Reinforcement of maintenance workshops
- Enhancement of flood warning system and development of a decision making and management system for the Jebba dam.

PHCN intends to conduct a stakeholder's forum in order to

1. Sensitize the stakeholder about the projects and the Project implementation schedules
2. Gather the opinion of various stakeholders on the update of the Report Project, Environmental and Social Management plan.
3. Use the relevant result of the fora to prepare Project Development Document (PDD) for the Carbon Finance aspect of the Dams.

Representatives of concerned stakeholders (i.e. Federal, State & Local Governments, NGO's, CBOs, Communities along the Niger River, Emirate Councils, Youth Organizations, etc) are kindly requested to attend these fora schedule to hold as follows;

KAINJI:
Date: 10th August, 2010
Venue: Kainji Hydro Power Station Conference Hall, New Bussa, Niger State
Time: 11.30am prompt

JEBBA:
Date: 11th August, 2010
Venue: Jebba Hydro Power Station Sports and Social Club Hall, Life Camp Jebba North, Niger State
Time: 11.30am

SIGNED:
Eng. M.A. Ganiyu
Manager PHCN, PMU



POWER HOLDING COMPANY OF NIGERIA PLC.

Project Management Unit

Tel. 234-9-4136683-5

No. 7 Kampala Street, Wuse II, Abuja

STAKEHOLDERS' FORUM FOR THE PROPOSED REHABILITATION OF KAINJI AND JEBBA HYDRO POWER STATIONS TO BE FUNDED BY THE FEDERAL GOVERNMENT OF NIGERIA IN CONJUNCTION WITH THE WORLD BANK

The Federal Government has obtained a Credit from the World Bank under the Niger River Basin and Water Resources Development and sustainable Ecosystem Management Project. Part of this Credit is to be applied for the rehabilitation of the Kainji and Jebba Hydro Power Stations, respectively.

The following jobs will be carried out at the respective Power Stations.

1. KAINJI

- Rehabilitation and enhancement of the turbine No. 5, 6, 7 & 12 possibly 9 and 10;
- Rehabilitation of annex services
- Renovation of navigation lock gate
- Renovation of the monitoring and surveillance equipment
- Enhancement of the flood warning system and development of decision making and management system for Kainji Dam.

2. JEBBA

- Rehabilitation of priority Electro Mechanic Equipment
- Rehabilitation of annex services
- Rehabilitation of water energy dissipation channel for the spillway and injections into the annex dam
- Calibration of monitoring and surveillance equipment
- Protection of water sheets against invasive tree stems
- Reinforcement of maintenance workshops
- Enhancement of flood warning system and development of a decision making and management system for the Jebba dam

PHCN INTENDS TO CONDUCT A STAKEHOLDER'S FORUM IN ORDER TO:

1. Sensitize the stakeholders about the projects and project implementation schedules.
 2. Gather the opinions of various stakeholders on the update of the consultant(s) Report on the project Environment and Social Management plan.
 3. Use the relevant result of the forum to prepare Project Development Document (PDD) for the Carbon Finance aspect of the Dam.
- Representatives of concerned Stakeholders (i.e. Federal State and Local Governments, NGOs, CBOs, Communities along the Niger River Emirate Councils, Youth Organizations, etc.) are kindly requested to attend these forum schedule to hold as follows:

KAINJI:

Date: 10th August, 2010

Venue: Kainji Hydro Power Station
Conference Hall, New Bussa,
Niger State

Time: 11.30 a.m prompt

JEBBA:

Date: 11th August, 2010

Venue: Jebba Hydro Electric Plc,
Sports and Social Club Hall,
Life Camp, Jebba North, Niger State

Time: 11.30 a.m. Prompt

Signed:

Engr. M. A. Ganiyu,
Manager PHCN, PMU

2. KAINJI DAM ATTENDANCE AND REPORT

The forum was held at the main hall at KHEPLC's offices on 10.8.10 and lasted about 2.5 hours.

Following introductions the Atkins Team Leader made a Power Point presentation of the main findings of the updated ESMP. His accompanying talk was translated into Hausa. About 75 stakeholders were present and PHCN made a record of attendees (Table below).

Following the presentation the meeting was opened to the floor for statements and questions. In most cases, but not all, these were made in English and response were provide as appropriate by the TL, the PRO or other PHCN staff.

Contact email addresses were provided for both the consultants and PHCN-PMU for written responses and electronic copies of the power point presentation were provide to all who made the request.

The C.E.O of Kainji Hydro Power Station delivered the opening speech asking everyone to listen to the consultant's presentation and then give their own imputes as the ESMP is meant to address all environmental issues that may arise from the rehabilitation project.

The General Manager PMU in his own speech said 'the World Bank is the one financing the Dam rehabilitation and as part of their requirements, before the project commences, there must be an environmental study that will address all environmental issues on ground and possible ones that may arise from the rehabilitation project. Atkins have been commissioned as consultants for the environmental studies, this gave the reason for this second stakeholders forum.

The consultant along with a local language interpreter presented their findings and recommendations to the whole forum.

Comments from the stakeholders were as follows:

- Chairman HYPPADEC Borgu Community said 'relationship between Awuru and PHCN is bad to the extent, the two are having court pending cases. However, the new Awuru settlement is PHCN initiative but the buildings are in bad shape while PHCN have not been carrying out maintenance and regular checks and development on the community. They have been abandoned for long they don't have electricity supply till date.'
- The district head of Koro community in his own comment said "all communities close to the dam are suppose to be benefiting positively from PHCN but they are not instead they are suffering."
- A representative from Fakun community said, there is no electricity supply or any development from PHCN in their community.
- Dr. Aminat Mohammed from Kaima community said on behalf of all women in Borgu community, the project should consider the women and empower them also provide employment for them. Also she wondered why the Borgu community is not having electricity supply.
- Abubakar Kaya from Kaya community asked "of what benefit is the project to them" especially since his community is not having electricity supply.
- The perm sec on energy from Kwara state said the notice for the forum was too short and inadequate, also the report should have been publish in the national dailies. He stated further that the effect of the dam on the downstream is high and what is PHCN downing to accommodate these communities in the technical committee. However, there should be a management consultation between PHCN and the communities also what is PHCN doing as regards payment of premium on the effects of the dam on the communities?
- The District Head of Kuruwasa village said that their community hosts the electric power generating stations, yet no electricity supply in all the villages.
- The District Head of Fakun said all their request to PHCN are being turned down, in that their community is in a dangerous place despite the fact that the dam starts from their village. The state government has not done anything for them yet the community spends a lot of money to get things in place.
- The representative from Dogun Gari said the kainji dam derived its name from the old community and yet there is no electricity supply in the community. Also, he wants PHCN to meet all their demands.

- The Chairman of HYPPADEC commented by saying that this is the second stakeholders forum on issues concerning the communities and their environment and these done with the World Bank. The reports have been seen and read, the consultants have written their views. The consultants should have asked HYPPADEC to write the names of all the communities affected and the problems they face. Since the World Bank is responsible for this project, how will the final report be implemented? Also, the technical committee on ground should have representatives from the communities.
- Representative from Borgu youths Federation, said cause of the reduction of fish catch many of the people in the communities affected has turned to farming. What will be the benefit of the project to them?
- The representative from Community Action on Popular Participation said since resettlement is to be expunged from ERSU, how will the project take place because the people need resettlement also, why is there no NGOs in the technical committee?

The C.E.O Kainji Hydro Power Station responded to comments made by saying that everything said was heard and shall all be looked into. On the issue of electricity supply, the Borgu community is increasing and it's not on national grid hence the Power Station cannot continue to supply electricity to all concerned or else the Power Station will have problems but the government is now making efforts to put the community on national grid by building a transmitting station so that everyone can be supplied with electricity.

The coordinator of ERSU PMU then gave a closing remark he also said that the people of Borgu should see the dam as theirs and also should look into the good the dam has done to community than looking at the bad. However both the PHCN and Borgu community will join hands together to move forward is the solution of any problem and that is the essence of the ESMP.

Subsequent contact with the consultants by email (any contacts direct to PHCN not included).

13/8/10 From Dr. S. I. Ovie, NIFFR, New Bussa

Stakeholders Forum for the rehabilitation of the Kainji and Jebba Hydropower Stations: Brief comments by the National Institute for Freshwater Fisheries Research

I represent the National Institute for Freshwater Fisheries Research (NIFFR) and I participated at above Forum during your presentation at both Kainji and Jebba hydropower stations. My comments, which largely represent the interest of my Institute are few and are stated hereunder:

1. The case of down stream communities:

Your report and presentation appeared to have focused mainly, if not entirely, on the impact of the dam on riparian communities around Lakes Kainji and Jebba only. As a Federal Government Institute with a national mandate, it is our opinion and submission that downstream communities (ie after Jebba) who are also heavily dependent on the water resources of the Niger River, especially for fishing and agriculture, should be mainstreamed into any mitigating interventions. Permit me to inform you that the construction of the two dams has greatly impeded downstream water flow and availability stretching from immediate downstream of Jebba to the Niger Delta. The adverse impact on fisheries and agriculture are real.

2. Your recommendations on Social Corporate responsibilities (SCR) of PHCN (-free admission into school and hospital, reconstruction of roads, water supply, training of fishermen, alternative sources of livelihoods etc) are commendable but what is the framework for sustaining these interventions after the expiration of the World Bank project cycle and funding becomes limited or totally unavailable from that source? Perhaps the Grievance Mechanism you enunciated could cope with any likely agitation that might arise from this recommendation in the event of any breach. However, I think we should be proactive with respect to any potential future agitation for continuity after project cycle.
3. As you rightly pointed out in your presentation, NIFFR has the capacity to undertake effective studies in the areas of flora and fauna. This will cover: fish production assessments (Catch Assessment Survey -CAS) including the use of certain lake chemical indices to estimate potential fish yields to complement or corroborate CAS estimates: preparation of best practice in fishing and fisheries using FAO platform for the Code of Conduct for Responsible Fisheries (CCRF) etc. Has fish production gone down or is an issue of excessive effort? Anticipated studies will reveal this.

4. While you also bemoaned the absence of a Socio-Economist in PHCN, we are pleased to inform you that NIFFR has a Division of Socio-Economics and Extension Services and is ready to key into this area of your recommendation. Alternative livelihoods studies and the problems of resettled people (not resettlement) are key components of this Division.
5. On water quality, I am also pleased to inform you that NIFFR has a Division of Environmental Studies that has all along been concerned with the water quality status of the two lakes. While the problem might be presently minor as you indicated, there are potentials for future worsening of the situation and consequently we should not ignore but be proactive in planning for this future likelihood.
6. Finally, I am not too sure whether you mentioned the issue of aquatic weeds in the lakes in your presentation. Permit me to inform you that this was a major problem in the two lakes in the 90s and was only controlled through the effort of NIFFR with international assistance from the German International Technical Cooperation (GTZ). Here, water hyacinth was the major culprit and while control was judged to be generally effective during the project life span, there is now a slow and gradual re-emergence of the weed in the lakes. I think that the issue of aquatic weeds deserve attention as they not only threaten the turbines for power generation but also the livelihoods of the riparian communities by impeding fishing and navigation.

Atkins response 18/8/10

1. We see the main impact area as extending from the head of Lake Kainji to Pategi where the Kaduna enters the Niger. We would expect ESMP activities to extend (or be confined, depending on your point of view) to this area.
2. We would not expect routine CSR activities to be funded by the World Bank project. The creation of an ESU would give more weight to the issues covered by its mandate but a measure of its success would be the extent to which communities take on their own responsibilities. We do not see CSR as meaning an endless flow of funds from PHCN to communities but rather PHCN acting as facilitators for communities to resolve their own problems and to become independent.
3. We think a thorough understanding of the fisheries resources is an important part of the ESMP.
4. I wasn't aware of NIFFR's socio-economic capabilities. This can be borne in mind when planning any social investigations.
5. Water Quality OK noted
6. We mention aquatic weeds in our report but not in the presentation I gave as we could see no immediate evidence that they are a current problem. However interested to hear that you think that they are becoming a returning problem. Perhaps could provide brief details of the 1990s control programme which we could include in our final report.

KAINJI STAKEHOLDERS ATTENDANCE

S/N	NAME	ORGANIZATION	ADDRESS/EMAIL	PHONE No
1	Abubakar Garba	Kaya	Kaya	08077168642
2	Isa Ibrahim Anaruwa	Fakun	Fakun	08053210919
3	Shuaibu Abdullahi	Kaya	Kaya	08051205011
4	Ian Mathiason	Atkins	UK	07030506440
5	F. Momoh	ENPLAN	Abuja	08034446788
6	Yakubu Mamuda	Fakun	Fakun	08054508592
7	Engr. M.A. Ganiyu	PHCN PMU	Abuja	08033302977
8	M.A Adeagbo	PHCN-KHE	New Bussa	08057073704
9	C.C Asuzu	PHCN-PMU	7 Kampala str Wuse Abuja	08051177779
10	Mamood Umam	Kwatachin	Kwatachin	08057101122
11	Aliyu Yakubu	Anfani	Anfani	
12	Daudu Yakubu	Anfani	Anfani	08075771976
13	Saadu Muhd	Koro District	Koro District	08054810925
14	Abubakar Isha	Fakun	Fakun District Head	08051487972
15	Alhaji Usman Muhammed	Fakun	Waziri Fakun	08050671519
16	Wamba Isha	Koro	Koro	08057866102
17	Ishiaka Yahaya	Awuru	Awuru	08071622489
18	Ibrahim Doko	Doko	Doko	08074662819
19	P. C. Njoku	ERSU PMU	PMU Abuja	08058519611
20	Mouamud Jubril	CAPP	New Bussa	08053438390
21	Mohamud Zakari	Village Head Nassarawa	New Bussa	08037999866
22	Adeniji A	KHE	KHE	08054484461
23	Bello G T	KHE	KHE	08050619229
24	J.o Ayanda	NIFFR	joshuayanda@yahoo.com	08052930175
25	S. I. Ovie	NIFFR	soloovie@yahoo.com	08057402662
26	Dr. Amina S Ahmed	HHYPADEC	Kainji	08054502255
27	Ahmed Haruna		New Kurwasa	08051578598
28	Aliyu Noma Usman	FEBY	New Bussa	08057077097
29	Innocent Tasie	KHE	KHE	08054502549
30	Saliuh Muhammed	Fakun	Fakun	
31	Yusuf Alhassan Awuru	Fakun	Fakun	08051502575
32	Attahiru Bitssa	HYPADDEC	New Bussa	08051502575
33	Usman Ibrahim	Awuru	Awuru	08052351453
34	Muhammed Aliyu Lako	HYPADDEC	New Bussa	08057067155
35	Adam S Ahamed	Dogon Gari	Dogon Gari	08059779339

36	M. Sadiq			
37	Mohammed Issah	Leaba	Leaba	08050755412
38	Engr. Akingbotolu	KHE	KHE	08054325855
39	Mohammed Leaba	Leaba	Leaba	08073726822
40	Sule Salihu	Kwatach	Sabon Pegi	08071678708
41	Umaru Abdulahi	Kwatach	Sabon Pegi	07055390447
42	Amechi Akwueze	NBA/NFS	aamechi2001@yahoo.com	08136060949
43	Adegunwa A A	PHCN PMU	akinadegunwa@nepapmu.org	08033304107
44	Idris Ali	KHE	idrisaidrisu@yahoo.com	08056813797
45	A S Abubarkar	KHE	aminuabu2000@yahoo.co.uk	08057028713
46	Audu Liman	Mokwa LGA	Mokwa LGA	08056455351
47	A N Saadu	BEC	New Bussa	08054565767
48	A U Tanko	BEC	New Bussa	08052252464
49	M D Osah	Sabuke	New Bussa	08075756923
50	Alhaji Y A Awuru	Rafi Development Association	Awuru	08057013887
51	Salihu Ibrahim	Fakun District	New awuru	08073313864
52	Robi A B	New Bussa	New Bussa	08057467196
53	Hauwa Zakari	New Bussa	New Bussa	08053520277
54	C O Eguko	KHE	KHE	08056966294
55	Shedu Haruna	Rafi	Rafi	08073298048
56	Femi Oshokoya	PHCN PMU	femiosokoya@nepapmu.org	08035891086
57	Suleiman Y Umar	Rafi	Rafi	08051056922
58	Umar Tanko Usman	Bussa District	Bussa District Office	08057439736
60	H Y Bello	KHE	hambel@yahoo.com	08052386560
61	R.O Akinwunmi	KHE	yinkaakinwunmi@yahoo.com	08051489491
62	D.O adekola	KHE	oluadekola@yahoo.com	08057101659
63	Melix Owoubri	IZON Community School	Makun Village	08056794801
64	Isha Abdullahi	Niger State House	Niger State	08133711018
65	Lukman Ibrahim	Nassarawa Rasi	Niger State	08058189975
66	Afun T A	PHCN		08023781803
67	Aliyu Olorunsola	Trumpet News Paper	aliuolurunsola@yahoo.com	08157101114
68	Musa Muazu	Gorafin District	Gorafin Village	08051165635
69	Salihu Mouhd	DH Rafi	Dogongara	08054568833
70	L O Orunsaye	KHE	KHE	08055127024
71	S. auta	KHE	KHE	08053948067
72	Kudu Jikada	Bida Rep	New Bussa	08036048972
73	Nuhu Lawal	CDC	New Bussa	08057013878

74	Usman Wakili	Old Kuruwasa	Kuruwasa	07051130772
75	I Itua	KHE	KHE	08053157334
76	Aliyu Koshe	SSA HYPADDEC	Govt. House	08036332933
77	Dr E atori	KHE	KHE	08053520275
78	Abidun Adegbiyi	Trumpet News Paper	New Bussa	08025705576
79	Mohammed Ibrahim	Radio Niger	New Bussa	07051958626
80	Muhammed Jiya			
81	Muhammed Usman			08074663417
82	Alhaji Yusuf			07058464955
83	Buhari Musa			07057959271
84	Ayuba Ahmed	Radio Niger	New Bussa	
85	Lawal Zubairu	KHE	KHE	08066574725
86	Abdullahi Usman	Sarikin Hausawa	Fakun	08073778968
87	Muhammed Bello	Sabuke	Sabuke	08072557371
88	Alhaji S. K. Mohammed	Kwara State Govt.	Ministry of Energy	07034508152
89	Alhaji Ibrahim Saidu	Kwara State Govt	Ministry of Energy	08055525794
90	Engr. A. J. Awoyemi	Kwara State Govt	Ministry of energy	08034430440
91	O. A Oladeji	KHE	KHE	08057011453
92	Adamu Isha	KHE	KHE	08057007768
93	Lawal Shuaibu	Nasarawa	Nasarawa	08051587695
94	Salihu Musa Dalau	Nasarawa	Nasarawa	07051973013

3. JEBBA DAM ATTENDANCE AND REPORT

The forum started at 11:34 am on the 11th August 2010 at the club house hall in the Jebba life camp. The list of attendants are shown below.

The C.E.O delivered the opening speech saying that the World Bank has asked for the environmental study so as to address some of the environmental issues on ground. He then implored everyone to listen to the consultants presentation of their findings and proposals.

The General Manager PMU in his own speech said 'the World Bank is the one financing the Dam rehabilitation and as part of their requirements, before the project commences, there must be an environmental study that will address all environmental issues on ground and possible ones that may arise from the rehabilitation project. Atkins have been commissioned as consultants for the environmental studies, this gave the reason for this second stakeholders forum.'

The consultant along with a local language interpreter presented their findings and recommendations to the whole forum.

Comments came from the stakeholders and they are as follow:

- The District Head of Nupe read out the Etsu Nupe's speech which said that they (Nupe Community) are glad that the World Bank are financing the Dam rehabilitations and have put the Nupe Community into consideration. They will want the Bank and PHCN to also look into the problems facing the community.
- The Asiwaju Of Jebba representing the Oba of Jebba said that there are thirty three (33) villages in jebba with a population of forty thousand (40,000) and their major occupation is farming. He also used the opportunity to thank PHCN for Bore Holes, Schools, Hospitals that where built by PHCN. However, the issues the community is having with PHCN is that of flooding and the community, wants free health care, more bore holes and employment opportunities for their people.
- The representative from Mokwa Community said 60% of Niger State the Host State to the Hydro Power Stations is being affected negatively by the Dams operations. However committees were inaugurated to look into the environmental issues before and after the Dams construction. What happened to the reports of these committees? In addition, in line with the consultant presentation saying that PHCN should implement their report, we are also asking for the report implementation.
- Pastor S.B Bello from Morrow Local Government Asked if copies of the ESMP could be made available to the LGA.
- Chairman HYPPADEC also representing the Governor of Niger State delivered the Governor's speech that was thankful for the ESMP report and he said if the report is implemented, it will go a long way to improve the life and standard of the people of the communities. He also made mention of HYPPADEC's happiness for the forum and the ESMP as this will also improve relationship between PHCN and the host community bearing in mind that all the three Hydro Stations are in Niger State.
- S.K. Mohammed representing the Kwara State Government was thankful for the organisation of the forum he however raised the following issues:
 - a. Early flood warning should be taken seriously by PHCN
 - b. Communities socio-economy survey should be taken serious especially for communities on the downstream
 - c. The technical committee is composed of government officials, there should be indigenes and Local Government officials on the committee
 - d. PHCN needs to have a good rapport with the communities so therefore PHCN should work on that.
- The Chairman Morow Local Government in his statement asked if there is any Kwara State member in the technical committee, which he faults for non-inclusion.
- Alhaji Sule Mohammed from Jebba community said there is a cordial relationship between Jebba community and PHCN. He also said the TOR published in the dailies were not made

available in Local Government areas. Communication gap between Mokwa JHE is high. He said further, that they have some demand which are as follow:

- a. Free medical treatments
- b. Scholarship
- c. Employment opportunities
- d. Since the Dam rehabilitation is coming up, Mokwa people should be given contracts in the project.

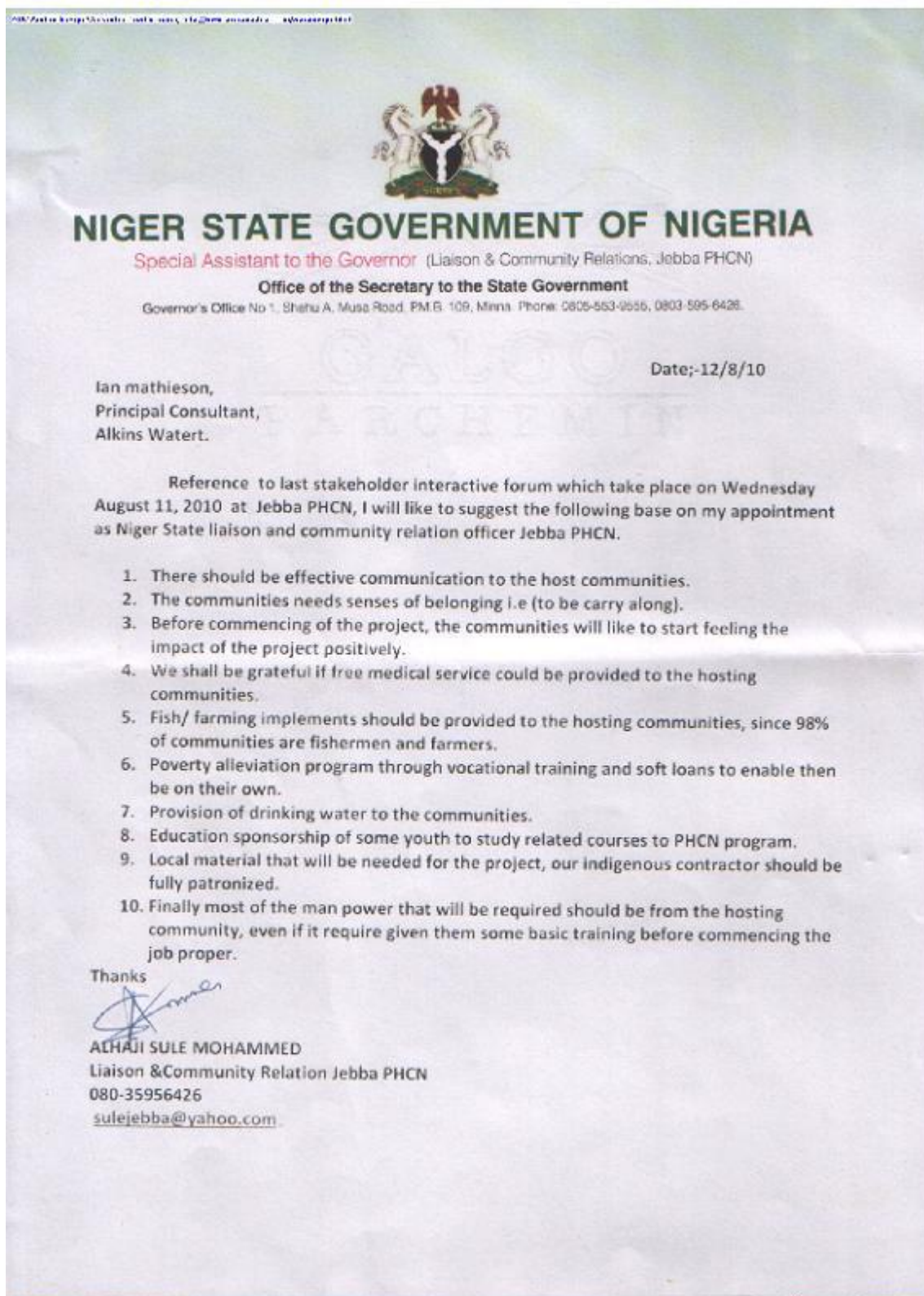
The CEO responded to all issues raised by saying that LHE has been doing alot for the host communities and they will continue to try their best for them. For the technical committee everyone has a chance to be a member which its being worked on. Everything said have been heard and will be worked on.

The coordinator of ERSU PMU then gave a closing remark he also said that the people of Borgu should see the dam as theirs and also should look into the good the dam has done to community than looking at the bad. However both the PHCN and Borgu community will join hands together to move forward is the solution of any problem and that is the essence of the ESMP.

Subsequent contact with the consultants by email.

From Sule Alhaji, Niger State Government – acknowledgement only sent.





14/9/10 Hamza Saidu from Tsafa Village in Mokwa local government requested more information. A copy of the draft report and the presentation were sent by email.

JEBBA STAKEHOLDERS ATTENDANCE FORUM

S/N	NAME	ORGANIZATION	ADDRESS/EMAIL	PHONE No
1	Alhaji M.B Sadiq	Etsu Nupe (Rep)	Bida	08054314772
2	A.T. Ibrahim	Mokwa Local Govt.	Vice Chairman	08035870725
3	Alhaji Muhd N Edugi	Mokwa LGA		08036442915
4	Alhaji M.T Mohammed	Village Head Jebba	Jebba	07037070750
5	Mohammed Gana	Village Head Jeaku	Jebba	
6	Abdullahi Muhammed	Village Head Gana		08037206334
7	Muhammed Gana	Village Head	Mazhi	
8	Muhamed Saba	Village Head	Kalema	
9	Audu Ibrahim	Jebba	Jebba	
10	Alhaji Yunusa Gago	Village Head Fagun	Fagun	
11	Muhammed Baba	Fangan	Fangan	
12	Usman Shaba	Mazhi	Mazhi	08054833318
13	MNUhammed Musa	Kalema	Kalema	
14	Alhaji A. Umar	Jebba Youth Movement	Jebba South	08058741494
15	Abdulkareem Muhammed	Jebba Youth Movement	Jebba South	08036427223
16	Adamu Muahmmed	Kalema	Kalema	
17	SB Bhat	Jebba Paper Mills	Jebba	08054692902
18	Mallam Saadu Muhammed	Oba's Palace Jebba	Palace Jebba North	08034840237
19	Alhaji Muahmmed	Jebba North	Jebba North	08060229547
20	Bello Usman	Jebba	Jebba	
21	Alhji N aremu	Jebba South	Jebba South	
22	Alhaji A Gidado	Jebba South	JebbaSouth	
23	Alhaji A Dumoye	Jebba South	Jebba South	08132370642
24	Sanusi Oladapo	Kwara State	Governor's Office Ilorin	08030419343
24	I. M Gano	PHCN Jebba	yahya_gano@yahoo.com	08051487906
25	M. J Baba	PHCN Jebba	Mjbaba03@yahoo.com	08051314307
26	A O Amadi	PHCN Jebba	Amadi_austin@yahoo.com	08057338394
27	S. A. Moronkeji	PHCN Jebba	simonajiboje@rockmail.com	08053345227
28	A Isyaku	DSS Mokwa	DSS Mokwa	08066578789
29	Gilbert Onwudefu	Jebba ESU	Jebba Hydro Electric	08057313736
30	Alhaji Isha Bukka	Bukka	Bukka via Morow	08065543055
31	Engr. M. A. Ganiyu	PHCN PMU	CHQ Abuja	08033302977
32	Femi Oshokoya	PHCN PMU	PHCN PMU	08035891086
33	Ayoade David	Josephdam Suger Bacitta	ayoadedavid@yahoo.co.uk	08030621604
34	Funso Duyeale	PHCN Jebba		08077375889

35	Ahmmed A. Sule	Jebba North	Chife Immam Jebba	08036536018
36	Mohammed Gara	Jebba North	Emi Gara Jebba North	08030663077
37	Alhassan Mamudu	Gbajibu	Gbajibu	
38	Idrisu Kola	Bukka	Bukka	
39	Alhassan Mohammed	Kunigi	Kunigi	
40	Ibrahim Aliyu	Gbajibu	Gbajibu	
41	Alhaji Adebayo Mohd	Moro LGA	B/Saadu	08069715955
42	Dr. S. I. Ovie	NIFFR	soloovie@yahoo.com	08057442662
43	Oba Abdulkadir Adebara	Jebba South	Oba's Palace Jebba	08062456547
44	Babatunde Asiwaju	Jebba South	Onipako Jebba	08033558818
45	Sule Mohammed	Government House Minna	sulejebba@yahoo.com	08035956426
46	M. S. Oyedun	Jebba Paper Mill	PMB 581 Jebba	08076545823
47	S. U. Baatt	Jebba Paper Mill	PMB 581 Jebba	
48	Ndagisidu	TSAFA	TSAFA	08134781544
49	Mohammed Jcece	TSAFA	TSAFA	08053588138
50	Alhaji Mohammed Umaru	BYAGI	BYAGI	
51	Musa Isha	BYAGI	BYAGI	
52	Audu Jibrin	Ekwa	Ekwa	
53	Abubarkar Dauda	Gbajibo	Gbajibo	
54	Dauda Mouhd	Gbajibo	Gbajibo	
55	Mohammed Baba	Yankayedai		
56	Bello Sunday	Moro LGA	tundebello@yahoo.com	08060885970
57	J. O. Ayanda	NIFFR	joshuayanda@yahoo.com	08052930175
58	Abdulkareem Lawal	Jebba North	Oba Palace Jebba	08035494723
59	Mamman Sani	Gbajibo		07036378847
60	Mohammed Gbajibo	Gbajibo		07080718048
61	Isa Mohammed	Gbajibo		08120765994
62	Mathew Buka	Bukka	Mokwa LGA	08035667492
63	Aliyu Isah	Bebigi	Mokwa Market Road	08034765659
64	Amechi Anakuenne	MBA/NFS	Aamechi2001@yahoo.com	08136060949
65	Isaac Baba	Nigerian Police	O/C Jebba Nartto	07064166978
66	Musa Mohammed	Patigiko	Patigiko	08070779299
67	Mohammed Issah	Patigiko	Patigiko	08084547656
68	Mohammed Rabi	Saminaka	Patigiko	
69	Moud Shehu	Saminaka	Patigiko	
70	Ibrahim Mohammed Jaji	Gana Jebba	Gana Jebba North	07085104048
71	Mohd Gbajibo	Gbagibo	Gbagibo	

72	Ibrahim Tsoko	Gbagibo	Gbagibo	
73	Mohamadu Kunmegi	Kunmegi	Kunmegi	
74	Usman Mohammed	Batagi	Batagi	
75	Umaru Sanda	Bukka	Bukka	
76	Mohamadu Dangana	Egangi	Sarkin Egagi	
77	S. k. Mohammed	Kwara State Government	Ministry of Energy	07034505152
78	Ibrahim Saidu	Kwara State Govt.	Ministry of Energy	08053525794
79	A. J. Awoyemi	Kwara State Govt.	Ministry of Energy	08034430440
80	Bolakale Ahmed	Idata Area Jebba	Jebba South	08065922664
81	Alhassan Mouhammed	Idata area Jebba	Jebba South	07033311713
82	Adegunwa A.A.	PHCN PMU	Abuja	08033304107
83	Cornel Asuzu	PHCN PMU	Abuja	08051177779
84	Olawale Babalola	PHCN Jebba	meewale@yahoo.com	08077666124
85	Engr. I. C. Okoli	Jebba H.E	engricokoli@yahoo.co.uk	08087617421
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87	Engr. Lamu Audu	Jebba H.E	La_audu@yahoo.co.uk	08055205300
88	ABUBARKAR Musa	Jebba H.E	Mananko2007@yahoo.com	08051929304
89	Okapra P. I.	Jebba H.E	godditech@yahoo.com	08121486433
90	Muhammed Koshe	SSA HYPPADEC	amkoshe@yahoo.com	0803633293
91	Sayed Adanu	Bukka	Bukka	07084593739
92	Kareem A.O	PHCN PMU	daisiplan@hotmail.com	08023550740

L) TERMS OF REFERENCE FOR THE ESMP UPDATE

NIGER BASIN WATER RESOURCES DEVELOPMENT AND SUSTAINABLE ECOSYSTEMS MANAGEMENT PROGRAM: REHABILITATION OF JEBBA HYDROELECTRIC POWER PLANT

Technical Assistance for the Update of the Environmental and Social Management Plan (ESMP) and the Consultancy Service on Early Flood Warning System and Dam Safety at Kainji and Jebba Dams Rehabilitation Projects

1. PROJECT BACKGROUND

Following a request from the Niger Basin Authority (NBA) in Niamey, the World Bank expressed its interest in financing the Niger Basin Water Resources Development and Sustainable Ecosystems Management Project (WRD-SEM). The rehabilitation of the Kainji and Jebba Dams is a component of the WRD-SEM. The project is designed to rehabilitate some turbines of the Kainji Dam and some facilities of the Jebba Dam. For both Dams, ancillary equipment will be rehabilitated in order to improve the performance of the two Dams to deliver more power into the Nigerian national power grid.

Due to the nature, location and regional scope of the WRD-SEM Projects which are in the Niger Basin (Guinea, Mali, Benin, Niger and Nigeria), the direct/indirect or induced impacts and proposed plans to construct at least three new Dams in the Niger Basin (Fomi, Taoussa and Kandadji Dams) of which one might be financed in the phase 2 of the project, the WRD-SEM project is classified as a Category A project according to World Bank Safeguard Policies. The rehabilitation of the Kainji and Jebba Dams component is classified as Category 2 according to the Nigerian environmental assessment classification. To be in compliance with the World Bank Safeguard Policies and the Nigerian environmental protection laws, an Environmental and Social Audit (ESA) of the WRD-SEM was carried out in 2002 (another Environmental Audit was carried out in 2007. The results were never implemented). The ESA of 2007 contains an Environmental and Social Management Plan (ESMP) for the Kainji and Jebba Dams rehabilitation. These ESMP for the Projects need to be made operational.

The rehabilitation of the Kainji Dam will increase its power output. This increase will offset thermal power production within Nigeria and this could make the rehabilitation Project eligible for Carbon Financing. This opportunity of Carbon Financing is presently being explored. With the inclusion of the Carbon Financing Project as an added component coupled with some omissions in the original ESMP and other concerns raised during the stakeholders' forums at Kainji and Jebba on January 28 and 30, 2009, respectively, the ESMP included in the ESA needs to be updated before the implementation of the Rehabilitation Projects can start.

2. OBJECTIVES OF THE DAM REHABILITATION COMPONENTS OF THE WRD-SEM

The objectives of the Kainji and Jebba rehabilitation components are to:

- (i) Reduce power outages in Nigeria thus limiting economic and social hardship on the population of the country.

- (ii) Create more employment opportunities, reduce poverty in Nigeria and improve the socio-economic standing of the country.
- (iii) Improve the functioning and water resources management of the two Dams in such a way that it benefits power generation, agricultural production of the riparian communities; reduce damages caused by flooding, sedimentation and others.

The Project Management Unit of the PHCN (PMU-PHCN) therefore intends to hire a highly experienced Consultancy firm with extensive international experience in the preparation of Environmental and Social Audits (ESAs) and of ESMPs for hydropower installations, international experience in preparation of Dam Safety audits and monitoring and the preparation of Emergency Action Plans and Early Flood Warning Systems. The consultants will be requested to i) update and implement the updated ESMP; ii) to prepare and implement a Dam Safety auditing and monitoring system; iii) prepare and implement an Emergency Action Plan and Early Flood Warning System in close collaboration with the PHCN-PMU Environmental, Resettlement and Social Unit (ERSU) in order to deliver on and be in compliance with safeguard issues to the highest international standard, especially the World Bank Safeguard Policies. The Consultants will be requested to provide on the job-training for the site ERSUs that will be formed by PHCN before the commencement of the rehabilitation projects. The firm should also possess experience to:

- 1) get the Kainji and Jebba Dams started towards ISO 14001 certification;
- 2) to provide on-the-job-training in order to form an operational and an internationally acceptable ERSU with Environment & Social, Occupational Health & Safety, Communication, Dam safety & dam related operational water quality monitoring /flood management sub units;
- 3) develop and put in place an internationally acceptable monitoring system for other environmental and social indicators to be developed as part of the updating of the ESMP;
- 4) develop and put in place an internationally acceptable Dam safety auditing and monitoring system;
- 5) develop and put in place an internationally acceptable Emergency Action Plan and Early Flood Warning System;
- 6) advise on needed equipment for these activities, including budgeting and preparation of bidding documents for their purchase;
- 7) improve effective communication and training needs and the preparation of bidding documents for the needed communication equipment;
- 8) provide on the job training in the above mentioned fields;
- 9) Assist and train-on-the-job the ERSU and its sub units in the PMU, Kainji and Jebba Dams.

3. STATUTORY (LEGAL AND ADMINISTRATIVE) FRAMEWORK

The Update of the ESMP and Consultancy on the Dam Safety & Early Flood warning System need to be in compliance with the policies and guidelines mentioned below.

The statutory (legal and administrative) frame-works within which the Consultancy activities shall be executed are provided in the following regulations, guidelines and standards (these regulations are not exhaustive):

- a) The World Bank Safeguard Policies (to be found at www.worldbank.org) and World Bank Group Environmental, Health and Safety Guidelines of 2007 (to be found at www.ifc.org).
- b) The regulations, guidelines and standards of the Federal Ministry of Energy formerly Federal Ministry of Power and Steel in Nigeria.
- c) The regulations, guidelines and standards of the Federal Ministry of Environment concerning power generation and transmission activities in Nigeria.
- d) The regulations, guidelines and standards of the Niger State Ministry of Environment.
- e) All International Conventions on Environmental Protection which Nigeria is party to.
- f) The Corporate and Operational Policies of the Power Holding Company of Nigeria.

Specifically, some of these statutes include:

- 1 Nigerian Wild Animals Preservation Act, 1916
- 2 Nigerian Forest Act, 1937.
- 3 Nigerian Land Use Decree, 1978
- 4 Waste Management and Hazardous Waste Regulations (S.1. 15) 1991
- 5 National Pollution Abatement in Industries and Facilities Generating Wastes Regulations (S.1.9) 1991
- 6 Endangered Species (Control of International Trade and Traffic) Decree, 1985.
- 7 Nigeria Inland Waterways Authority (NIWA) Decree, 1987
- 8 The National Environmental Impact Assessment Decree No. 86 of 1992..
- 9 FEPA EIA Procedural Guidelines, 1995.
- 10 FEPA EIA Sectoral Guidelines for power Generation and Transmission Projects, 1995.

The most stringent Policy, Guidelines or Standards will apply.

4 PROJECT LOCATION

The Kainji Dam is located in Kainji, Borgu Local Government Area of Niger State, Nigeria and the Jebba Dam is located in Jebba, Mokwa Local Government Area of Niger State, Nigeria.

5. NATURE AND DESCRIPTION OF THE PROJECT

The Kainji and Jebba Dams Rehabilitation component involves:

- a. 1. *Rehabilitation of Kainji Dam and Hydropower Plant***
 Rehabilitation and harmonization of productive electromechanical equipments of units 5, 6, 7 & 12 (possibly 9 & 10 and the common systems.
- i) Rehabilitation of auxiliary services
 - ii) Rehabilitation of the navigation lock
 - iv) Upgrading instrumentation and monitoring equipment
 - Improvement of the flood warning systems and development of a
 - v) decision support & management system.

- b. *Rehabilitation of Jebba Dam and Hydropower Plant***
 2.
- i) Rehabilitation of the electro-mechanical equipment
 - ii) Rehabilitation of auxiliary services
 - Improvement of civil works and rehabilitation of upper
 - iii) navigation lock
 - iv) Upgrading of instrumentation and monitoring equipment
 - v) Prevention of tree invasion
 - vi) Reinforcement of the maintenance workshop

PROPONENT'S OBLIGATIONS

In pursuing these Rehabilitation Projects (PHCN) shall:

- 1) Recognize and comply with all applicable environmental regulations, policies, guidelines and standards of the World Bank, the Federal Republic of Nigeria as represented by Federal Ministry of Environment (FMEnv, defunct (FEPA), Niger State Ministry of Environment (NSMEnv.) and Borgu Local Government Area, as well as International Environmental Conventions/Guidelines and Agreements to which Nigeria is a signatory.
- 2) Undertake adequate Consultations with all Stakeholders and respecting agreements and understandings reached with relevant parties.
- 3) Update the Environmental and Social Management Plan (ESMP) prepared as part of the Environmental and Social Audit (ESA of 2007) and the Environmental Audit of 2002.
- 4) Follow strictly Company's Health, Safety and Environmental Policies, as well as World Bank Safeguard Policies and Environmental, Health and Safety Guidelines of 2007 in these fields (General Environmental, Health and Safety Guidelines, Occupational Health Guidelines, etc). It shall be the responsibility of the Applicant to educate all parties on such policies.
- 5) Put in place an operational Dam Safety System, an Emergency Action and an Early Warning System.
- 6) Establish Environmental, Resettlement and Social Unit (ERSU), comprising of Communication, Health and Safety, Dam Safety and Water Resources Management/Flood Management Sub Units for the Kainji as well as for the Jebba Dams.

6. OBJECTIVES OF THE CONSULTANCY

The objectives of the Consultancy Phase 1 Consultancy is to bring environmental and social management of the two Dams in compliance with applicable regulations and guidelines and in line with international best practice to:

- 1) have a working document on environmental and social management for the Dams' rehabilitation Projects
- 2) monitor and improve public health, occupational health and social interests downstream of the Dams and around the reservoirs
- 3) improve water quality management in the reservoirs and downstream of the two Dams
- 4) manage water weed infestations in the wider project area, e.g. water hyacinth infestation
- 5) improve ecosystems management upstream and downstream of the Dams
- 6) bring Dam safety and Emergency Action/Early Flood Warning Systems up to international standards
- 7) bring water resources management, including flood management, up to international standards
- 8) improve flood control in order to reduce downstream Damage of the water releases of the two Dams up to international standards
- 9) investigate the origin of erosion and sedimentation downstream of the two Dams along the Niger River and find solutions to these problems
- 10) improve water resources management upstream and downstream of the two Dams up to international standards in order to minimize impacts on socio-economic activities and on the environment.
- 11) have trained staff that would have the capability to handle the environmentally related issues on pollution prevention, Dam safety auditing and monitoring, occupational health & safety, Emergency Action Plan and Early Warning System, Communication, fire fighting, liquid & solid waste management.

7. CONSULTANCY STUDY SCOPE OF WORK

The Consultant shall carry out in a satisfactory manner the following activities:

1. Update the ESMP and define the required institutional set up and the resultant responsibilities for implementing the ESMP including the budget estimates for its implementation and also provide estimates for recurrent operational and equipment costs; in particular, the Consultant shall prepare a list of prices for services related to the implementation of the ESMP, and such prices will be included in the rehabilitation contracts;
2. During the update of the ESMP the Consultant will work very closely with the PMU-ERSU and other relevant specialists Departments of the Kainji and Jebba Dams. The consultants provide extensive on-the-job-training on all activities undertaken; viz; pollution prevention, Dam safety auditing and monitoring, occupational health & safety, Emergency Action Plan and Early Warning System, Communication, fire fighting, liquid & solid waste management etc. These are to be carried out in one week in Jebba and same for Kainji. It is expected that after the training they Staff should be able to carry out these assignments without the assistance from Consultant expert.

3. As part of the update, tie the ESMP to the different rehabilitation activities; verify and prioritize the actions proposed in the 2007 ESMP for the Kainji and Jebba Dams and verify the proposed institutional arrangements. Verify also the actuality and applicability of the proposed actions in the Environmental Audits of 2002 and 2007 for the Kainji Dam, which were never implemented and include a budget for those that would need to be implemented;
4. The Consultant shall analyze the environmental and social impacts of the proposed Carbon Finance project and include mitigation measures, to reduce the negative impacts as well as enhance the positive impacts into the updated ESMP;
5. The Consultant shall develop and present in Annexes of the ESMP: all procedures and protocols of activities mentioned in the ESMP (e.g. pollution prevention, Dam safety auditing and monitoring, occupational health & safety, Emergency Action Plan and Early Warning System, Communication, fire fighting, liquid & solid waste management etc.);
6. The Consultant shall develop and put in place, up to international standards,
 - i) a fire management system;
 - ii) a monitoring system for other environmental and social indicators;
 - iii) prepare an update for the appropriate remediation Plan for Decommissioning, Closure or Abandonment of the Temporary Facilities which will be required during the rehabilitation project; cost items pertaining to such remediation plan shall be included in the rehabilitation contract;
 - iv) identify any omissions in the ESA/ESMP of February 2007 and the Environmental Audit of 2002 and propose appropriate environmental and social mitigation measures;
 - v) Develop and put in place an Environmental Management System EMS for both Kainji and Jebba Dams, which will lead the way to ISO 14001 compliance. This system will include adequate housekeeping, internationally acceptable liquid and waste management systems, pollution prevention and abatement procedures, etc. ;
 - vi) Preparation and implementation of an internationally acceptable Occupational Health and Safety system within the Kainji and Jebba Dams organizations;
 - vii) Consultants shall comment on the Contractor EMP and monitor the implementation of the Contractor EMP. Also provide on-the-job-training to the ERSUs in monitoring the Contractor EMP implementation;
 - viii) Preparation of an internationally acceptable Dam Safety audit and monitoring system, including dam safety procedures and protocols at the Kainji and Jebba Dams, and put in place dam safety measures;
 - ix) Preparation of an Emergency Action Plan and Early Warning System including community training, selection and marking of dangerous and gathering points for the communities in case of emergencies. The Emergency Action Plans and Early Warning System should be used, at the appropriate level, during major operational water releases and emergency situations. Dangerous places should be marked. The preparation of a dam break analysis is necessary for this purpose;
 - x) the Consultant shall present and discuss the updated Final Draft ESMP Report with stakeholders at the Kainji and Jebba Dam sites, and/or other stakeholders sites and include valid concerns and relevant comments

raised by stakeholders into the final ESMP Report. The Consultant shall organize stakeholders' fora in collaboration with the PMU-PHCN. For this purpose the Final Draft ESMP in English will be disclosed at or near the Kainji and Jebba Dam sites at publicly accessible places and an Executive Summary in Hausa and English will be included in the Final Draft and Final ESMP Reports. The Consultant shall organize the announcement of the availability of the Draft ESMP Report for comments in the newspapers and on the local radio and provide writing material at the disclosure places, so that people can write their comments after which the Fora will be organized. A grievance redress mechanism shall be incorporated into the Report in order to forestall communal conflicts with PHCN on relevant issues. Stakeholder concerns, comments and recommendations shall be incorporated into project monitoring reports;

- xi) Consultants shall advise the Kainji and Jebba Dam Generation Business Units on any other important environmental and social matter and their cost implications (e.g. the preparation and adoption of an Environmental Management System, ISO 14001, and on improved Social Responsibility Policy; and improved HIV/AIDS Policy, etc.)
- xii) The consultants shall advise on and prepare the bidding documents for all the equipment needed for the implementation of the ESMP, the Dam Safety System and the Emergency Action and Early Warning System.

8. CONSULTATIONS WITH REGULATORY AGENCIES AND OTHER STAKEHOLDERS DURING PROJECT IMPLEMENTATION

Throughout the duration of the Consultancy, PHCN & the Consultant shall maintain effective communications with relevant stakeholders which will include the following:

- i) Federal Ministry of Environment
- ii) Federal Ministries of Agriculture & Water Resources , Forestry and National Resources
- iii) Niger & Kwara States Governments
- iv) The Niger and Kwara State Ministries of Environment
- v) Borgu, Mokwa, Moro and other affected Local Government Areas
- vi) Community Based Organizations
- vii) Non Government Organization around Niger and Kwara States
- viii) Hydro Power Producing Areas Development Commission (HYPADEC)

The consultations with the stakeholders will have the following objectives:

- i) Address project issues and concerns pertaining to environmental, safety and social matters promptly in order to manage conflict.
- ii) Build consensus on potential impacts identified and to offer mitigatory measures before, during and after the project.
- iii) Avoid any misunderstandings about the development of the project.
- iv) Ensure that any apprehensions and concerns about the project, nature, scale and impact of the operation have been addressed.

9. IMPACT MITIGATION MEASURES OR ALTERNATIVE ACTIONS

All negative impacts of the Projects identified shall be considered for mitigation and management. These measures shall be implemented during the implementation period and thereafter in order to minimize or completely eliminate the key negative impacts of the Dams. Such measures will include among others:

- 1) Emergency response and Early Warning.
- 2) Dam Safety issues.
- 3) Health and safety management procedures.
- 4) Solid/Liquid wastes management procedures
- 5) Regular pollution abatement and control during (construction, operations and maintenance).
- 6) Environmental/HIV-AIDS awareness programs for construction and Dam operations staff etc.

10. MONITORING PLAN

The Consultant shall prepare an efficient and cost-effective monitoring program for all the activities mentioned in this TOR.

12. ESMP Implementation and Compliance Guidelines, Policies and Regulations

The ESMP shall clearly specify guidelines for ensuring compliance of project implementation with procedures, practices and recommendations.

The guidelines to be prepared by the Consultant shall, as a minimum, include the following:

1. Achievement of project's objectives and commitment.
2. Responsibilities and accountability.
3. Corrective actions which will be employed should the need arise.
4. Inspection, auditing and monitoring of all phases of project.
5. Decommissioning and remediation of project's temporary installations.

13. QUALITY ASSURANCE/QUALITY CONTROL

Knowing that data acquired is critical for the management activities outlined above the Consultant shall maintain a quality assurance/control program that will help PHCN monitor and maintain the quality of their job performance. This shall provide control activities and performance audits. Some measures to be taken shall include:

- 1) A table or organizational chart that will be put in place which shall spell out the roles and responsibilities of the major contributing departments.
- 2) Calibration of all equipment used for in-situ measurement.
- 3) Sample collection date, time, location, handling, transfer, preservative methods, in-situ analysis, field observations and methods will be recorded in field notebooks/log

sheet to document daily progress of work. The Notebooks/log sheets will be confirmed and endorsed by the field coordinator.

14. TOTAL CONSULTANCY TIME, PROPOSED MISSION SCHEDULE AND DELIVERABLES

The total Consultancy time will be 3 months. The proposed mission schedule will be as presented in the following table. The Consultants may suggest another arrangement in their proposal.

Mission	Description of Activities	Activities Deliverables
First Mission of 2 months start after signing contract	Update ESMP; - Start Phase 1; - Publication of ESMP; - Preparation Dam Safety System; - Preparation Emergency Action Plan and Early Warning System; - Start preparation of all procedures and protocols related to all the activities mentioned in this TOR; - Preparation and publication of bidding documents for Equipment; - Stakeholder fora on Draft Final ESMP;	First Mission Activities include: - Inception Report at beginning of First Mission; - Submission of Draft Final Report of the ESMP two weeks before end of First Mission; - Holding of the Stakeholders Fora; - Publication of Final ESMP;
Second Mission of 1 month;	Continuation of consultancy - On-the-job-training of ERSUs; - Continued preparation of all procedures and protocols related to all the activities mentioned in this TOR;	Second Mission Activities ; - Training of the ERSUs and - Finalization of procedures and protocols;

The deliverables shall be reports written/produced (both hard and electronic copies in Microsoft Word 2007 and PDF) in accordance with international best practice, such as the World Bank format for an Environmental and Social Management Plan as stated in an annex to OP 4.01. It shall be produced in phases as indicated below:

1. Inception Report

The Inception Report will indicate the approach and methodology to be followed to satisfactorily carry out the activities requested in this TOR. The Inception Report will need to be delivered within one week of the commencement of the Consultancy service. It will include the identification of gaps, and how these gaps will be filled. The Inception Report shall be provided in 10 hard copies and electronic copies in Microsoft Word version 2007 format and PDF.

2. Draft Final & Final ESMP Report

The Draft Final ESMP Report will provide detailed descriptions of all the mitigation measures to be implemented, their budget and responsible entities. The annexes to the draft Final ESMP will contain the methodological statements, procedures, protocols, etc. (these protocols and procedures can be finalized during the second mission, if needed). The Draft Final ESMP Report is due 2 weeks before the end of the First Mission period of 2 months. The Draft Final Report will be submitted to the client two weeks before the end of the First Mission (20 hardcopies and an electronic copy in Microsoft Word version 2007 and PDF). The Final ESMP Report will be submitted at the end of the First Mission period of 2 months after inclusion of comments by PHCN, the Federal Ministry of Environment and the World Bank. The stakeholders' fora will be carried out in the two weeks before the end of the First Mission. The Final ESMP Report will address all comments/problems raised by the relevant stakeholders during the stakeholders' meetings. The Final Report will be delivered in twenty (20) hardcopies and electronic copies in Microsoft Word version 2007 and PDF at the end of the First Mission.

Among the Protocol Documents that should be finalized and submitted during the first mission shall include the following:

- a) Kainji & Jebba Dams "Occupational Health and Safety Documents for the Rehabilitation Project"
- b) Kainji & Jebba Dams "Waste Management Protocol for the Rehabilitation Projects"
- c) "Dam Break Emergency Action Plan and Flood control plans for Kainji and Jebba Dams operation"

3. Bidding Documents for the Required Equipment

The Bidding Documents shall contain detailed descriptions of all the required equipment and the cost estimate in a separate document. The Bidding Documents is due at the end of the First Mission, thus 2 months after the commencement of the Consultancy services. The Bidding Documents shall be provided in 5 hard copies and electronic copies in Microsoft Word version 2007 and PDF.

4 Final Activities Report

The Final Activities Report shall contain detailed information on the completion status of all the activities carried during the entire Consultancy service period of 3 months in total, including on-the-job-training activities and training of PHCN staff in the use and maintenance of the equipment, monitoring techniques of all the activities mentioned in this TOR and developed during the consultancy assignment. This report will be due at the end of the Consultancy service in a total 3 months and it shall be produced in 10 hard copies and electronic copies in Microsoft Word version 2007 and PDF.

15. QUALIFICATIONS OF CONSULTANTS

1. **Team leader:** Shall be an International ESA and ESMP preparer/ implementer Consultant with at least 15 years of international experience in the field of ESA and ESMP preparation and implementation in hydropower facilities (for a total of 3 months)
2. **Occupational Health and Safety Consultant** with at least 10 years international experience in this field. Preferably experience in hydropower facilities (for a total of 1 month)
3. **International Dam Safety Consultant** with at least 10 years of international experience in this field (for a total of 1 months);
4. **Communication specialist** with 10 years of experience in dealing with communication issues and stakeholder engagement with communities in Nigeria (for a total of 1 months), preferably speaking the local language of the area of intervention
5. **Specialist Consultant** with 10 years international experience in the preparation and implementation of Emergency Action Plans and Early Warning Systems (for a total of 2 months)
6. **International Consultant** with 10years experience in the preparation of bidding documents (for a total of 1 month).

The Consultant in his proposal can combine certain of these fields of expertise and/or propose additional fields of expertise. If the Consultant thinks the job can be done in less time, the Consultant should propose a different total time for each expertise in order to make his proposal more competitive

16.0 FACILITIES TO BE PROVIDED BY THE CLIENT

- 1 The Client will provide all previous relevant reports and data stated in **the TOR.**
- 2 The Client shall provide for the Consultant an office space equipped with furniture, and basic secretarial facilities in PHCN-PMU Office in Abuja.
- 3 Assistance shall be provided in obtaining permissions, licenses, work permits, residence visas, and re-entry/exit visas for the Consultant's staff and their families.

17.0 IMPLEMENTATION SCHEDULE:

This assignment is estimated to be completed in a total of three (3) Months and it is scheduled to begin early January 2010.