TITLE PAGE

AN APPRAISAL OF THE ENVIRONMENTAL IMPACT ASSESSMENT OF DOMA DAM IN NASSARAWA STATE

BY

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(PGD/GEO/2001/2002/250)

NOVEMBER, 2003

AN APPRAISAL OF THE ENVIRONMENTAL IMPACT ASSESSMENT OF DOMA DAM IN NASSARAWA STATE

BY

SAIDU ABDULLAHI AKPAKI

A thesis submitted to the Postgraduate School, Federal University of Technology, Minna. In partial fulfilment of the requirements for the award of Postgraduate Diploma (PGD) in Environmental Management.

November, 2003

CERTIFICATION

This dissertation titled: "**An Appraisal of the Environmental Impact Assessment of Doma Dam, in Nassarawa State"** by Sa'idu Abdullahi Akpaki meets the regulations governing the award of Postgraduate Diploma of the Federal University of Technology Minna and is approved for its contribution to knowledge and literary presentation.

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H.O.D. Geography	Date
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Course Co-ordinator	Date
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Dean, Postgraduate School	Date
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External Examiner	Date

DEDICATION

This thesis is dedicated to my parent Alh. Saidu Akpaki and Hajiya Aishatu Musa (Atine). Thanks for always being the wind beneath my wings.

ACKNOWLEDGEMENT

Masha Allahu La Quwata Illa Billah, all praise is due to **Allah** who sustain us through all our endeavours. Many people (friends and relatives) have contributed positively in different ways to mention but these few: My brothers and sisters – **Alh. Mustapha** & **Hauwa Idris, Hajiya Lauratu, Jafar, Hussain, Hamza, Qasimu, Baba Ali**, and the rest of the family.

My friends **Abdullahi Wali, Isa Kaita, Abubakar Ango, Musa Pada**, and your families all **Jazakumullahu Hairan.** And to **Murjanatu** and **Christy of Almiftah Telecoms** thanks for your understanding and encouragement.

I also wish to acknowledge the invaluable assistance of my ever humble friend **Ibrahim Hassan Ogiri** and his family for their indispensable contribution throughout this programme and to my ever understanding lecturers of Geography department Federal University of Technology, Minna with special reference to **Dr. A.S. Abubakar** for supervising this work.

All praise be to Allah! Special thanks to my late grandmom **Hajiya (Umma)** may Allah make better your solace.

Alhamdulillah!

ABSTRACT

It is necessary to see what happened in the course of Doma Dam construction as a major modification of human environment. As environmental concerns are not fully incorporate in the dam project cycle, once a Dam project is approved, promotes tend to neglect environmental protection measures that have been identification in EIA studies and established as conditions for project implementation. Many a times, the time sheets of engineering and environmental activities have not been matched, with negative and unexpected consequence. For example, there have been cases of reservoirs being filled up before the completion of population displacement and animal rescue.

The objective of an EAI on this project is to determine the potential environmental, socio-economic and health effects of the project on the people and the environment with a view to reduction or mitigating any adverse effects. This study highlighted on the affected environment due to inundation, flooding fishing and irrigation activities as these affect the socio-economic and health status of the inhabitants of the area. The observation has shown that both positive and negative impacts occurs as a result of the construction and installation of irrigation facilities. These various dimension of physical transformation in the project area has been paralleled by changes in the human response. The changes are noticeable both in the perception of the resource potential of the whole area and in some of the technological adjustment already being undertaken to realise this potential.

Irrigation activities were assessed with emphasis on vegetation clearing (deforestation) and stripping of the topsoil during land preparation and levelling, labour emigration and displacement of people. The effect of the changed environment on the health of the population was also observed. It revealed to a greater or lesser extent an increase in water related diseases due to lack of

enlightenment on environmental education and adequate health care facilities. Agricultural activities also improve the economic potential of the people around the area with increase in fishing activities though increase in population and excessive growth of stubborn grasses in the land area has reduced drastically the productivity of the area.

Lastly, the study proffered suggestion on certain mitigation measures and gave recommendations on effective and productive dam and reservoir construction and maintenance.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BASIC PRINCIPLES

Definitions of environment impact assessment abound. They range from the oft-quoted and broad definition of Mum (1997), Which refers to the need to "identify and predict the impact on the environment and on man's health and well-being of legislative proposals, policies, programmes, projects and operational procedures, and to interpret and communicate information about the impacts" to the narrow UKDOE (1989) operational definition:

"The term environmental assessment describes a technique and a process by which information about the environmental effects of a project is collected, both by the planning authority in forming their judgments on whether the development should go ahead". To put it more succinctly and pithy, EIA is an assessment of the impact of a planned activity on the environment.

In essence, EIA is a process, a systematic process that examines the environmental consequences of development actions, in advance. The emphasis, compared with many other mechanisms for environmental protection, is on prevention. Of course planners have traditionally assessed the impacts of developments on the environment, but invariably not in the systematic, holistic and multidisciplinary way required by EIA. From the foregoing review of the effects of the change in the river regime on the economic life of the people of Doma and environs, it can be seen that problems requiring immediate attention have been created and these point to the need for a carefully worked out regional development plan via EIA for the area. The potentialities which the Doma Dam hold for irrigation agriculture cannot be over emphasized. But experience has & show that many otherwise viable and

major economic development projects have turned out into catastrophe to their immediate environment due to insufficient account of their relationship with the surrounding environment problems always arise from unanticipa resources depletion or damage to natural resources in the course of the project public opposition and unforeseen cost escalation during project execution.

The enactment of wide-range of EIA regulations such as the EIA Decree No.

86 of 1992 lists some major project for which an EIAs is compulsory. These are projects such as:

- Agricultural and River Development project
- Urban and Rural Development project
- Industrial and infrastructural projects
- Transportation and public utility project.

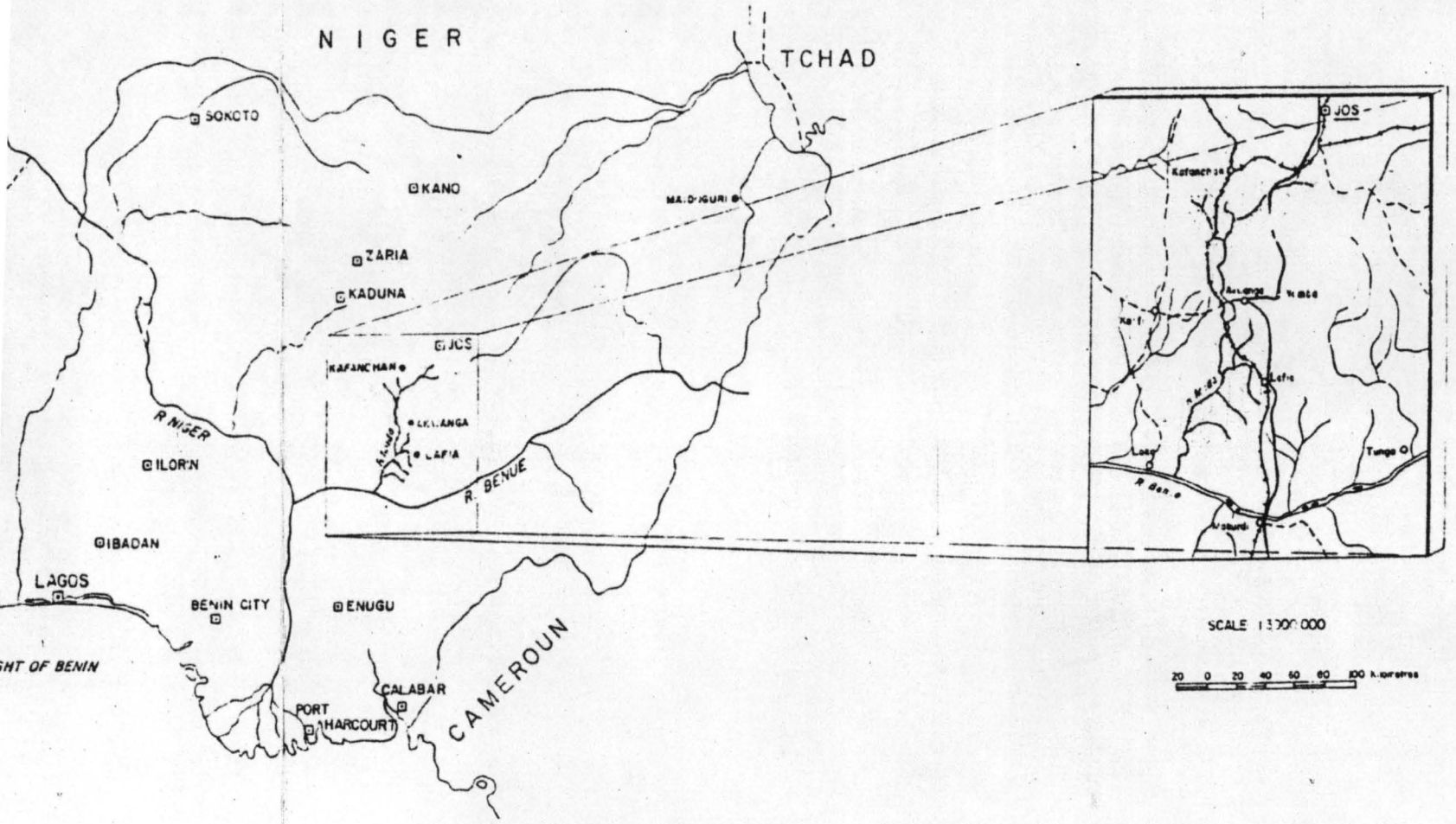
However the anibiguity0 inherent in the term "Project" still remains. An

example of this is the EIA procedures for electricity generation and transmission, in which a power station and the transmission lines to and from it are seen as separate projects for the purpose of EIA, despite the fact that they are inextricably linked.

An EIA, therefore, focuses on development actions which may have impacts not only on the physical environment such as in road, dam, bridge or building construction but also on the social and economic environment such as resettlement and compensation, employment opportunities, services (e.g. health, education) and community structures, lifestyles and values may be affected.

As with all development projects, some of the advantages of dam construction will be immediate while others will take some time to materialize. Besides, there are problems created by the scheme either foreseen or otherwise, which could be of great concern to the residents of the basin area. Therefore, after identifying and articulating the potential problems, the EIA seeks to identify measures that must be incorporated into the project design to policies, plans and Programmes at an early stage in order to minimise or remove completely to the identified problem.

An effective EIA always have some terms of reference based largely on particular foci of specialization such as: demographic impact assessment, health impact assessment, climate impact assessment, gender impact assessment, psychological impact assessment and noise impact assessment. Other more encompassing areas include policy assessment, technology assessment and economic assessment. EA as the generic process that includes EIA of specific projects (e.g. dams and reservoirs), SEA of policies plans and programmes (e.g. irrigation, fisheries, HEP), and their relationship to a larger set of impact assessment and planning-related tools.



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MADA RIVER FEASIBILITY STUDY AND DESIGN

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FEDERAL MILITARY GOVERNMENT OF NIGERIA	GOVERNMENT OF BENUE PLATEAU STATE

MADA RIVER BASIN LOCATION AND STUDY ZONE

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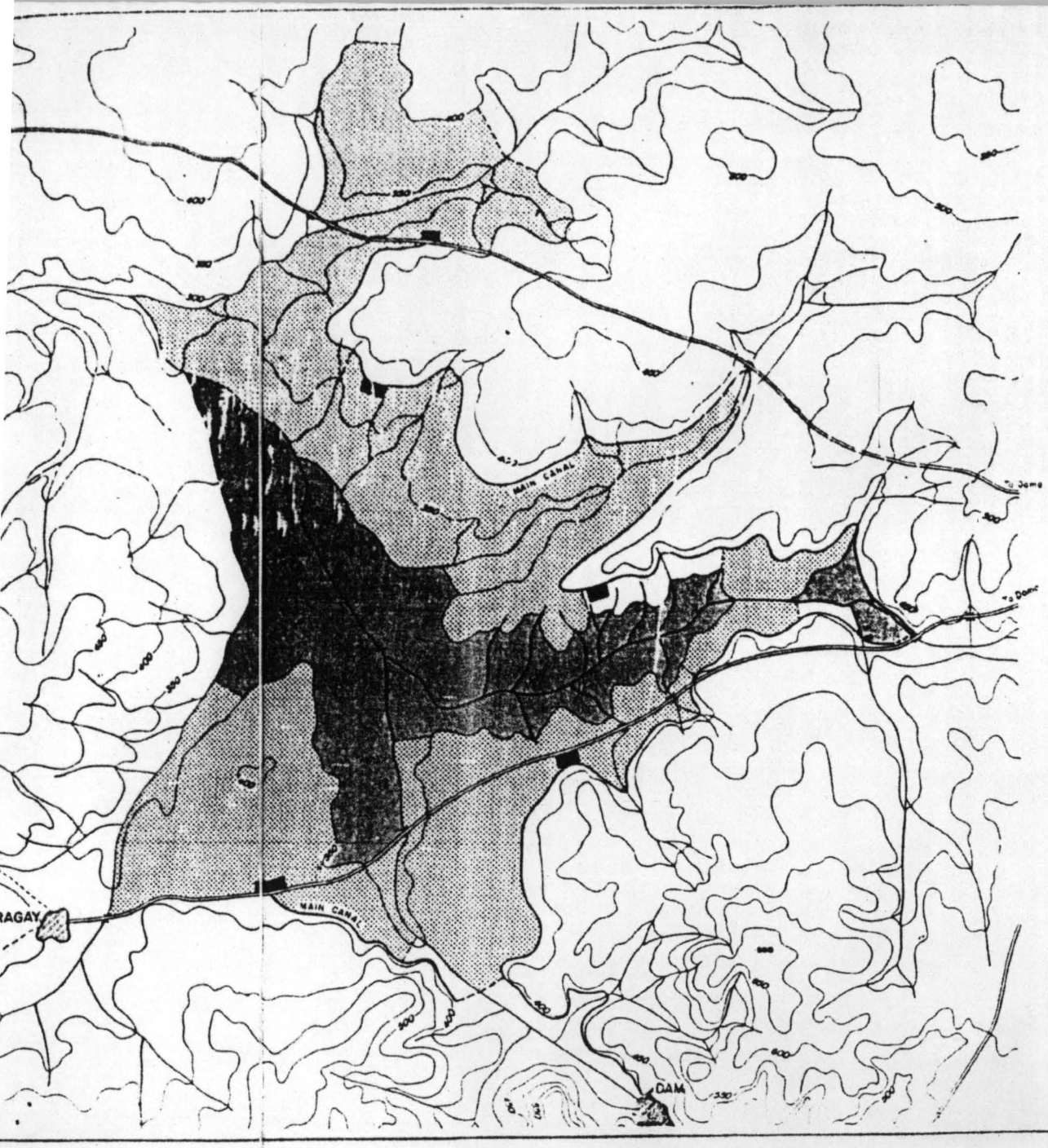

LEGEND

SPRINKLER IRRIGATION

SURFACE IRRIGATION

MAIN CANAL AND STORAGE RESERVOIR

N

400 0 400 800 1200 1600 2000 Metres

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EXECUTING AGENCY
MINISTRY OF NATURAL RESOURCES
GOVERNMENT OF BENUE PLATEAU STATE

DOMA SCHEME - PROPOSED LAYOUT

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SHAWINIGAN LIMITED

OTTAWA CANADA
MONTREAL, CANADA

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1.2 GEOGRAPHICAL BACKGROUND Of The STUDY AREA.

The DOMA dam is located at about 10km from the main town and Alagye/Rutu. This is an earth or rockfill dam on the Ohina River. It has a crest elevation of 414 feet to provide over 1,000metre hectares of live storage. A free overflow spillway of 60 metres crest length with a flood storage of 10feet provides a freeboard of 6feet on the project-designed flood.

The above river got it main catchments from the Mada river which flows approximately North to South, rising in the hills 30miles South of Jos at an elevation of 4,000ft, and joining the Benue River just East of Loko and 40miles West of Makurdi. The catchment is 120 miles long and on average 30miles wide and covers an area of 3,500sq.miles.

From the sources the headwaters fall rapidly to a plain at 1,450ft above Nigerian survey Datum (A.N.S.D) between Jagindi and Gudi. This is followed by a second torrent stage as the river falls through the rapids in the Mada heights to a second plain at about 250ft. A.N.S.D. before joining the Benue at a level of approximately 10ft. A.N.S.D. see figure 1.1

1.2.1 CLIMATE

The climate is largely governed by the rise in topography from South to North, which also controls the heavy precipitation in the headwaters of the project area. Rainfall varies from 55in, in the South to 65in. in the North of the area with a distinct dry season from Mid October to April, which induces very high potential evaporation and transpiration rates.

Since significant variation in local rainfall have been noted in the basin, the precipitation values used in water balance calculations have been derived from seven stations located within or near to the agricultural area.

1.2.2 HYDROLOGY

A small control watershed has been established near Doma with most of its drainage area in the Doma Forest Reserve. This gauging station has been located on the Ohina River, seven kilometers from the Doma on the Doma-Alagye Road. The riverbed is sandy and susceptible to minor bed shift problems. The drainage area is largely undeveloped forest with an area of 258 square kilometres.

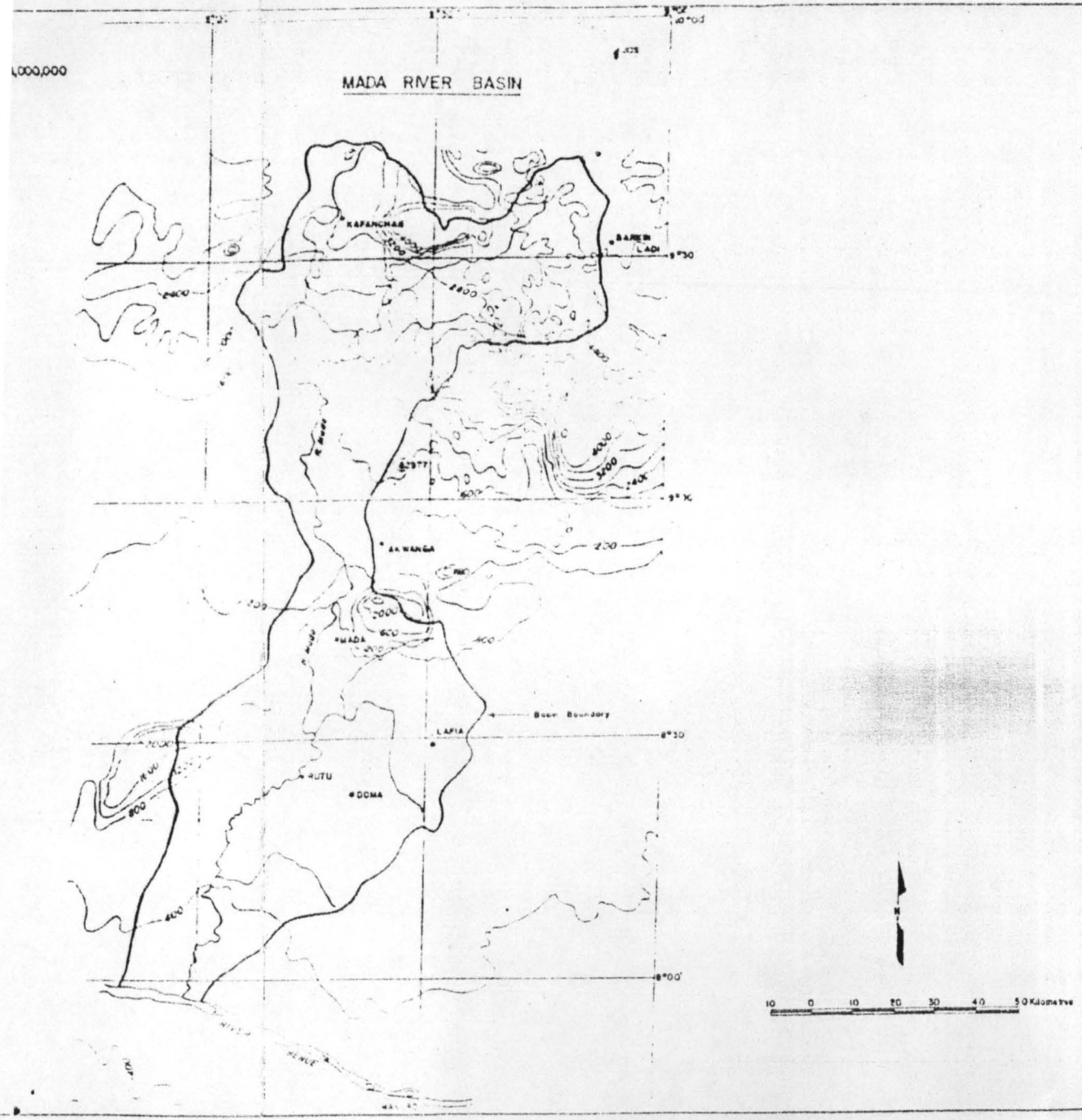
1.2.3 GEOLOGY

The project area is situated in the low lying Benue valley plain which is composed of porous cretaceous sediments, typified by the sandy soils of the Doma area.

Through the central section of the basin where the river flows over the basement complex many reaches of the river followed inferred faults. Faulting is believed to be the reason for many of the abrupt changes in direction of the present channel.

1.2.4 TOPOGRAPHY

The Doma Dam and irrigation scheme falls within the Benue Escarpment Zone. This escarpment, in the area of the basin, faces southeast and marks the Northern limit of the Benue valley. It drops on average of 100metres (300ft) and the top forms the western drainage boundary of the Mada below the west at Gudi for a distance of some 50kilometres. In the reach of river below Gudi bridge the Mada river plunges through this escarpment zone falling through 150metres (500ft) in a series of rapids. The east and west



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EXECUTING AGENCY:
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TOPOGRAPHY OF THE MADA RIVER BASIN

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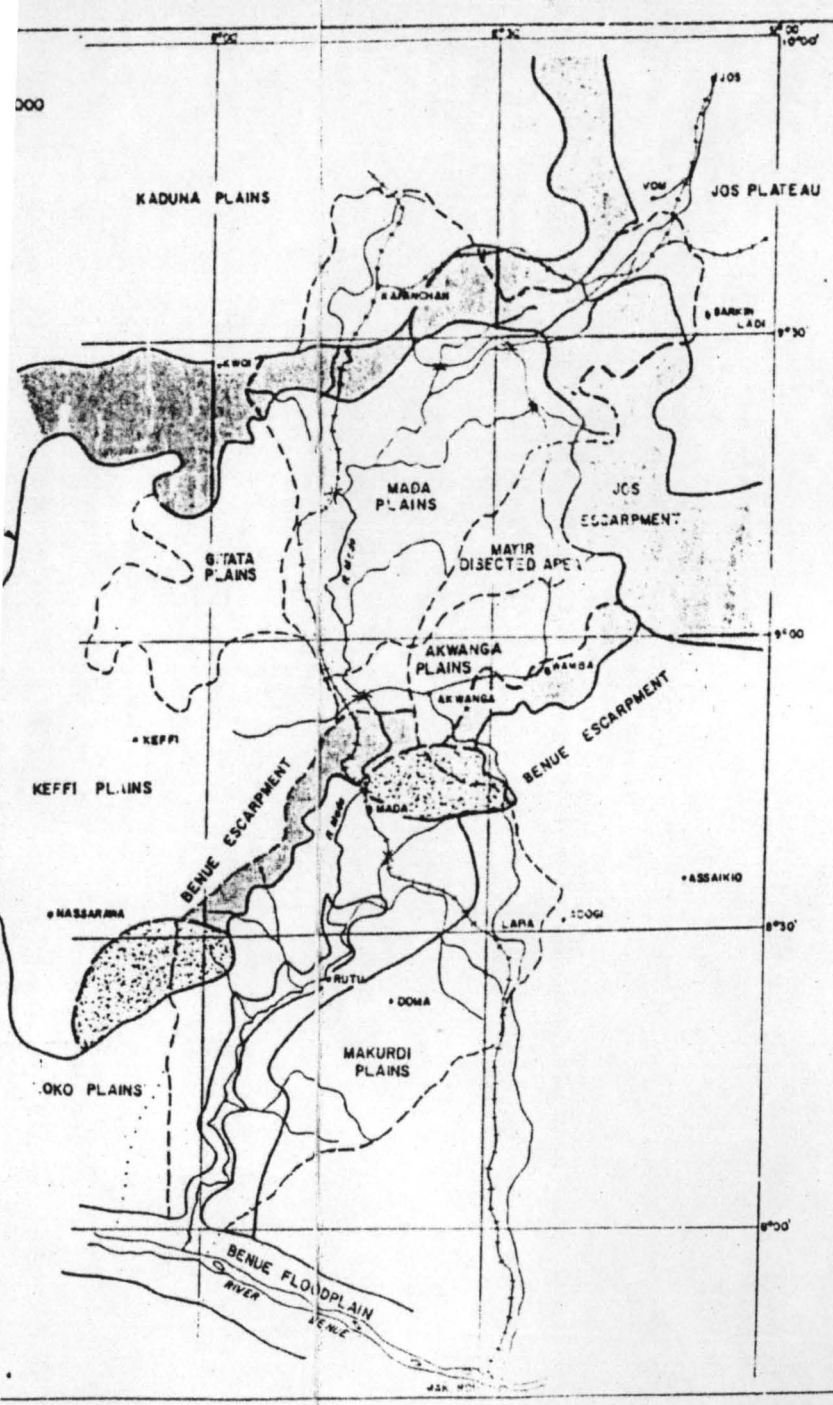

LEGEND

ESCARPMENTS AND STRONGLY DISSECTED TERRAIN

MASSIVE ROCKY HILLS

10 0 10 20 30 40 50Kilometres

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PHYSIOGRAPHY OF MADA RIVER BASIN

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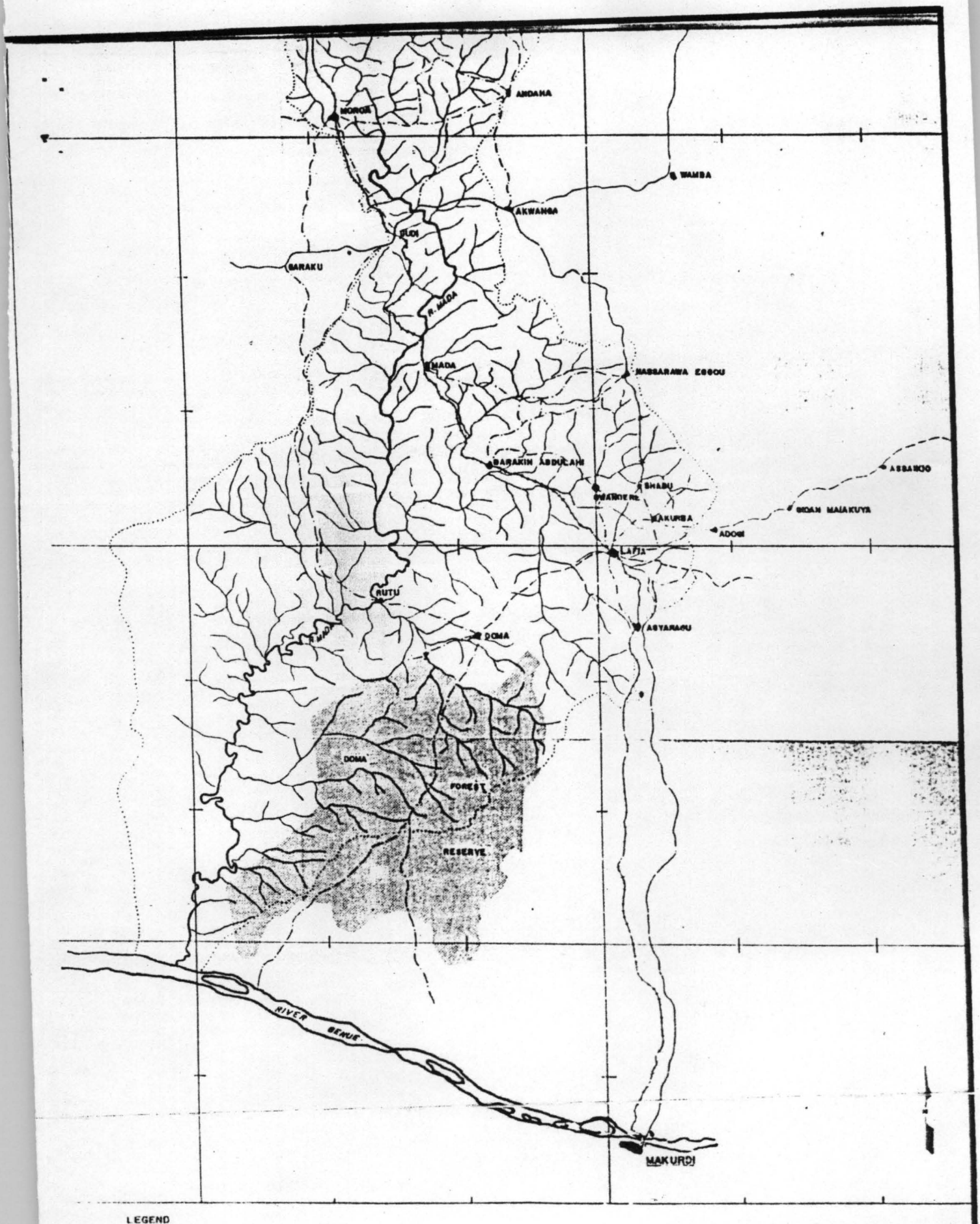
ANDAHA
MOROA
WAMBA
AKWANGA
GARAKU
R. MADA
MADA
NASSARAWA EGGOU
BARAKIN ABDULAHI
SHABU
AKURBA
ADOGI
LAFIA
RUTU
DOMA
ASYARAGU
DOMA
FOREST
RESERVE
RIVER BENUE
MAKURDI
LEGEND
Built up area
Main Roads
Secondary Roads
Minor Roads
Railways
Major River
0
10
20K Kilometres
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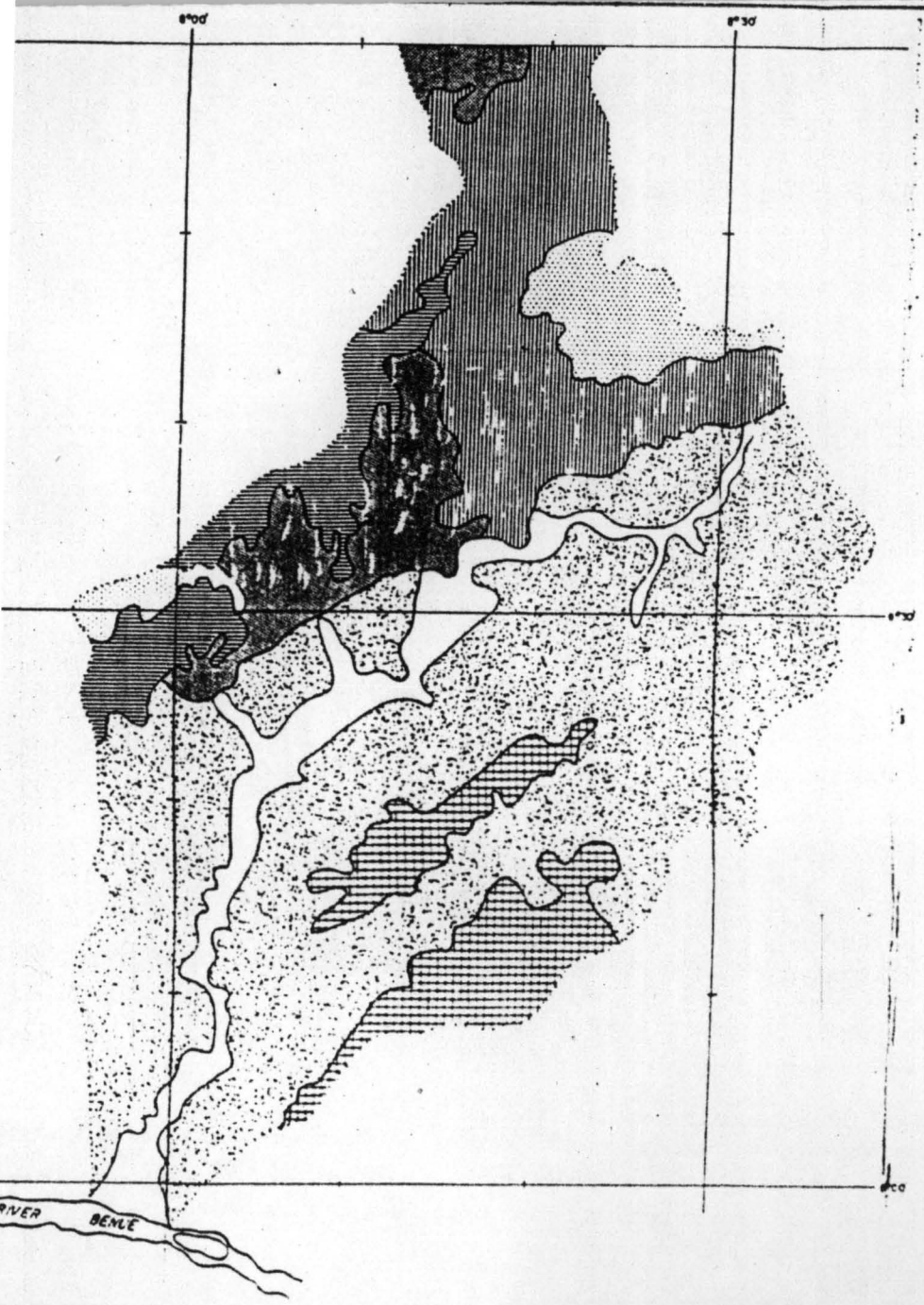
GENERAL WATERSHED AREA



LEGEND

- Raw mineral soils and Lithosols
- Lithosols and Ferruginous tropical soils on basement complex
- Ferruginous tropical soils and few Lithosols on basement complex
- Ferruginous tropical soils on basement complex
- Ferruginous tropical soils on marine facies
- Ferruginous tropical soils and ironpan hills on marine facies
- Alluvial soils

0 10 20 Kilometres

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GENERALIZED SOIL MAP

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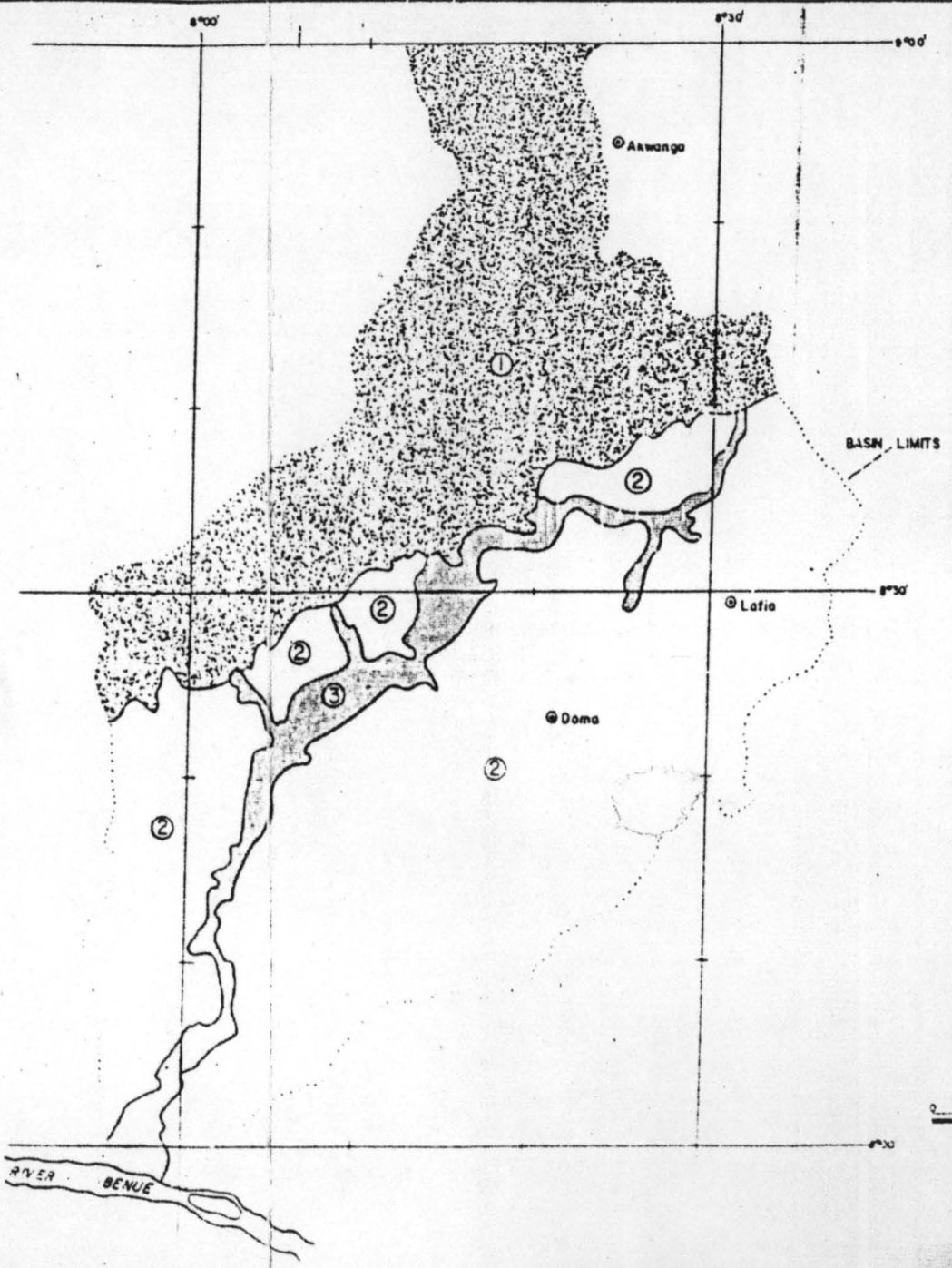
SURVEYS CANADA
MINERAL CANADA



LEGEND

① Akwanga Region—Gently undulating plains to rugged hills on basement complex; mainly granite, gneiss and schist.

② Doma Region—Gently undulating plains to rolling hills on marine facies; mainly sandstone and shale.

③ Mada Region—Flat plains on alluvial floodplains.

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PHYSIOGRAPHIC REGIONS

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of boundaries of these plains form the boundaries of the drainage basin leading to project area.

1.2.5 SOILS

The Doma Region consists of gently undulating to rolling hills on cretaceous sediments. Here the coarse textured ferruginous tropical soils cover most of the region, while ironpan hills rise up to 100m above the surrounding plains south of Doma. Although some parts of this region have been classified as suitable for irrigation, they have moderate to severe limitation in soil and topographic characteristics.

Modifications were made according to the F.A.O system for the separation of soil series. Soils series were separated on the basis of texture and the colour of the B-horizon. Separation of the texture was based on the criteria of soil survey manual, U.S.D.A. Handbook No. 18. The colour separation was mainly based on the F.A.O. system. Alluvial soils are classified according to texture, since it is the most stable property of these soils. Irrigation land classes of soils were determined according to series of standards modified from the U.S.D.I. Bureau of Reclamation manual for Nigeria conditions. These standards were determined jointly with the Ministry of Natural Resources, Government of Benue-Plateau state, and they believed to have high practical value for the soils of the project area.

1.3 STUDY PROBLEM

The emergence of a dam where before there was only a river valley brought about significant changes in the general ecology of this area. There is now an extensive, open water surface across which winds can blow with greater force and generate waves of unusual

dimensions. Furthermore, with a new depth of over 120feet in some places, the dam now provides a different type of environment for the fish population. The expectation is that there will be a tremendous increase and variety in the yield of fish. Changes in the level of the river (Ohina River), it was expected, would create a vast, periodically inundated area, which, if soil conditions permit, would have become very important for irrigation cultivation.

In terms of the human population of the area, however, this auspicious future was a distant hope. The immediate concern was how to resettle and rehabilitate them before they were flooded out of their traditional milieu. Especially in the area of extensive floodplain, numerous villages like Alagye, Rutu, Dogon Kurmi and Yelwa Ediya were expected to be submerged. Substantial farm areas as well as valuable dry season, swamp grazing grounds were also to go under water. More important, the new dam conditions, which promised an increase in fish yield, also rendered obsolete traditional fishing techniques based on the kwalekwale (canoes). In short, task of rehabilitating the population displaced appeared to be more complex than that of resettling them.

It was in these circumstances, that attention began to turn to the need for prior EIA of the project area.

1.4 JUSTIFICATION

Based on the reconnaissance survey, it is observed that both positive and negative impacts occurs consequently as a result of the dam and reservoir construction such as dilapidated canal and control structures, silted and badly eroded canal embankment, constant flooding and channel erosion due to over flow of the dam

especially in the rain season, disruption of water chemistry, over growth of seaweed or sudds and general changes in ecology.

Almost invariably, dams are being built and irrigation schemes set up without proper coordination and control and without serious impact studies or post development monitoring. The negative environmental and social impacts of these project which often affect the hydroecological and physical parameters of the environment which often result in the inundation of large expanse of land, high biodiversity losses and organic matter loading and anaerobic decomposition with the reservoir. Tox and hazardous chemical effluent and pesticide and fertilizer applications from agricultural lands within the watershed are becoming evident and cannot be ignored if we are to avoid the sorts of problems which they have brought in other parts of the world.

1.5 SCOPE AND LIMITATIONS OF THE STUDY.

This thesis examines both the pre-project and the post-project impacts in the setting of Doma dam to the environment. These involved the evaluation of water resources, vegetation and land use, fishery, public health and safety of the dwellers of the project area. The scope of this thesis also include the assessment of socio-economic impacts of the project on the study area.

1.6 AIMS AND OBJECTIVES

- To assess the environmental impacts of the project with emphasis to socio-economic influence.
- To highlight on positive impacts and the need for legislation to guide dam users and operators.
- To identify the negative impacts and preferred mitigation measures to curtail such impacts.

- To recommend plans, policies and programmes to mitigate and or minimise project related adverse impacts on the environment.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 THE NATURE OF EIA.

In recent years there has been a remarkable growth of interest in environmental issues-in sustainability and the better management of development in harmony with the environment. Associated with this growth of interest has been the introduction of new legislation, emanating from national and international source such as the European commission that seeks to influence the relationship between development and the environment. EIA is an important example. EIA legislation was introduced in the U.S.A over 25years ago. An European community directive in 1985 accelerated its application in EU member states and, since its introduction in the UK in 1988, it has been a major growth area for planning practice.

Prevention is better than cure; an environmental impact statement which is an integral part of EIA revel many significant unavoidable adverse impacts which provide valuable information that could contribute to the abandonment or substantial modification of a proposed development action. Where adverse impacts can be successfully reduced through mitigation measures, there may be a different decision.

The non-technical summary is an important element in the documentation; EIA can be complex, and the summary can help to improve communication with the various parties involved. Reflecting the potential complexity of the process, a methods statement, at the beginning, provides an opportunity to clarify some basic information (e.g. who the developer is, who has

Produced the EIS, who has been consulted and how, what methods have been used, what difficulties have been encountered and what the limitations of the EIA are). A summary statement of key issues, up-front, can also help to improve communications. A more enlightened EIS would also include a monitoring programme, either here or at the end of the document. The background to the proposed development covers the early steps I the EIA process, including clear descriptions of a project, and baseline conditions (including relevant planning policies and plans). Within each of the topic areas of an EIS there would normally be a discussion of existing conditions, predicted impacts scope for mitigation and residual impacts.

EIA practices vary from study to study, from country to country, and best practices is constantly evolving. A recent UN study of EIA practice in several countries advocated changes in the process and documentation (United Nations Economic Commission for Europe 1991). These included giving a greater emphasis to the socio-economic dimension, to public participation, and to "after the decision" activity such as monitoring.

2.2 THE PURPOSE OF EIA

Over the years the realization has dawned that large dams cause many environmental and social impacts. World over, a great majority of large dams have been completed only I the last thirty years. In 1950, there were 5,196 dams commissioned in the world. In 1982, there were 35,000 of which 34,798 are over 15 meters in height. Up till 1980 large dams were completed in India, accounting for 500,000ha forest loss. Since 1981, about 1877 dams are either completed or are under construction.

The construction of the kainji lake and the consequent generation of electricity of kainji is regarded as the cornerstone of the Six Year National

Development Plan launched in Nigeria in 1962. Much hope had been placed on the effects the scheme would have on the economic development of Nigeria as power generated at kainji is capable of satisfying the major part of the anticipated power requirement in Nigeria until about 1980. As well as producing power as economically as any other hydro alternatives, it was hoped that the kainji scheme would yield several additional benefits particularly for fishing and agricultural development.

The construction of dams and reservoir is therefore more beneficial than it negative impacts especially in areas like Doma and environs where agriculture and fishing is the mainstay of the inhabitants but the benefits lost longer where EIA is taken seriously and effectively.

2.3 PROJECT, ENVIRONMENT AND IMPACTS

(Dams and Reservoirs)

In developing countries, environmental assessments of dams were first performed in the early 70's as a response to requests from

international finance agencies, namely the World Bank and Regional Development Banks (Sagulin in West Java, Indonesia, Mahaweli Ganga in Srilanka, Sobradinho, in the northwest region of Brazil and Salto Grande, a development shared by Argentina and Uruguay). Most of these assessments were not intended to be a tool for decision-making on the implementation of such dam projects, as projects themselves were already being implemented, some with strong opposition from local and foreign environmentalists and scientific groups. EIA reports were then prepared by one or a small group of experts, being limited to considerations on the direct consequences of dam building and operation.

During the last two decades, several facts have contributed to the improvement of both the awareness of governments and investors in developing countries about the principles of sustainable development and EIA technical and procedural advances. External pressure to consider environmental aspects in project planning, external financial help and technical assistance for institutional and capacity building, as well as the results of the World Commission and Development Report "our common future" (1987), and the agreement that culminated with UNCED 1992, have led to some sort of EIA system being created in the majority of developing countries.

Gradually, while the EIA process involves, scooping procedures and legal requirements for the assessment of dams has been extended to include a range of environmental issues, in particular those related to impacts on social groups and directly affected communities. However, to ensure the broadest inclusion of relevant social concerns about dams in EIA studies, there is still a need to

improve scooping procedures in order to promote the sound participation of affected communities and other interest groups.

As scooping and technical quality of EIA studies evolve, the prediction of impacts on the physical environment (erosion, water quality and quantity) seems to have progressed with the use of mathematical models and other appropriate techniques. As for biological aspects, some scientific development may be recognized in the field of aquatic ecosystem dynamics and the prediction of impacts from the filling up of reservoirs, although the shortage of baseline data may have limited the use of the best methods.

Another area of knowledge with much scope for improvement is the prediction of direct and indirect negative socioeconomic impacts, and the interactions between these and the effects on the natural environment [conflicting demands for water usage, salinization of flood plains down-stream of the dam, loss of land and water productivity etc.]. Most EIA studies of dams have limited such issues to the identification of evident direct impacts on social groups and recommendation on the future development and implementation of management programmes to mitigate them [programmes for population displacement from flooded areas and resettlement, health assistance, compensation measures etc.]

Uncertainty is an issue inherent to EIA studies, especially regarding the impact assessment of dams in tropical regions where, as happens in many other ecosystems, the shortage of primary and secondary baseline data is recurrent. Moreover, as the time period from the beginning of project planning to the completion is long [from ten to fifteen years], the degree of uncertainty in

environmental studies of dams is higher than in other kinds of projects EIA

2.4 ASSESSMENT OF THE EFFECTIVENESS OF EIA

The Netherlands, with its small area of densely populated and highly industrialized land, has developed a worldwide reputation for powerful and progressive environmental legislations. The National Environmental Policy Plan (NEPP) of 1989 an update (NEPP-Plus) established a national environmental strategy bases on the concept of sustainable development.

The main problem regarding the effectiveness of EIA of dams in developing countries like Nigeria is that, in the great majority of cases, project proponents still consider the EIA process as a bureaucratic requirement to be fulfilled for project approval, isolated from the project planning and implementation cycle. EIA studies are often carried out after the decision on the site of the dam has been made and engineering studies and project have been completed. The choice of site of a dam is usually determined by economic and engineering criteria, with little or no consideration for environmental issues. As a consequence, the opportunity is lost for considering dam site alternatives with less damaging environmental and social impacts. Moreover, late EIA studies impede the contribution and exchange of information between environmental specialist and project designers regarding prevention and mitigation of negative impacts.

In countries where EIA regulation require some sort of environmental permit for project implementation, the planning process of dam is rarely in harmony with EIA and permit procedures, causing delays in decision-making and project implementation, in addition to the drawback of late EIA studies mentioned above. In countries where the authority responsible for the energy development sector administers the EIA procedures, as part of the project authorization, EIA effectiveness is also threatened by conflict of interest

between development interests and the implementation of the environment mandate.

Development that does not cost the Earth! Existing environmentally harmful developments have to be managed as best they can. In extreme cases, they may be closed down, but they can still leave residual environmental problems for decades to come. How much better it would be to mitigate the harmful effects in advance, at the planning stage, or in some cases avoid the particular development altogether. Prevention is better than cure.

Economic development and social development must be placed in their environmental and social development must be placed in their environmental contexts. Building (1966) vividly portrays the dichotomy between the "throughput economy" and the "spaceship economy" (see fig 2.1). The economic goal of increased GNP using more inputs to produce more goods and services contains the seeds of its own destruction. Increased input brings with it not only goods and services but also more wastes products. Increased imputs demand more resources. The natural environment is the "sink" for the wastes and the "source" for the resources.

Environmental pollution and the depletion of resources are invariably the ancillaries of economic development.

2.5 EVALUATION OF THE PERFORMANCE OF EIA AS THE BASIS FOR MANAGEMENT ACTIONS.

This is probably the EIA function the performance of which has been less effective. The main impetus toward the further development and evaluation of EIA, however, was the discovery of oil and gas in the North sea. The extraction of these resources necessated the construction of large developments in remote areas renowned for their scenic beauty and distinctive way of life (e.g the shetlands, the Orkneys and the high land

region). Planning authorities in these areas lacked the experience and resources needed to assess the impacts of such large developments. In response, the Scottish Development Department (SDD) issued a technical advice note to LPAS (SDD 1974). In 1970s some EIAS were carried out mostly for oil and gas developments. Many of these were sponsored by the SDD and LPAS, and were prepared by environmental consultants, but some (e.g for the Flotta oil terminal and Beatrice oil field) were commissioned by the developers.

In 1973, the Scottish office and department of the environment (DOE) commissioned the University of Aberdeen's Project Appraisal for Development Control (PADC) team to develop a systematic procedure for planning authorities to make a balanced appraisal of the environmental, economic and social impacts of large industrial developments. By far dams or man-made lakes are most important aspect of river basin development, and from their very nature dams reflect multipurpose or integrated project. Among the purposes of dams are flood control, water supply for man and animals, irrigation, power, or a combination of two or two or more of these [Harrison-church 1968, p.3] with respect to the dams already built in Africa, the most important purposes are the generation of power for domestic and industrial uses, improvement of navigation, flood control, the promotion of fishing activities and the provision of water for domestic, industrial and irrigation purposes [steel 1968]. Dams have been built in Nigeria since ascent 1918, notably for domestic water supply, and ever since, more than 160 dams of various reservoir capacities have constructed in various parts of the country.

Technical reasons for the poor performance of the environmental management of dam projects submitted to EIA begin with poor impact

prediction in EIA studies, so that sound monitoring plans and mitigation measures can barely be identified. In fact, on account of the lack of elements related to impact nature and magnitude, a number of EIA studies of dams like the kainji dam in Niger state and Tiga dam in kano have failed to propose comprehensive environment management programmes for dam implementation, presenting a list of generalities in the place of appropriate mitigation measures and monitoring plans. In this situation, such dam project end up being approved on condition that the design and cost evaluation of environment management actions is presented sometime in the future.

CHAPTER THREE

3.0 DATA COMPUTATION/METHODOLOGY

3.1 DATA SET

The data from 1980-1999 (as available) on the

- Socio-cultural
- Economy – farming & fishing
- Water reservoir and irrigation activities and
- Public health are used to determiner the extend of project imparts on the people and environment.

3.2 DATA SOURCE

Information used in this study is based on two types of data source: the primary source, which entails data, extracted from field survey and observation and conducting oral interview. The second source is the secondary source, which involves reviewing texts, journals, newspaper, magazines and monographs.

3.3 METHODOLOGY/ ANALYSIS.

3.3.1 RECONNAISSANCE

The method and procedures used and relevant data to support and define the problems, which would aid in the context definition, was sought and around the project area and the lower Benue River Basin Development Authority's Headquarter at Makurdi, Benue State.

A reconnaissance field survey was undertaken in order to acquaint us with study area and measure the impact of the problems studied. During the reconnaissance survey series of maps and overlays were viewed as the federal ministry of Agriculture and water resources already had

commissioned 1:10,000 topographic maps of these location as well as aerial photography of the probable development area.

3.3.2 PERSONAL INTERVIEW /INQUIRY

In the present study, two methods for analysing the EI were adopted. These are interviews conducted in town and the surrounding village and inquiries from the authorities concern.

CHAPTER FOUR

4 ANALYSIS/FINDING

4.1 IMPACT ON ENVIRONMENT

A belt of fairly dense bush follows the course of the Mada river and its tributaries and it is possible that this causes an obstruction to flows, thereby assisting the saturation of the fadama during the wet season.

It is also probable that some of the moisture in the soil profile originate from groundwater flow from the hills. Again, the high stage in the region during the wet season provides a low hydraulic gradient and therefore reduced flows through the soil.

The presence of water in these areas was viewed as a complex matter and its removal by adequate drainage led to the following activities:

i) Clear the vegetation away from all natural watercourses.

ii) Pump out water, which has been trapped in ponds, and fill the low-lying areas.

iii) Cut additional grains into the river and perpendicular to its axis to a length equal to the width of the flood plain.

From studies of aerial photographs and field reconnaissance, the bush cover were cleared, heavy machinery were used in areas close to water courses where the density of trees is such that land clearing operations are not practicable. These has brought about constant inundation and flooding of arable land especially around Alagye and Rutu areas.

The construction of the dam brought about the submergence of all areas below 450-contour line and the creation of a large reservoir as a consequences ponding occurs in the lower reaches of the

tributaries and overspilling soon occurs. These also brought about significant changes in the general ecology of this area.

4.2 INSTITUTIONAL/SOCIOLOGICAL IMPACT.

In the project area, there is the local Administration which have an influence upon the people in the area and those who might move into the project area.

A greater number of subordinate councils is also located on and near the project such as those headed by the chief of Doma, the Andoma of Doma. Undoubtedly, these councils have some effect upon the administration of the project in operation, and should be kept in mind when planning project operation.

The use of agricultural land is granted by the local government authority of the division and district and administered by the village head or chief. Complains unsettled at the local level can be referred to district heads and to the local authority council. Land tenure operates on a basis of customary use. There is gross mismanagement of affairs and finances occurring at the administrative level were maintenance of both equipment and the reservoir are neglected. Problems also occur with population pressures in the project area, the rise in population and the decrease of available land is tending to change the concept of communal or family holdings. As land is passed down from father to son, the holdings become smaller, until it is difficult or impossible to support the family on the plot.

The project has brought about socio-cultural diffusion of Alago the original settlers with Tiv from Benue state, Eggon from Nassarawa, Hausas and the migratory Fulani. These different people inter

marry with consequent exchange of cultural ideas and believes. There is also the issue of social conflict where peasants are disposed of their land, unsatisfactory resettlement schemes and inadequate and often delayed compensation. These result into serious resentment and lack of co-operation and outright revolt between the peasants and the authority. Land was confiscated from the original natives and their fishing ground impeded, affecting their social and economic activities to make way for the project.

Though, the Fulani tribesmen have had traditional rights for grazing their cattle on the crop residues and natural pastures of the project. They use specific routes as they migrate through the zone and the area is inspected by the Veterinary Division of the Ministry of Natural Resources to assure that the crops are not damage. In most cases the Fulani and the resident villagers live in relative harmony and contribute to each other's mutual benefit but still, there is also the problem of occasional violent clashes between the Fulani herdsmen with Tiv and Alago farmers over unrestricted grazing activities by the herdsmen.

The submergence of the fadama land due to periodic overflow of the dam downstream has forced the peasants especially the Eggon people who grew rice on this part to change their mode of farming or migrate.

4.3 AGRICULTURAL/ECONOMIC IMPACT.

In the project area, with the exception of the Doma Forest Reserve, land has been available outside the villages and the members of expanding families who require land merely open up new areas further away from the village.

The fundamental farming units in the project is the family, which consist of an average of 6.8 persons but considering the early age at which family members begin to provide labour for the unit, and since women also supply a significant amount of work in agriculture, the family members contributing to agricultural production are assumed to be 50 to 60 per cent of the total family group.

The results of the survey taken in the project area indicated that agricultural income per farm unit ranged from 0 to 5692 naira based on the amount of produce sold. Forty three per cent of the families questioned earned from N1500 to N12, 000 and another 17% earned from N1000 to N5000. Income per man-year of labour average N17.40. The study also indicated that most labour is provided by the family itself with very little supplied by hired workers.

The major constraints to agricultural production in the area of the present time can be grouped into four categories:

- The marked wet and dry periods with considerable variability of rainfall in the wet season. Although it is possible with short season crops to obtain two harvests during one rainy season, this requires harvesting one crop during the rains, which present some drying problems. Unfortunately.
- The irrigation scheme, which would have supplemented the dry period, is abandoned.
- The seasonal labour shortage, especially at the beginning of the wet season, associated with the above rainfall patterns. With the beginning of the rainy season, the land

(which is mostly hand-cultivated) must be prepared and planted in a two or three month period, thus concentrating a large part of the yearly labour requirement in one three month period. It would appear that in most cases this lack of labour for land preparation limits the area that can be cultivated.

- Lack of integration between livestock and crop production and livestock disease control. At the present time cattle in the area are held by the nomadic Fulani and there is no integration of livestock and crop production. Possibilities exist for the fodder in the dry season and generally more intensive livestock production.
- Soils – there are two major types of soils in the area, the light-textured upland soils and the heavy-textured flood plain soils. The flood plain soils, although very fertile, are presently subject to flooding and cannot be worked with machinery during the wet season. See table 4.1 & 4.2

The sources of credit available in the project area are the family, moneylenders, middlemen – merchants and banks. The co-operation now is experiencing a period of re-organisation and is not very active in the credit field. The Nigerian Agricultural Bank has handed over its small-scale loans and livestock loans to the Agricultural Division of the Ministry of Natural Resources for super and so actually provides no direct service for the small farmer. In the project area the farmers do not seem to use the services of the money lenders-middlemen-merchants and therefore the family is the principal source of credit. Because there is traditionally no compulsion to repay loan to the family this source of credit tends to

be limited to certain individuals and tends to become scarce when most needed.

Table 4.1

GROSS AND NET BENEFITS ON FLOOD PLAIN AREAS UNDER RAINFED CONDITIONS.

Crop	Gross value	Net Benefit
Rice	N4,149,000	N1,645,000
Maize	N1,169,000	N 390,000
	N5,318,000	N2,035,000

Table 4.2

NET BENEFIT FROM PRESENT PRODUCTION.

Crop	Area (Ha)	Net Benefit
Rice	3,953	N189,744
Guinea corn	930	21,390
Maize	776	11,640
Benniseed	27	0
Millet	14	0
		N222, 774

To give N1, 772,000, as the net incremental benefit.

In summary, the possible returns to the area without irrigation are:

Table 4.3

POSSIBLE VALUE OF RETURNS TO RAINFED AGRICULTURE (N)

Level I (without flood control)	Total Net Benefit	Gross Returns
Level II (with flood control)	20.4	42.1
	22.2	46.8

Net benefit excluding off-farm costs, e.g. extension service, dam construction, etc.

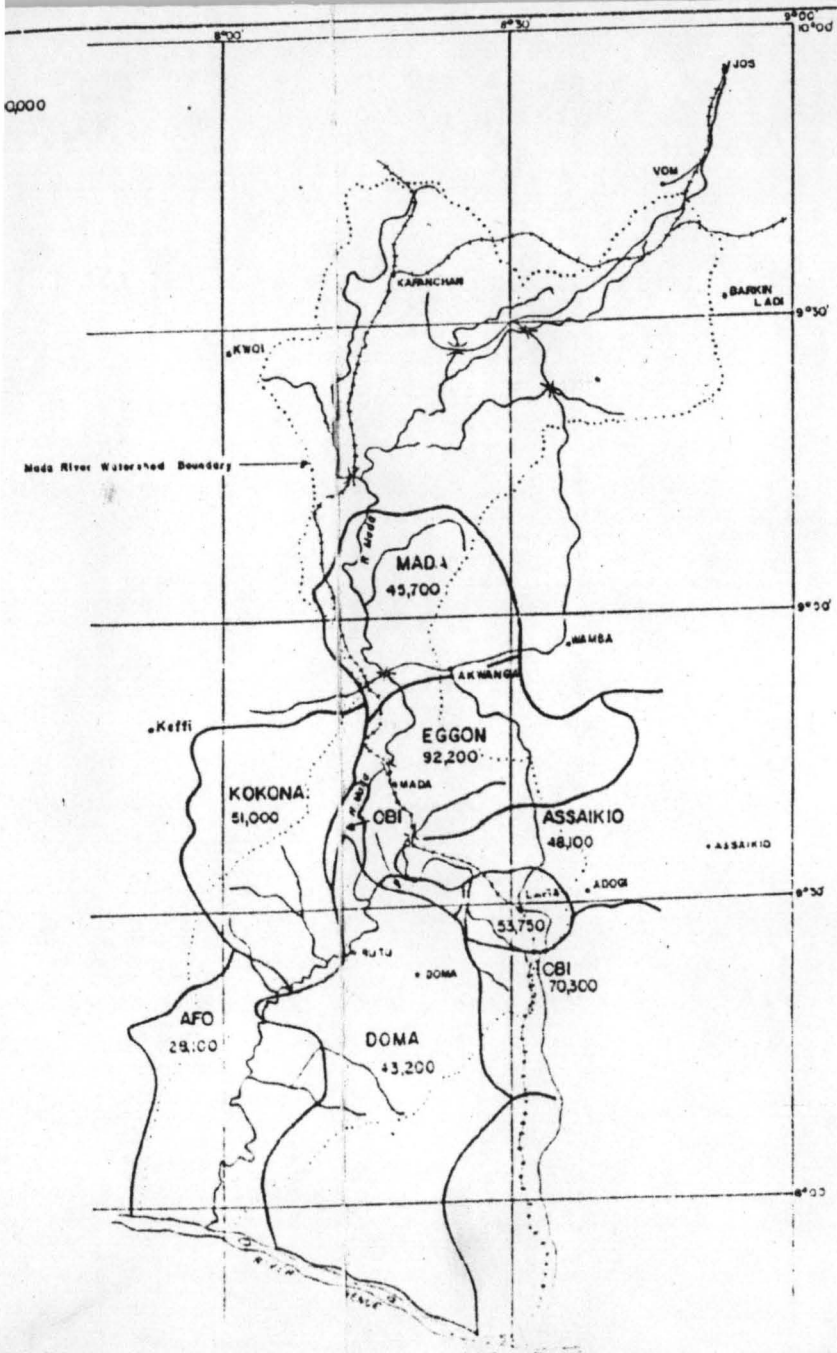
However, the upland areas covered by the irrigation scheme naturally contain some of the better soils in the area. In order to calculate a maximum dryland production on these area it was assumed that 100 per cent of the area would be cropped under improved practices but with the same mix of crops as are now produced in the area.

4.4 IMPACT ON HEALTH

Dams directly or indirectly transform the nature and productivity of riparian, estuarine and coastal ecosystem. This transformation or impacts have a direct bearing on the biological diversity that is encompassed in these ecosystems.

The study has revealed that after the construction of the dam, there is noticeable increase in water related diseases. It showed high infection of malaria, cholera, dysentery, diarrhea, typhoid fever and schistosomiasis and there is no adequate primary health care services coupled with lack of environmental awareness of the people.

The use of chemical such as fertilizers, pesticide and herbicide on irrigation farms to improve productivity lead to leaching to downstream hence people consume polluted water and eat fish that contained large quantities of such chemical and these means widespread incidence of killer, incapacitating and debilitating diseases.



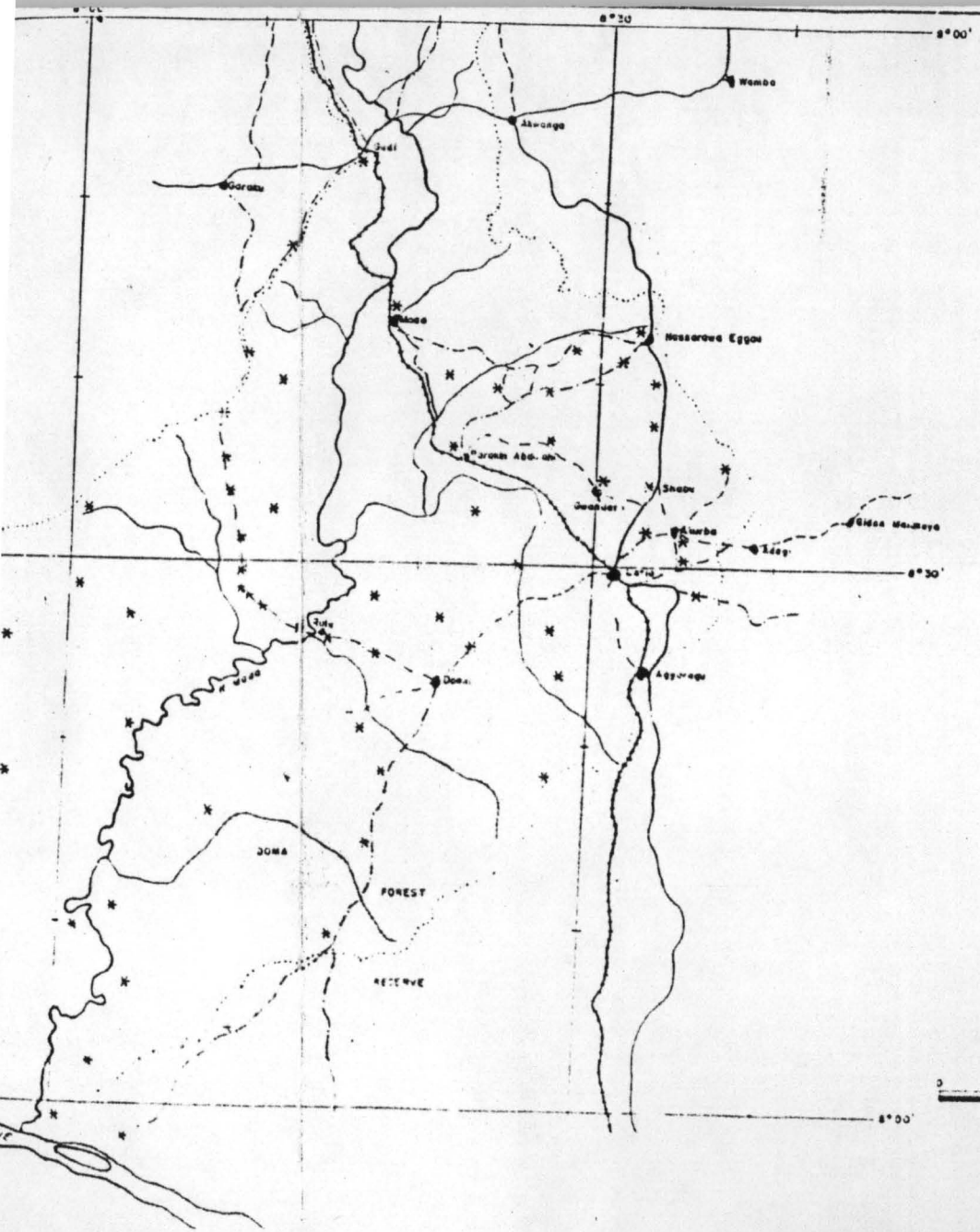


MADA RIVER FEASIBILITY STUDY AND DESIGN

FEDERAL MINISTRY OF AGRICULTURE AND NATURAL RESOURCES FEDERAL MILITARY GOVERNMENT OF NIGERIA	EXECUTING AGENCY MINISTRY OF NATURAL RESOURCES GOVERNMENT OF BENUE PLATEAU STATE

DISTRICT BOUNDARIES AND POPULATIONS

[illegible] EARTH SCIENCES LIMITED HARWOOD LIMITED	OTTAWA, CANADA MONTREAL, CANADA
[illegible] Mohamed Bin	CHECKED [illegible] APPROVED [illegible]
[illegible]	[illegible]



LEGEND

- Built up area
- Main Roads
- Secondary Roads
- Minor Roads
- Railways
- Major River
- Minor River
- Basin Boundary
- Location of farms where pursors questioned during the farm survey *

0 5 Kilometres

MACA RIVER FEASIBILITY STUDY AND DESIGN

FEDERAL MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
FEDERAL MILITARY GOVERNMENT OF NIGERIA

EXECUTING AGENCY
MINISTRY OF NATURAL RESOURCES
GOVERNMENT OF BENUE PLATEAU STATE

FARMER INTERVIEW LOCATIONS

[illegible] EARTH SCIENCES LIMITED
[illegible] LIMITED

OTTAWA, ONTARIO
MONTREAL, CANADA

CHAPTER FIVE

5.0 MITIGATION/RECOMMENDATION AND CONCLUSION

5.1 MITIGATION/RECOMMENDATION

The environmental impacts of a project are those resultant changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. The parameters may be any of the type of environmental receptors such as: air quality, water quality, noise, levels of local unemployment and crime.

- A new approach to the planning process of dams aiming at its compatibility with the EIA process is strongly recommended, the firsts step of which would be to ensure that river basin studies (river basin inventory) include the following aspects: consideration of the multiple uses of water and natural resources; identification, assessment and selection of dam scheme alternatives taking into account both the maximization of economic and energy efficiency and the minimization of environmental impacts.
- The EIA Decree 1992 prohibits the commencement of public or private sector projects or activities "without prior consideration, at an early stage, of their environmental effects". The provisions under these statutes and regulations must be duly complied with and consequences for contravention are clearly specified.
- Going back to basics i.e. building on well-established procedures, by providing, for example, more good practice guidance, explicit periods for the process, and the removal of duplication.

- Upgrading EIA process and activities in particular, better quality control, public involvement and addressing the issue of cumulative effects.
- In addition to the implementation following and monitoring procedures regularly performed as a part of the EIA process, independent environmental audits in private hydropower plants and dams are recommended to verify the level of compliance with social agreement and environmental legislative and efficiency of impact mitigation measures.
- Sharpening EA as a sustainability instrument i.e. incorporating relevant sustainability indicators, the consideration of capacities, dealing with risks and uncertainty and linking EIA with other forms of assessment and other policy instruments, such as environmental accounting.
- There is the need to resuscitate the lower Benue River Basin Development Authority, in line with the Tennesses Valley Authority to take full charge of all developmental aspects of the Doma Dam and irrigation scheme. This is in recognition of the fact that a river is essentially a unit from its source to the sea and ought to be developed to provide for all the uses of the waters and the benefits to be derived from their control.

5.2 CONCLUSION

The conclusion, which emerges from this analysis is that although dam and reservoir construction represents a major technological change in Nigeria's agricultural and rural systems, the aggregate impact of the strategy on rural development remains limited.

If the concept of the human environment has any validity at all. It must take cognizance of the full range of modifications over the whole course of a river basin occasioned by an event such as the construction of a dam. In the case of the setting of Doma dam, there can be no doubt that significant ecological changes have occurred both upstream and downstream of the dam.

All this emphasizes the vital importance of an EIA, which should not only analyse and predict the modifications resulting from the dam construction but also monitor, audit cost, present alternatives where necessary to ensure environmental protection through sustainable development.

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ACRONYMS

AEE – assessment of environmental effects

ANSD – Above Nigerian Survey Datum

CEC – Commission of the European Communities

CEPA – Commonwealth Environmental Protection Agency (Austrilia)

CEQ – Council on Environmental Quality (US)

EC – European Council

EA – Environmental Assessment

EES – Environmental Evaluation System

EIA – Environmental Impact Assessment

EIR – Environmental Impact Report

EIS – Environmental Impact Statement

EPA – Environmental Protection Act.

ES – Environmental Statement

GNP – Gross National Product

Ha – Hectares

LPA – Local Planning Authority

PPPs- Policies, Plans and Programmes

RA – Risk Assessment

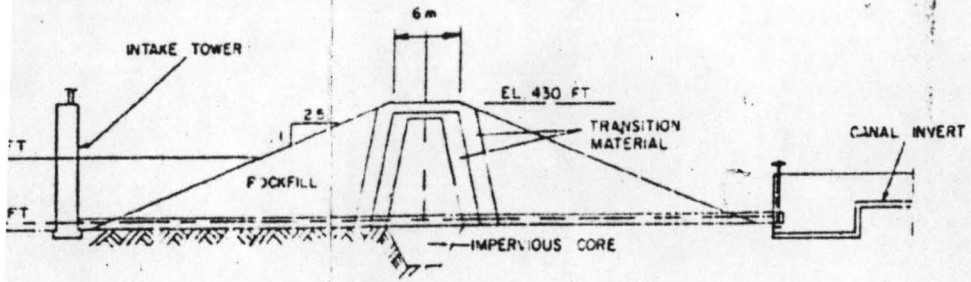
SEA – Strategic Environmental Assessment

SIA – Social Impact Assessment.

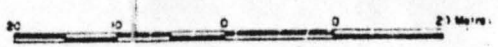
USDA – United State Department of Agriculture

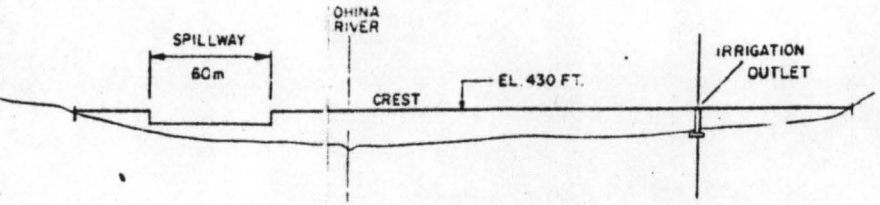
USA – United State of America

UNCED – United Nations Conference on Environment and Development

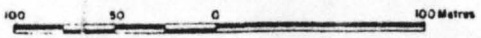


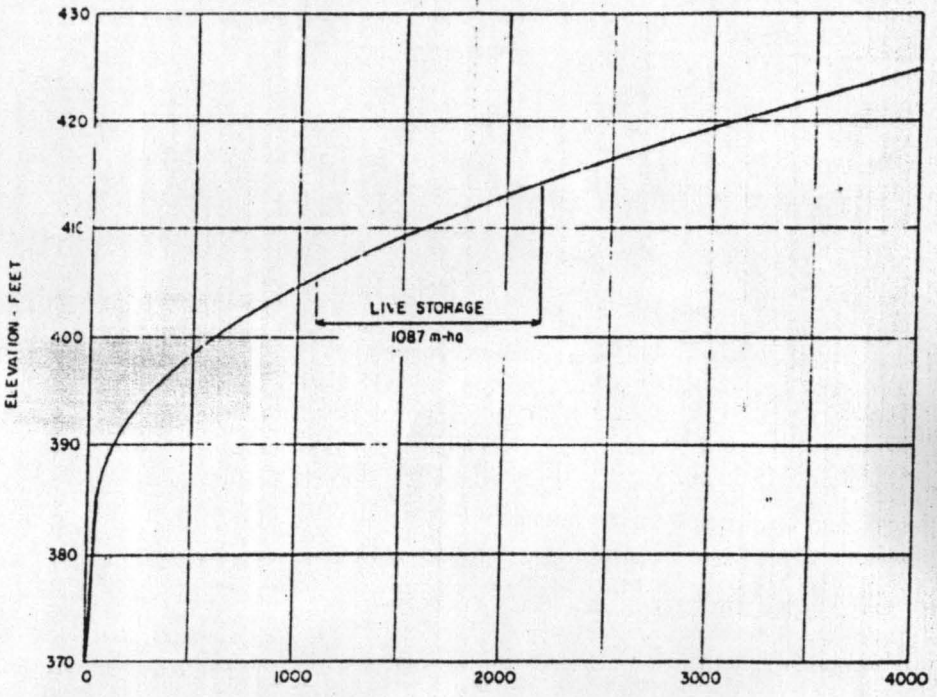
SECTION THROUGH DAM AT IRRIGATION OUTLET





UPSTREAM ELEVATION OF DAM





VOLUME - METRE - HECTARES

ELEVATION - STORAGE - RELATIONSHIP

MADA RIVER FEASIBILITY STUDY AND DESIGN

FEDERAL MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
FEDERAL MILITARY GOVERNMENT OF NIGERIA.

EXECUTING AGENCY:
MINISTRY OF NATURAL RESOURCES
GOVERNMENT OF BENUE PLATEAU STATE.

DOMA SCHEME - DETAILS OF DAM SECTION AND RESERVOIR STORAGE RELATIONSHIP

KENTING EARTH SCIENCES LIMITED — OTTAWA, CANADA.
SHAWINIGAN LIMITED — MONTREAL, CANADA.

DRAWN: | CHECKED: | APPROVED:

DATE: 3/1/74 | SCALE: AS INDICATED | DRAWING # FIG 27 | REVISED: