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NIGER RIVER BASIN PLANNING PROJECT -- REVISED SENRA IMPLEMENTATION PLAN AND INSTITUTIONAL ANALYSIS

Prepared for

U. S. Agency for International Development
Niamey
Niger

Prepared by:

James T. Thomson, ARD Senior Associate
Jeff Goodson, REDSO/Abidjan, AID
Franklin E. Hudson, U. S. Army Corps of Engineers, Vicksburg
Dan Jenkins, REDSO/Abidjan, AID
Jean-Marie Zinzindohoue, Niger Basin Authority

Associates in Rural Development, Inc.
72 Hungerford Terrace
Burlington, VT 05401
U. S. A.
Under AID IQC number PDC-0000-I-04-4104.

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ACRONYMS AND ABBREVIATIONS

COE	Corps of Engineers (U.S. Army, Vicksburg District)
COM	Council of Ministers (NBA political decision-making body)
DSRS	Data Storage and Retrieval System (developed in COE project to support the WSRM)
FAC	Fonds d'aide a la cooperation
FAO	Food and Agriculture Organization (of the United Nations)
HYDRO-NIGER	Multi-donor project which has developed a model to forecast short-term future river flows and water levels
HOS	Heads of State (NBA political decision-making body)
INBP	Integrated Niger Basin Plan
NBA	Niger Basin Authority
NRBP	Niger River Basin Planning project (number 625-0944)
NRB	Niger River Basin
PC	personal computer
SOGREAH	French parastatal engineering firm which has developed, for NBA, a river hydraulics model to study the short-term movement of flood waves on the river in short reaches
SENRA	Socio-Economic and Natural Resources Assessments (component of NBPP, Phase II)
TDY	temporary duty
UNDP	United Nations Development Programme
USAID	U.S. Agency for International Development
USAID/Niger	USAID Mission to Niger
USAID/W	USAID headquarters in Washington, D.C.
WMO	World Meteorological Organization
WSRM	Water and Sediment Routing Model (under development for NBA by COE component of NBPP, Phase II)

PREFACE

The revised implementation plan for Phase II (project number 625-0944) of the U.S. Agency for International Development's (USAID) Niger River Basin Planning (NRBP) project was developed by a four-person team:

- Jeff Goodson, USAID's REDSO/WCA environmental Officer,
- Franklin E. Hudson, an economist from the U.S. Army Corps of Engineers' (COE) Vicksburg District,
- Dan Jenkins, the REDSO/WCA water resources engineer; and
- James Thomson of Associates in Rural Development, Inc. (ARD), who served as acting team leader and institutional analyst.

It is expected that this revised implementation plan will be included in or used as the basis for a more comprehensive document for Phase II of the NRBP project, either a project identification document or project paper.

The team members began their work together in Niamey, Niger on September 10, 1985. Mr. Goodson and Mr. Jenkins spent two weeks in Niamey, Mr. Hudson three and Mr. Thomson five. In that relatively limited period of time, a great deal of information had to be collected, analyzed and written up. Also, because two members of the team originally proposed were unable to participate, the four-person team had to cover more areas than they had expected.

In addition, events concerning the NBA's future, in terms of donor coordination, data collection and personnel recruitment, progressed rapidly during September and October, 1985. The institutional analysis, in particular, benefited and suffered from those changing circumstances. During the course of a series of about 10 group meetings with high-level NBA staff and donor representatives, fruitful interaction took place that would not have occurred in individual interviews. However, the time spent on these meetings reduced the number of interviews that could be conducted. As a result, the team was unable to contact some individuals who could have contributed insights for this revised implementation plan.

Mr. Thomson wrote the main body of this final report as well as Appendices C and D, on political considerations for the Niger Basin Authority (NBA) and donor coordination options. Mr. Jenkins prepared Appendix A on the Water and Sediment Routing

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Model (WSRM). Mr. Goodson authored Appendix B on the Socio-Economic and Natural Resources Assessments (SENRA) component of the project. Mr. Hudson prepared the revised cost analysis for Phase II of the project, which is presented in Appendix E.

The team received assistance from a number of people, most prominently Mr. Dayton Maxwell, General Development Officer (GDO) for USAID/Niger; Mr. Michael Gould, Assistant GDO for USAID/Niger; Mr. Sam Christian and Mr. John Rice, who are both on long-term assignments to the NBA project from the COE Vicksburg District; Mr. Jean-Marie Zinzindohoue, Director of Water Resources for the NBA in Niamey; and Mr. Youssouph Bourahim, manager of the NBA/COE computer center. Staff members from USAID/Niger, the NBA Executive Secretariat, United Nations Development Programme (UNDP) in Niger, United Nations' Food and Agriculture Organization (FAO) project for the NBA and Niger's Ministry of Hydraulics and Environment were all uniformly informative and helpful in answering questions and providing guidance and logistical support.

Mr. Thomson would like to express his personal appreciation to Mr. Goodson, Mr. Hudson and Mr. Jenkins, who made the role of acting team leader more of a pleasure than a job. The responsibility for any failure to present their input accurately, as well as any shortcomings in the institutional analysis, lies with him.

EXECUTIVE SUMMARY

Introduction

This report addresses three aspects of Phase II (project number 625-0944) of USAID's Niger River Basin Planning (NRBP) project. All three concern issues raised in the final evaluation report for Phase I of the NRBP project (number 625-0915). They are:

- a revised implementation plan for the socioeconomic and natural resources assessments (SENRA), which restricts the scope of data gathering to secondary sources;

- an assessment of the U.S. Army Corps of Engineers' (COE) current plans, within their component of the NRBP project, for data collection, storage and retrieval, as well as their proposals to set up and calibrate a Water and Sediment Routing Model (WSRM) of the Niger River basin (NRB); and

- in light of findings related to the first two issues, an institutional analysis of Niger Basin Authority (NBA) structures that recommends ways to:

  --improve the relevance and applicability of the project's present goals and objectives within the NBA's statutory limitations and overall planning mandate; and

  --improve the functioning of the planning unit.

With regard to the three concerns just noted, this report first provides a revised plan for the SENRA component of the NRBP project. Second, it finds that the COE component is proceeding effectively. Finally, it argues that the NBA's institutional problems remain critical, but can be overcome if three conditions are met:

- for at least the next four years, the NBA Secretariat's technical staff must concentrate the bulk of its effort on processing information relevant to NRB development;

- management within the secretariat must improve to allow planning unit staff members to focus on planning activities and rapidly strengthen NBA relations with the member states; and

- donor coordination must increase, both among the donor and lender organizations involved with the NBA and between those agencies and the secretariat--options to accomplish this objective exist, but unless the performance of the NBA Secretariat improves, continued donor support may be conditional on a larger role for donors in NBA management.

SENRA

The revised implementation plan for the SENRA compoment presented in this report restructures that effort as a 39-month, $3.5-million study of secondary sources. The study will be executed by a nine-person technical assistance team, including a long-term natural resources- or macro-economist as project manager, a long-term social scientist, four medium-term biophysical scientists and three short-term technical assistants. The first six team members will be assisted throughout their tours of duty by six NBA member-state counterparts.

Outputs for Phase II of the NRBP project will include a published atlas and three accompanying volumes--commentary on the atlas, a report on data gaps and intervention effects assessments. These will provide a socioeconomic and natural resources data base that will be indispensable for developing macro-level NRB intervention proposals and highly useful in making initial feasibility assessments of specific project proposals. Data gathering and all of the volume drafts will be completed by project-month 21. The final reports will be produced and distributed by project-month 30. During the last 18 months of the project, the two long-term technical assistants will work with their counterparts almost exclusively on planning activities in the NBA Secretariat's planning unit.

A total of 10 person-years of on-the-job training in data collection and analysis, and planning methods and procedures will be provided to NBA counterparts. At the end of the project, the two long-term counterparts will be integrated into the secretariat's planning unit as full-time staff members. The four medium-term counterparts will return to their countries, where they will be expected to play important roles on NBA national committees.

COE Project Operations

The COE component of the NRBP project has made significant progress since the Phase I evaluation team assessed its performance in November, 1984. The team preparing the revised implementation plan for Phase II concluded that all three major activities

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undertaken by the COE component are moving forward. These activities include:

- ongoing development of the Data Storage and Retrieval System (DSRS) information base;
- organization of the sediment data survey at an appropriately modest level during the initial phase; and
- calibration and exploitation of the WSRM.

Additional positive developments in the COE portion of the NRBP project are as follows:

- hiring several of the hydraulics engineer graduates trained under Phase I of the project to supervise the sediment data survey;
- bringing on a full-time manager for the NBA/COE computer center; and
- continuing the program of on-the-job training in river basin planning and management in the United States.

After examining the DSRS, the present team concluded that the evaluation team's recommendations to incorporate a number of additional data categories were inappropriate. While data must be gathered in these areas, this can best be worked into the NRB planning process through multidisciplinary analysis of the consequences of intervention proposals.

Institutional Analysis

The NBA Executive Secretariat has faced four significant problems since 1980:

- lack of an effective planning unit;
- inadequate communication between the secretariat and member countries;
- faltering member-state contributions, despite the relatively modest level of donations required; and
- irregularities in its financial management.

These problems are interrelated. The NBA's inability to provide member states and donors with needed services, especially in terms of information relevant to the development of intervention proposals which can command generalized support throughout the NRB,

has undoubtedly raised doubts in critical quarters about the secretariat's usefulness. Furthermore, the agency's inability to assure member states and donors that the funds they contributed were being used honestly and efficiently certainly had a similar effect. As a result, the contributions of a number of member states have fallen into arrears, which has further impaired the NBA's ability to fulfill its role as an information processing organization. Donors have also expressed serious reservations about the secretariat's capability to provide support to donor-financed projects.

Planning Unit Capabilities

For the Phase I evaluation team, the objective of developing the planning unit into an effective, operational body appeared to be both critical and highly problematic. The major issues raised in their final evaluation report were whether planning unit personnel could devote themselves full-time to planning activities and whether the staff had the technical capability to do effective planning.

In 1985, an NBA Council of Ministers (COM) directive placed the planning unit under the supervision of the executive secretary, with his deputy as functional head of the unit and a staff composed of the heads of the Water Resources, Navigation and Agriculture Directorates. For the planning unit to function effectively, the deputy and technical directors must be freed from administrative duties. Administrative matters should become the responsibility of the Secretariat Directorate of Administration. The executive secretary should supervise administrative affairs in the secretariat, in addition to taking primary responsbility for reinforcing relations between the NBA and member states.

To strengthen the core staff of the planning unit, two FAO technical assistants, specializing in rural economy and agronomy/ agricultural engineering, have been posted to the NBA and a senior macroeconomic planner from UNDP soon will be. If the SENRA component of Phase II of the NRBP project is financed, two long-term technical assistants (a natural resources- or macro-economist and a social scientist) and two NBA counterparts with backgrounds in the same disciplines will be added to the planning unit's staff. Finally, the COE component will provide up to five individuals, including two technical assistants in river basin planning and hydraulics engineering who are already working at the NBA Secretariat. All five COE team members will work closely with planning unit personnel. The unit will then have staff members with the skills and capabilities needed to fulfill its primary role.

Office space for most of the individuals (both professionals and support staff) associated with the NBA technical center and

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planning unit has already been arranged. They will operate out of the existing technical center, a new, much larger building leased by the NBA/COE project or space to be leased by the SENRA project.

Relations Between the Secretariat and Member States

The relationship between the NBA Executive Secretariat and member states remains a critical problem. This problem can be resolved if the executive secretary takes several steps immediately. NBA national committees must be organized in all the member states. The secretariat's documentation center must begin to publish the newsletter authorized by the COM in 1981, so that individuals in member countries who are potentially interested in NBA activities are regularly informed of important developments in the NRB. Finally, the documentation center must once again produce materials that are relevant to basin planning activities and make them available to the member states.

Donor Coordination

Improved coordination among donor and lending organizations involved with the NBA, as well as between them and the secretariat, is imperative. Several options to accomplish this aim exist, ranging from:

- a minimal amount of additional donor access to NBA decision-making bodies and a slight increase in donor support for the secretariat;
- a mechanism for formal donor access to the NBA and a full share in management of the secretariat;
- statutory donor participation in open NBA meetings and full responsibility for secretariat management.

The donors that are currently or potentially involved with the NBA-- UNDP, FAO, USAID, FED, Fonds d'aide a la cooperation, CIDA and the World Bank--will soon consider whether to make a request, via the NBA Executive Secretary, for a decision on this issue from COM.

Financial Management

The issue of financial management of the NBA can be dealt with adequately by the introduction of a computerized accounting system in combination with regular distribution of copies of the organization's financial records. Such a system is now being installed at the COE project and will likely be extended to the secretariat. The increased scrutiny of the agency's financial affairs that this system will permit should reduce both the

likelihood and seriousness of financial mismanagement in the future.

I. INTRODUCTION

A. Background

The sequence of events preceding this report merits a brief review. The revised implementation plan for the U.S. Agency for International Development's (USAID) Niger Basin River Planning (NRBP) project, Phase II (project number 625-0944), was initiated in response to recommendations contained in the final evaluation report for Phase I of the NRBP project (number 625-0915), completed in December 1984.

B. Purpose of the Mission

The mission to revise Phase II of the NRBP project had three broad goals:

- revise the implementation plans for the socioeconomic and natural resources surveys to bring those activities into accord with recommendations--that is, restrict the scope of data gathering to existing secondary sources in both areas, while postponing detailed field studies for funding and implementation under specific project interventions;

- examine and comment on the U.S. Army Corps of Engineers' (COE) plans in their subcomponent of the NRBP project for data collection, storage and retrieval as well as their proposals to set up and calibrate a water and sediment routing model of the Niger River basin (NRB); and

- in light of the findings related to the first two objectives, undertake an institutional analysis of Niger Basin Authority (NBA) structures and make recommendations in several areas, including ways to:

  --improve the relevance and applicability of the project's present goals and objectives within the context of present and past directives of NBA statutory meetings and the overall planning mandate of the NBA Executive Secretariat, and

  --upgrade the functioning of the planning unit, particularly with regard to divisions within each secretariat office between operational and planning activities, financial management and controls for both project and NBA operating budgets, NBA staffing, office accommodations, staff training needs and donor coordination; and evaluate the NBA's

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experience and capabilities in the area of major water resources planning and suggest recommendations with a view to improving the secretariat's ability to procure and manage the appropriate technical assistance required for elaboration of a basin development plan.

During the mission, it became apparent that a somewhat broader political analysis of the NBA mandate and action opportunities could help clarify certain aspects that have impaired the agency's functioning up to now. This political discussion appears in Appendix C.

C. Major Issues and Assumptions

The overall goal and purpose of the NRBP project's second phase remain unchanged. Its goal is "to assist the member states of the NBA to effectively use the water resources of the Niger River for the socioeconomic development of the population of the Niger Basin." The project's purpose is "to establish an institutional capacity within the NBA to do coherent river basin development planning, identify rational development projects and facilitate member states' agreement on river basin activities."

The Socio-Economic and Natural Resources Assessments (SENRA) had to be restricted in scope, and their outputs had to be more thoroughly defined. The evaluation team for the first phase of the NRBP project concluded that no primary research should be undertaken by project personnel. Such investigations only become fully productive and justified when a specific project intervention is envisaged and a preliminary investigation indicates the need for more detailed work. Thus project efforts should be restricted to building up overviews and inventories of existing literature in the socioeconomic and natural resources areas. In order to clarify the role USAID intended to play in a multi-donor, multi-member-state effort, and to develop explicit task descriptions for the technical work to be contracted, the statement of SENRA outputs had to be refined. This has now been done (see Appendix B).

The planning function must be reinforced, so that NBA can at long last begin to produce information of value in guiding development interventions in the river basin. Several possible solutions to this problem will be discussed below.

Donor coordination has become indispensable, as a condition both for continued donor participation in secretariat-level planning operations, and as a step in laying the groundwork for balanced river basin development. Issues of particular significance in this regard are:

- the timing of coordination efforts;

- donor agreement on NBA purposes and the mode of donor-NBA collaboration and inter-donor cooperation within the secretariat information processing or planning unit; and

- the position that USAID should adopt vis-a-vis NBA in the event donor coordination does not become a reality.

An institutional analysis of NBA, in its broader political context as well as at the level of secretariat activities, will help clarify a number of issues which have impaired the functioning of NBA since its creation, and indeed brought about the downfall of its predecessor, the Niger River Commission.

D. Report Contents

This report is divided into five sections, of which the first is this introduction. Section II provides a brief discussion of the project goal and purpose; important elements here are the interlinked definitions of training and institution-building. Section III outlines the essential elements of the revised socioeconomic and natural resources inventories. Section IV summarizes comments on the COE water and sediment routing model. Finally, Section V deals with all aspects of the institutional analysis at the secretariat level. The appendices include:

A--detailed description of the water and sediment routing model;

B--detailed discussion of the socioeconomic and natural resource inventory components, including terms of reference and qualifications for nine short- and long-term technical assistance positions, the implementation plan and budget;

C--detailed institutional analysis of NBA in the broader political context;

D--conceptual discussion of donor coordination possibilities;

E--cost analysis for the revised implementation plan;

F--list of individuals consulted; and

G--map of the Niger River Basin.

II. GOAL AND PURPOSE

A. Introduction

This section addresses the linked issues of institution-building and training, in the context of the NRBP project's goal and purpose. The project goal is to use basin water resources to promote socioeconomic development for populations within the watershed. The project purpose is, in conjunction with other donors, to develop within NBA the institutional capacity to do coherent river basin development planning and to identify rational development projects.

The process of river basin planning is discussed in Section II, Project Description, of the original project paper. The document correctly stresses the complexity of basin development planning in the West Africa multi-state context. While the term "plan" is used in the singular form at various points, the analysis in fact proposes a highly realistic, staged approach to "plan" development. Six separate stages are envisaged:

1--studies to determine the technical, environmental, economic and social soundness of alternative development strategies;

2--plan formulation, a period in which data is "analyzed and synthesized into integrated river basin plans (sic)";

3--submission to member states and donors: "Plans (sic) are presented, explained and justified during this phase to the actors who will decide upon their implementation";

4--formulation of political and investment decisions, the stage during which member states and donors respectively decide "what proportions of the plan are politically acceptable," and "which are attractive development investments";

5--funding, perceived as likely when, and only when, member states have come to a political consensus and donors have become convinced of the investment soundness of a proposed package of interventions; and

6--implementation.

To clarify subsequent discussion in this revised implementation plan document, "intervention options" (or, as a practical synonym, "river basin development scenarios") will

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replace the more ambiguous term "plans." This change in terminology clarifies the role of both of the USAID project components, COE and SENRA. USAID project teams, working with other donor technical assistants, will help build NBA indicative planning capability by formulating, in close concert with NBA staff personnel, a series of intervention options for NRB development.

To pretend to do more than this would contradict the project's underlying logic as originally proposed. The NBA secretariat's planning unit cannot by itself create an "Integrated Niger River Basin Development Plan (INBP)," as the project summary description somewhat loosely suggests. On the other hand, it very well can help to clarify thinking about basin development, by collecting data, analyzing it, developing a small number of intervention options and then presenting them for consideration by NBA political councils (stages 1 through 3, as outlined above).

The NBA Council of Ministers (COM) and/or Heads of State (HOS) will then either select one of the proposed intervention options, modify it to meet their criteria, or ask the planning unit to revise one or more of the options and resubmit (stage 4, above, with possible reiteration through several rounds of stages 2 through 4, if modification by the planning unit is requested). Only when the NBA political councils agree on an option will it be possible to talk about an INBP with credibility sufficient to attract serious donor interest. This document can then be submitted to interested donors for review and project funding discussions (stage 5, above).

As interventions outlined in the INBP move from the planning phase through implementation (stage 6), and as the NBA planning unit continues to acquire and integrate information into its data base and three models (see Appendix A), presumably new rounds of intervention options will be presented to the COM and HOS for consideration and eventual negotiated approval. As each round of options moves through the decision process, the INBP will be modified to reflect project elements of the new NBA-approved intervention option. In this sense, the INBP will constitute a periodically updated exercise in indicative planning.

As the NBA planning unit personnel develop their monitoring, information processing and analytic capabilities, they will be able to provide almost constantly updated assessments of developments in the fluvial system. These will reflect not only the effects of in-river interventions, but also those of other critical variables, such as surface water runoff, which are affected by off-river developments and land use.

With this type of monitoring capability at their disposal, NBA decision-makers will be well positioned to consider real

consequences of past decisions and probable results of newly proposed river basin development scenarios. They will also be able to negotiate with each other, starting from a common basis of shared information, in attempting to craft political decisions about intervention options which do in fact promote the socioeconomic welfare of basin populations. (For further consideration of this and related issues, see Appendix C.)

B. Institution-Building

Institution-building is a broad concept which can be interpreted in several ways. The narrow definition stresses the creation and strengthening of organizational capacity. Typical action recommendations which flow from this definition include a) attracting a competent staff; b) placing them in an organizational context which provides appropriate material and human resources as well as management skills to accomplish the organization's mission; and c) developing a set of mutually supportive relationships between the organization and the clientele it serves in its environment.

This organization-centered perspective on institution-building is a useful tool in many situations. It focuses attention on a series of leverage points where those who wish to develop an institution can usefully intervene to modify intra-organizational behavior. It often highlights as well points at which interactions between the organization and its environment can be altered to improve overall performance.

A broader definition of institution-building adopts a constitutional perspective. Analyses of this sort focus on the rules which influence behavior in the broader political system. They examine the ways rules create incentives for people to deal with each other in productive or unproductive ways. A subset of that behavior--what happens in a particular organization--may be selected for particular attention against the backdrop of the broad political context in which the organization exists.

Both of these approaches have their advantages and disadvantages. This document draws, to an extent, on both in an effort to produce some implementable recommendations designed to strengthen NBA's organizational performance. Institutional analysis contained in the body of this document focuses on ways to strengthen the secretariat. Appendix C presents a broader-gauged analysis of the general political context in which NBA operates, with an eye to creating incentives that will promote mutually productive relationships among member states via the intermediary of the NBA Executive Secretariat.

C. Training

Training, though the concept encompasses all deliberate efforts to upgrade people's skills, has often in practice been understood to mean study at academic institutions. Nonformal education has gained a measure of acceptance over the last two decades, as a relevant form of training. A third approach, on-the-job training, has always existed to some extent in donor-financed projects. It is inherent in the counterpart and technical advisor roles.

Each of these forms of training may become relevant at some point in the process of building a given institution. The NBA secretariat employs a fair number of member-state individuals with strong backgrounds of academic training and professional work experience. What they lack to some extent is knowledge of certain processes critical to the development of NBA's information gathering, analysis and dissemination functions. Examples here include sediment and water sampling procedures; model development and calibration; information storage and retrieval; and iterative negotiations to produce coherent propositions for the multipurpose development of NRB procedures.

Training in these activities for this project is best delivered and acquired in the day-to-day working situation of the NBA secretariat, complemented by practical training in the form of short courses and perhpas workshops. As such, once the methods for solving problems are understood, they can be directly applied within the secretariat. The purposes of training in this context are to enable NBA secretariat staff appointed by member states to function effectively at the interstate level, and to manage the secretariat in the long run--50 years at a minimum--as a going concern dedicated to processing information about NRB realities, possibilities, and the consequences of both.

III. SENRA REVISED IMPLEMENTATION PLAN

This section outlines the information to be gathered by the multidisciplinary assessment team, presents a work plan for data collection, presentation and analysis, and indicates the outputs to be provided under the contract.

In brief, the SENRA team will collect, in a variety of fields, secondary source data not available at the NBA secretariat as of contract start-up. The team will work with counterparts appointed by NBA member states. Results of data collection efforts will be presented in three forms:

- an atlas containing seven map sets, ranging in scale from 1:250,000 to 1:1,000,000;
- a companion volume of commentaries on the maps; and
- a companion volume outlining remaining data needs.

A fourth output, again produced in collaboration with NBA staff, will be:

- a companion volume of effects assessments, analyzing the probable consequences either of generic types of interventions, or of six specific proposed intervention options.

Training will be an integral part of each stage of assessment work.

The assessment work will be contracted by USAID/Niger to a private-sector firm, either through an open-competition, request-for-proposals procedure or on a solicited-bid basis to an architecture and engineering firm. The contractor will organize a three-year effort. The SENRA team will consist of two long-term (39 months), four medium-term (18 months) and three short-term (up to four months) personnel. The long- and medium-term technical assistants will work with NBA-assigned counterparts.

Once physical outputs have been produced, the two long-term technical assistants will remain with their counterparts at the NBA secretariat to participate in all stages of intervention option preparation and, as necessary, revision. At termination of the SENRA activities, the two NBA counterparts should become permanent members of the NBA planning unit staff, with responsibility for leadership roles in information processing. Exact job descriptions for these positions in the post-project phase should not be defined at this point.

A. Justification for Approach

The current NRBP project proposes to help develop NBA's capability to do indicative planning. Indicative planning is by its very nature a macro-level exercise. If properly done, the process highlights the major interrelationships among interventions at various points on the river, whether they be of one or multiple types. It also creates a broad base for calculating the trade-offs between different hypothetical packages of interventions.

SENRA will provide some elements of general information necessary to project, in a preliminary way, the probable consequences of any given intervention or set of interventions. At this level of analysis, generic or general information is the only kind that is useful. Any more detailed information will simply complicate the preliminary analysis to the point of impossibility.

More detailed studies of specific production systems will be procured when NBA member countries move to the stage of selecting discrete intervention options. If additional research is indicated at that stage, in light of the impacts assessment materials, individual production systems can then be examined in the local context. Development opportunities and potential adverse impacts can be identified at that point. Enabling and mitigation measures, as appropriate, can be proposed, tested and tailored to local conditions and applied.

B. Assessment Tasks

The socioeconomic and natural resources assessments will provide generic information inputs (e.g., crops, land-use patterns, etc.) for use by planning unit staff as they develop alternative intervention options. The NBA secretariat has been mandated to engage in basin-wide planning. Many non-riverine production systems (e.g., rainfed agricultural systems), as well as those which are only partially riverine (e.g., certain transhumant pastoral systems which depend on in-channel water and associated pastures for herd maintenance during part of the annual cycle), can exert significant influence on NRB development possibilities. By the same token, many of these production systems could benefit from, or be adversely affected by, certain river works and stream flow modification devices. For this reason, the two assessments will cover the entire basin south of the 17 degrees 30 minutes north latitude (which runs north of the bend in the Niger at Bourem, and north of Agadez).

Within the target zone, data will be collected from secondary, non-restricted sources in the fields of economics, the

social sciences, soils, forestry, agronomy, irrigated agriculture, fisheries, terrestrial ecology, geohydrology, public health and cultural resources. A detailed description of data types to be obtained appears in Appendix B.

Collected data will be synthesized in the form of seven map sets, consolidated in atlas form. The map sets, listed by subject and scale, will be as follows:

1:1,000,000 -- Multispectral Scanner Base

- administrative divisions; diseases
- groundwater resources; important mineral and geological deposits

1:500,000 -- Multispectral Scanner Base

- soils; vegetation
- parks, reserves, important ecological areas; cultural resources
- prime farmland; prime pastureland; irrigation operations and irrigation potential
- agricultural, pastoral, fishing and other important economic production/subsistance systems; cyclical and non-cyclical transhumance patterns; demography

1:250,000 -- Line Base River and Tributary Maps

- fisheries resources

In addition to the atlas, three accompanying volumes will be produced. The first will be a set of commentaries on atlas maps. These will highlight significant aspects of each map set and generally suggest the relevance of each category of data for NRB development.

The second companion volume will note data gaps and weaknesses in the existing data base. This volume will alert planners responsible for projecting consequences of river basin development scenarios to the kinds of research efforts they should encourage NBA member-state officials to undertake, in order to gradually build up NBA's data base. The report on data gaps will also warn intervention design teams responsible for undertaking detailed project design efforts of situations where additional primary data must be collected.

The final specific output to be produced by the SENRA team in collaboration with NBA counterparts will be the third

companion volume, this one on effect assessments. For purposes of the effects analysis, the contractor will address both positive and adverse impacts and, to the extent practicable, the relative economic trade-offs involved in various intervention scenarios in specified geographic zones.

The SENRA team will assess effects from an intervention perspective (e.g., impoundments, water withdrawal, irrigation infrastructure, navigation works impacts), organized by major physiogeographical regions in the NRB (e.g., upper watershed to the inland delta; inland delta; inland delta to the Kainji dam in Nigeria; from Kainji dam to the Niger River mouth). The number of interventions to be assessed should be carefully considered, given the time and resources available to the project.

Brainstorming, consultation, alternative development scenario production and evaluation, and draft effects analysis preparation will be conducted by long- and medium-term technical assistants in Niamey, Niger, during a period not to exceed 60 days. During this period, SENRA team members, their NBA counterparts, COE, and other NBA and donor personnel will consult and collaborate closely to ensure that the effects analysis product is relevant in light of projected secretariat activities.

The effects analysis volume will be finalized in the United States, through the joint efforts of the SENRA team and NBA counterparts. The short-term technical assistance team members will prepare their draft and final effects analysis contributions in the United States.

C. Personnel

The SENRA field team will consist of a total of nine individuals:

- two long-term (39 months) technical assistants:

  --applied natural resources- or macro-economist,
  --applied social scientist;

- four medium-term (18 months) technical assistants:

  --applied soils/vegetation specialist,
  --applied irrigated agriculture specialist,
  --applied aquatic ecologist/freshwater and estuarine fisheries specialist,
  --applied terrestrial ecologist; and

- three short-term (four months) technical assistants:

  --geohydrologist,
  --public health specialist, and
  --cultural resources specialist.

D. Programming

1. Timing

The SENRA project contract must be signed by early September, 1986, at the latest, for the contractor to mobilize the field team by early November, 1986. Because SENRA outputs will become inputs--along with FAO project findings on NRB agriculture, irrigated agriculture and rural economics, and COE modeling scenarios--to the process of preparing intervention options to be presented to the NBA committee of experts and COE at the end of the USAID project, it is imperative that no slippage occur on this point. If at all possible, the contract should be finalized several months earlier (for example, during July, 1986).

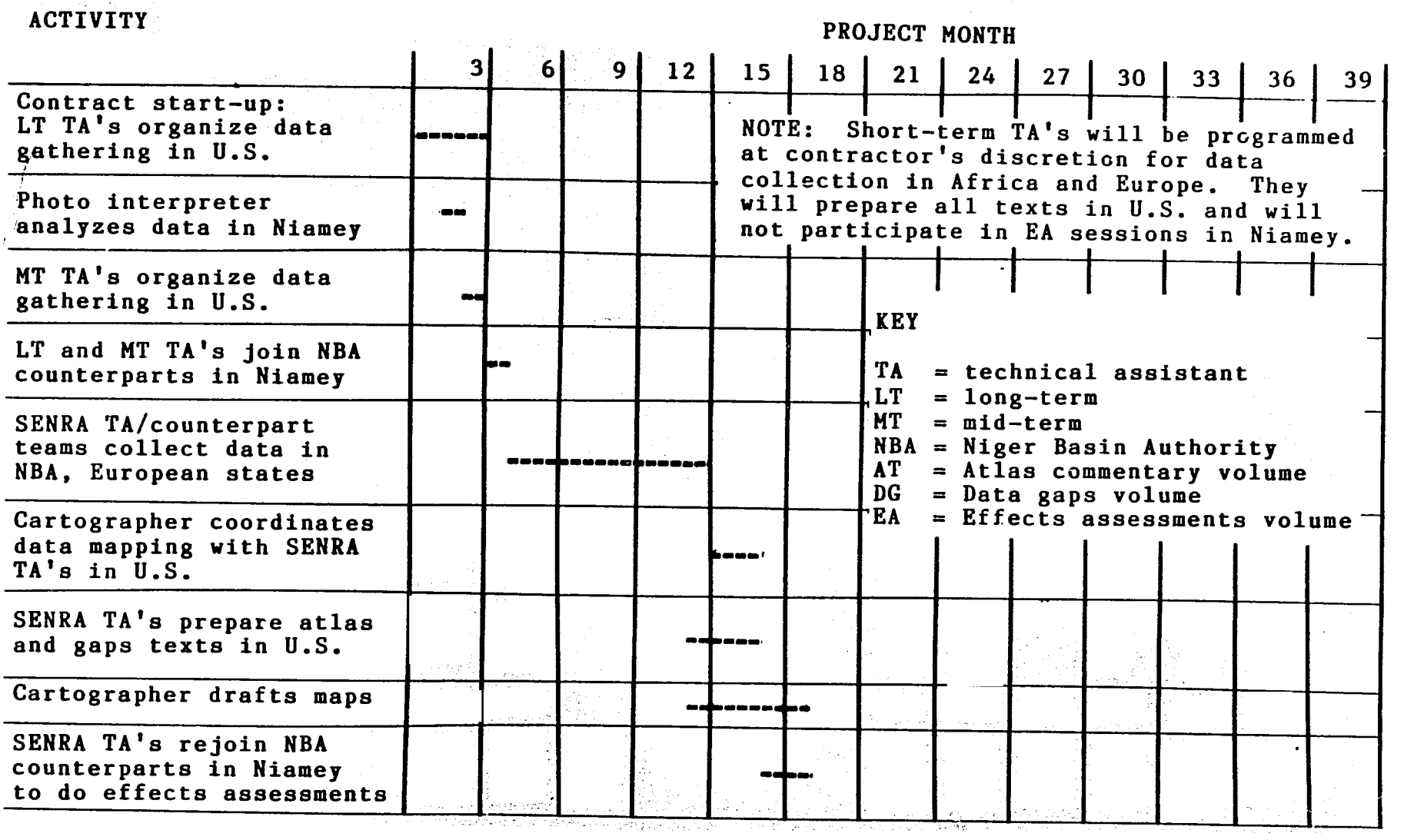
2. Data Collection

Figure 1 (on the following two pages) provides a graphic representation of the programming of SENRA data collection and processing activities. The two long-term (39-month) technical assistants will organize the data collection effort in the United States during the first three project-months. During the second project-month, a photo interpreter will travel to Niamey to examine available data. The four medium-term (18-month) technical assistants will begin their data collection activities in the United States during the third project-month. In the fourth project-month, the long- and medium-term technical assistance team will go to Niamey, where they will be joined by their NBA counterparts.

Field trips to collect secondary data will begin during the fifth project-month and continue in Africa and Europe through project-month 12. Short-term technical assistants will travel alone or with members of the technical assistance and NBA counterpart team in Africa and Europe at the discretion of the contractor. A total of 300 person-days of short-term technical assistance has been allocated for this phase of data collection and report preparation.

Figure 1.

SENRA DATA COLLECTION AND PROCESSING MONTHLY PROGRAMMING



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SENRA MONTHLY PROGRAMMING (con't.)

PROJECT MONTH

ACTIVITY	3	6	9	12	15	18	21	24	27	30	33	36	39
SENRA TA's do draft effects assessments in U.S., assisted during final month by NBA counterparts													
Cartography finalized													
Draft Atlas, AT, DG, EA volumes complete													
LT TA's continue working with NBA counterparts in Secretariat planning unit													
Draft Atlas, AT, DG, EA volumes translated, distributed													
Draft Atlas, AT, DG, EA volumes reviewed													
Draft Atlas, AT, DG, EA volumes finalized													
Final Atlas, AT, DG, EA volumes translated													
Final Atlas, AT, DG, EA volumes produced													
Final Atlas, AT, DG, EA volumes distributed													

3. Production of Draft Reports

During project-months 13 and 14, a senior cartographer will coordinate data mapping for the atlas with the long-, medium- and short-term technical assistants in the United States. In project-months 13 through 16, the senior and other assistant cartographers and draftsmen will prepare maps for the atlas. At the same time (project-months 13 to 15), the technical assistance team will draft a volume of commentary on the atlas and a report on gaps in the existing data.

The technical assistance team and their counterparts will return to Niamey to spend project-months 16 and 17 developing the analyses of effects assessments for specific proposed interventions and scenarios. The drafts for the effects assessments will be prepared in the United States during project-months 18 through 20. NBA counterparts will participate in the final phase of report preparation in the United States for a period of approximately one month. Draft versions of the atlas and its commentary, the report on data gaps and effects assessments will be completed by the end of project-month 20.

4. Preparation of Final Reports

The draft versions of these four documents will be translated into French. Then, 200 copies of each report, 150 in French and 50 in English, will be distributed as they become available during project-months 18 through 21 (some of this work may carry over into project-month 22). The drafts of these documents will be reviewed by NBA personnel and others during project-months 21 to 25. Modifications and editorial corrections will be made during project-months 26 and 27. Final translations will be undertaken during project-months 27 through 29, and final production of the reports will occur from project-month 29 through 32. One thousand copies (750 in French and 250 in English) of the final reports will be distributed through the NBA and donor communities in project-months 32 to 34.

5. Long-Term Technical Assistance Team's Role Through the End of the SENRA Project

Beginning in project-month 21, the SENRA team will be reduced to the two long-term technical assistants. During project-months 21 through 39, they will continue to work with their NBA counterparts at the NBA Secretariat's planning unit in Niamey. They will assist planning unit personnel as well as the technical assistants and NBA counterparts associated with the planning unit to refine the set of intervention options to be submitted to the NBA committee of experts and COE in mid-1989.

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IV. COE WATER AND SEDIMENT ROUTING MODEL

A. Introduction

The USAID REDSO/WCA water resources engineer assigned to the revised implementation plan team for the second phase of the NBA project spent the second two weeks of September, 1985 in Niamey. During that time, he reviewed comments in the evaluation of the COE effort during the first phase (through December, 1984) and assessed the sediment data survey arrangements, Water and Sediment Routing Model (WSRM), and Data Storage and Retrieval System (DSRS). He discussed all three of these aspects of the project with the resident COE technical assistance team and then prepared a report which appears in Appendix A.

The engineer found some of the Phase I evaluation recommendations appropriate, but felt that others exceeded the scope of the project's goals and objectives or were impractical, given limited funds and/or manpower. His conclusions focused on three main points:

- the sediment data survey,
- appropriate types of information for inclusion in the DSRS, and
- the WSRM's use orientation.

B. Sediment Data Survey

The water resources engineer concluded the current COE technical assistance team was correct in opting to start that activity on a modest basis. This action was dictated by their concern that the sediment data survey not overtax the NBA/COE project's limited capability to supervise the survey very closely, thereby ensuring the quality of the data collected. Initially, data will be gathered at only 12 measuring stations in the basin. All are located at active gauging stations with many years of data on daily water levels and rating curves that are periodically updated.

Since the data collection effort is limited in scope, it will be possible to provide the administrative and logistic support needed to assure that measurements are taken in a regular, reliable fashion. Working under the supervision of a sediment data survey manager based at the NBA in Niamey, two regional survey managers, located in Bamako, Mali and Lokoja, Nigeria, will administer survey activities in their sections of the NRB. The overall project manager and at least one regional manager have been recruited from the group of four NBA

technicians who received long-term training in the United States during Phase I of AID's COE project.

The REDSO/WCA engineer concurred with COE technical assistants that 12 sampling points provide an adequate, though not rich, basis to begin calibrating the WSRM. As the NBA's capability increases in conjunction with the growth of member states' facilities and data collection potential, the number of data points will be gradually increased. This will permit fine-tuning of the WSRM as more information is collected on naturally critical stretches of the river or those which become important because of project interventions.

C. Data Storage and Retrieval System

The water resources engineer concluded that some of the suggestions contained in recommendation 6 of the Phase I evaluation report (page 42), concerning additional data categories to be integrated into the DSRS, were inappropriate because they tended to be either site-specific, and thus applicable only at that level, or country-specific and hence too large in scope. The five types of data which are considered indispensable for proper functioning of the WSRM and will draw on the DSRS are as follows:

- river channel geometry--cross sections, river distances and elevation;
- rating curves--the relationship between river discharge and water surface elevation at key locations;
- sediment data--particle size distribution and discharge/sediment transport relations at critical locations;
- hydrographs--historical records of river discharge and elevation at key locations; and
- precipitation--historical records of rainfall in the river basin.

A sixth category of information, water quality, should also be integrated into the DSRS for use in the model.

The data in all these categories must be regularly updated if the DSRS is to remain a useful tool. The sediment data survey managers will organize data collection as part of their duties. This effort will include receiving information on daily water levels from 172 river gauging stations, discharge data from 101 stations where rating curves exist and rainfall data from 569

stations. Once collected and verified, these data must be loaded into the DSRS and analyzed.

Other data types mentioned in Recommendation 6 of the Phase I evaluation will be required when the planning unit starts trying to identify feasible sets of NRB interventions. Both FAO and AID's SENRA project are or will be collecting much of that data. The team members agreed that those data categories would be difficult to include in the DSRS as it is presently set up. Instead, the various data sets and categories will have to be integrated through the efforts of planning unit staff members and technical assistance personnel from NBA member states and donors, who are associated either directly or indirectly with the planning unit (see Section V.C).

As the evaluation team for Phase I of the NRBP project rightly stressed, the second phase of the project must build an institutional capability within the NBA's technical center to manage the data base and WSRM. If that does not occur, the planning unit will lose half of its core of analytic capability when the project terminates and the COE technical assistance team leaves.

To deal with this issue, in early October, 1985, the COE project initiated procedures to make the position of computer center manager a permanent one at the secretariat's technical center. In the interim period since the evaluation, an individual from an NBA member state has been hired on a full-time basis by the COE project to work with the DSRS and WSRM as well as generally manage programming and operations at the computer center. This person appears to be highly competent, motivated and a solid candidate for the permanent position. In any case, the post must be made permanent and staffed with a highly qualified individual, who is prepared to make a long-term commitment to the job.

D. WSRM Use Orientation

Recommendation 7 of the Phase I evaluation suggests that WSRM "modeling and analysis of developmental alternatives should focus primarily on agriculture." This recommendation reflects the evaluation team's finding that too much emphasis was placed by the Phase I COE technical assistance team on modeling navigation alternatives and perception that the COE team would persist with this orientation during the second phase of the project.

However, as the water resources engineer on the revised implementation plan team noted:

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"The Participating Agency Service Agreement (PASA) with the COE for Phase II states that after the model is made operational, the NBA will select up to three proposed projects to be analyzed using the model. In addition to the projects selected by the NBA, the model will be used to study the interventions needed to provide navigation with minimum depths of one, two and three meters. These analytic outputs were established to provide specific minimum requirements during Phase II of the project.

"However, the intent of COE and USAID is to exploit the model as much as possible to facilitate sound, basin-wide planning. This may well involve additional runs to test variations of several more intervention scenarios in various areas of water use.

"At the end of the PASA period, the NBA will be left with the model in operating condition and a staff of individuals proficient in its use."

The COE technical assistance team currently in Niamey indicated that the WSRM, operating on a pair of IBM personal computers (PCs) linked to the DSRS stored on a hard disk, will be able to work through the consequences of a series of interventions, entered into the model as a development package, in a matter of hours. This modeling capability raises the possibility that the NBA Secretariat planning unit will be able to explore a broad range of different options, which can be winnowed from a variety of perspectives (e.g., river engineering, socioeconomic and natural resources, rain-fed and irrigated agriculture, etc.). Options that are obviously unworkable for any reason will be rejected, with a brief commentary indicating the basis for the finding of infeasibility.

A final, smaller set of options that either appear feasible in technical, socioeconomic and political terms or can be made practicable by careful tailoring can then be subjected to much more refined analyses through a series of modeling iterations. Throughout this process, input will be required from the biophysical and social science disciplines as well as decision-makers and others (probably involved in Member State National Committees) who are capable of making informed judgments about the political feasibility of particular scenarios.

As the REDSO/WCA water resources engineer indicates in his report (see Appendix A) and subsequent conversations with the COE team confirmed, the team clearly sees navigation as only one of a number of purposes that the waters of the Niger River can serve. It would be just as erroneous to assume that irrigated

agriculture interventions should dominate all other uses as to presume that projects to improve navigation potential should enjoy first priority. The error of the latter assumption is obvious. The first was amply demonstrated in April, 1985 when the Niger was dammed at Niamey under 50-year, low-flow conditions to ensure an adequate water supply for a community of 500,000 residents. As a result, upstream irrigation projects had to temporarily cease withdrawing water from the river.

Basin waters must serve multiple uses. The developing capability for informed analysis, based on the WSRM and a much richer data base concerning the NRB's biophysical and socioeconomic characteristics, will permit NBA decision-makers as well as member-state and donor officials to compare the implications and probable consequences of one scenario against another. They will be able to assess the costs and benefits of an intervention to promote irrigated agriculture, not just for that use, but also in terms of hydropower generation, water supply, flood control, fisheries productivity and navigation. These issues ought not to be prejudged, particularly since the purpose of the USAID project, both the COE and SENRA components, is to enhance the NBA's analytic capability as an indispensable condition for informed river basin planning.

V. INSTITUTIONAL ANALYSIS

A. Introduction

This section focuses on ways to improve the organizational capability of the NBA Secretariat. Particular attention is paid to the in-house division of operational responsibilities between the executive secretary and his deputy. The analysis strongly suggests that the executive secretary should handle the overall supervision of secretariat operations and take special responsibility for all activities concerning relations with member states. The deputy should provide the leadership for the planning unit. Both officials will need to mutually support each other if this division of labor is to be fully efficient. Other in-house issues discussed in this section include financial controls and office space for professionals, particularly those from member states, and donor technical assistants, who will arrive shortly to increase the staff of the planning unit. There are adequate solutions to problems in both of these areas.

In the secretariat's external relations with member states and donors, the focus is on the pressing need to regularly produce a small, but interesting newsletter dealing with NBA issues and secretariat activities; provide a growing range of services to member states to justify their annual contributions; and form NBA national committees in each member state. National committee members will play several important roles, including lobbying for the NBA in their own countries and informing secretariat personnel, through the executive secretary, of their states' interests and preferences concerning NBA activities and programs.

Finally, this section examines external relations between the NBA, especially the Secretariat, and donor and lender organizations associated with the NBA. This subsection stresses the need for solid administrative support to enable the NBA Secretariat to fulfill its information processing role. Under certain conditions, this might involve increased donor involvement in the management of secretariat activities.

B. Overview of Secretariat Operations for 1986 to 1989

The NBA Executive Secretariat should concentrate its full attention and resources during the coming four years (1986-1989) on developing an in-house capacity to collect, analyze and disseminate data relevant to NRB development activities. The goal of the organization during this period should be to establish itself as the premier purveyor of information for all those--member states and donors--interested in promoting beneficial use of the Niger River and its tributaries.

Much of the groundwork for attaining this goal has already been laid. Two models are already calibrated and functioning, Hydro-Niger and SOGREAH, respectively (for details, see Appendix A). A third model is under development by the COE component of the USAID NBA project.

Another donor-financed activity has begun, that is, FAO's agricultural and irrigated agriculture data collection and planning effort. Two more will start up within the year. UNDP's senior planner will shortly begin collaborating with the head of the NBA planning unit in overseeing planning tasks. The second component of the USAID project, the SENRA activities described in Section III of this report, should be contracted by October 1986 and initiated soon thereafter.

All of these activities involve on-the-job training components:

- Member state personnel already assigned to the Executive Secretariat staff will collaborate with the two FAO and one UNDP technical assistants.

- The USAID project's COE component has already integrated two hydraulics engineers specifically trained in methods required to develop and operate the water and sediment routing model, and very likely will add one and possibly two more.

- The USAID project's SENRA component will bring in six additional individuals from member-state countries. Two will fill counterpart roles for a total of 39 months each, with the possibility of subsequent incorporation into the NBA secretariat staff, as full-time replacements for the SENRA long-term technical assistants.

- Four other member-state individuals will work as counterparts with the SENRA team for a total of 10 months each.

- Through the SENRA component of the project, another four NBA member-state technicians will participate in on-the-job training with U.S. land and water resource management agencies for a total of six months each. Thereafter they might also be integrated into headquarters staff, to take over ongoing information processing tasks once the SENRA medium-term technical assistants and FAO technical assistants depart.

This increase in NBA secretariat staff sets the stage for a dramatic improvement in the agency's human resources capabilities

and, in all likelihood, its ability to produce outputs that are relevant to planning.

C. Strengthening the NBA's Planning Capabilities

The evaluation team for the first phase of the NRBP project concluded that the NBA lacked a real capacity to engage in information processing relevant to planning because there was no operational unit dedicated to NRB planning (see Figure 2 on the next page). The team explicitly recommended upgrading NBA's capability in this area.

1. Assumptions

It is assumed that, as recommended above (Section V.B), the NBA secretariat will devote itself exclusively to planning activities over the next four years. This would involve not only monitoring and information processing, but also progressive creation of lines of communication between the secretariat and relevant technicians and political officials in the member states. However, to accomplish these aims, the following activities should be excluded during that four-year period:

- all secretariat efforts to generate financial support for NRB interventions (as opposed to supplying useful information to project entrepreneurs);
- any secretariat involvement in supervision of project implementation; and
- any secretariat involvement in intervention project management.

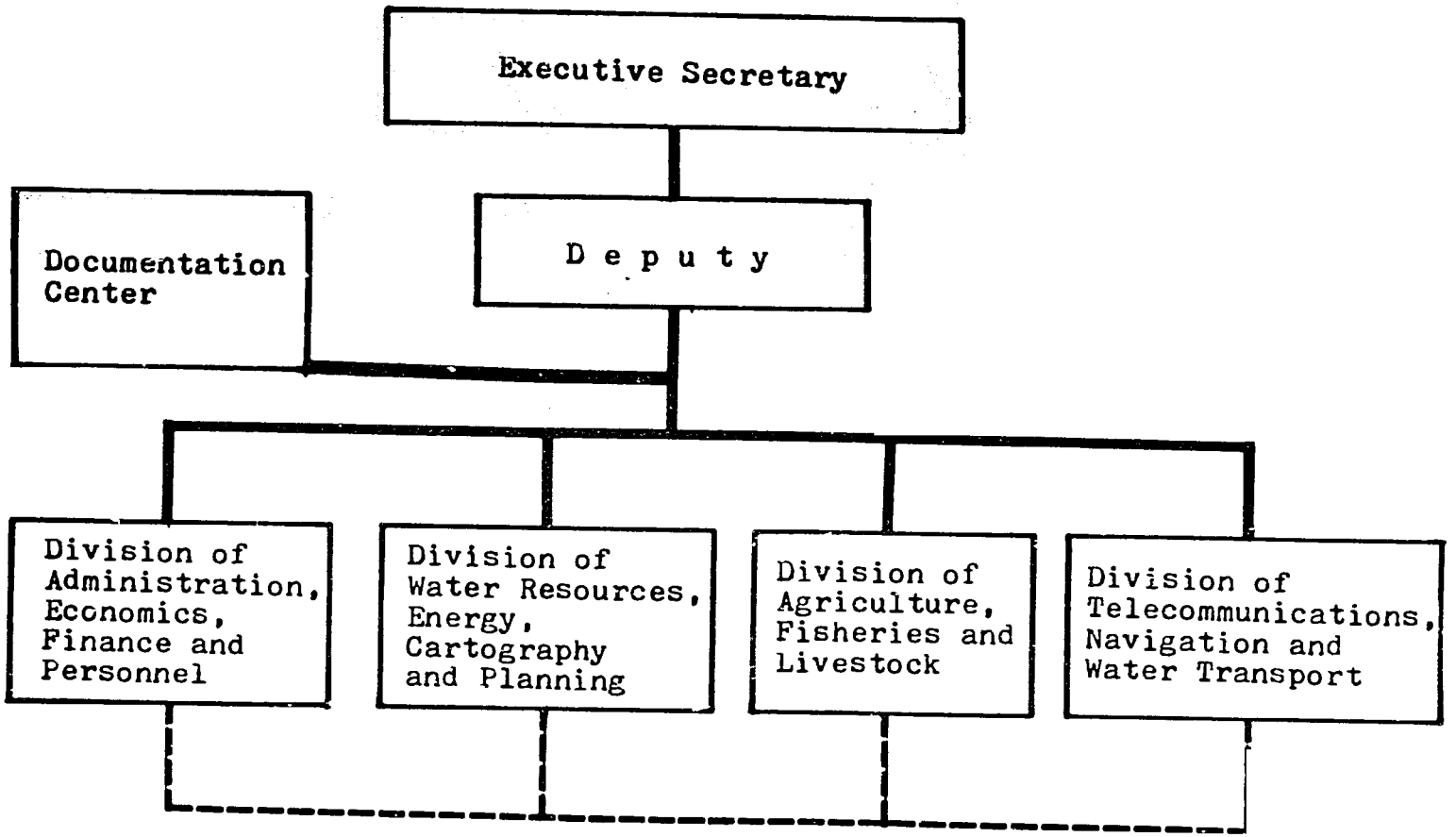
2. Planning Unit Organization

If the three conditions noted above were respected, then the COM decision that the planning unit be composed of the executive secretary, his deputy and the three technical directors (Navigation, Transport and Communications; Agriculture, Fisheries, Forestry and Animal Husbandry; and Water Resources, Planning, Energy and Cartography) would offer a reasonable framework for engaging in information processing as a basis for multiple-use development of NRB water resources (see Figure 3).

As this discussion and Figure 4 indicate, ample professional talent will become available to the secretariat during the coming 12 months. Thereafter, the problem will be to use that talent effectively.

Figure 2.

NIGER BASIN EXECUTIVE SECRETARIAT



line of direct authority

direct working relations

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Figure 3.

Restructured Secretariat: Division of Operational Responsibility

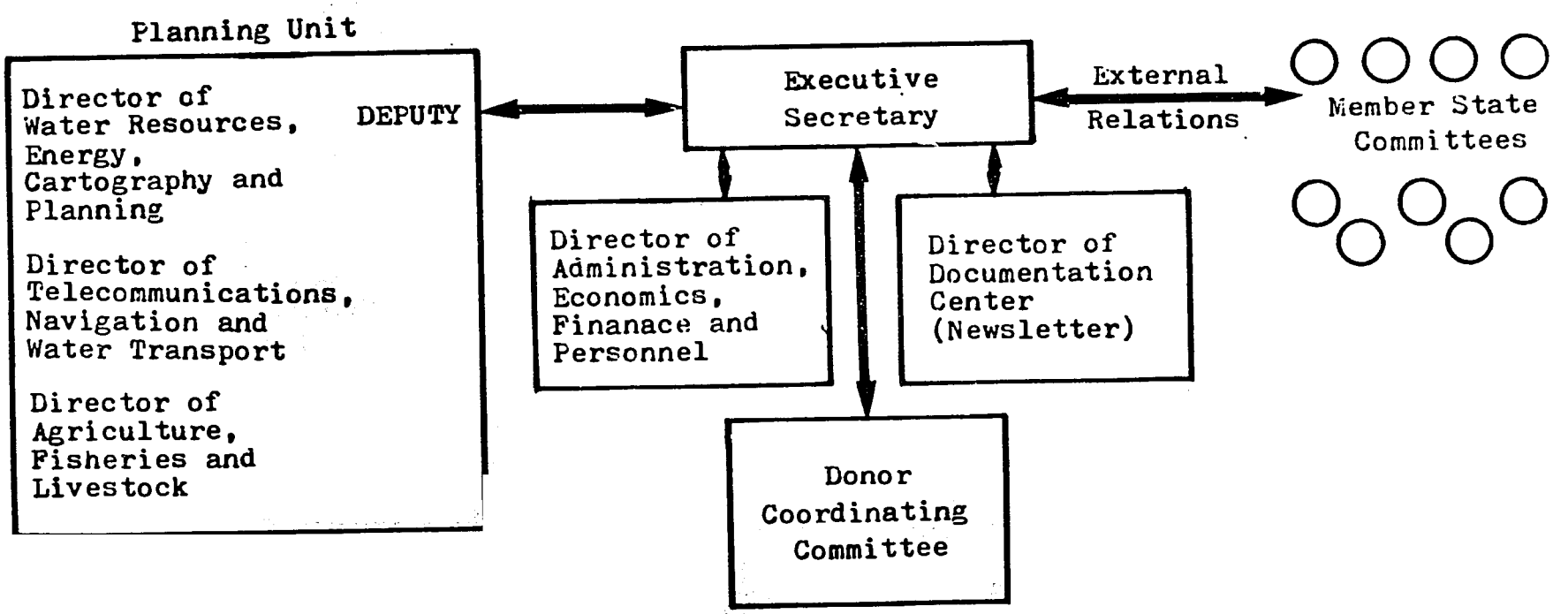
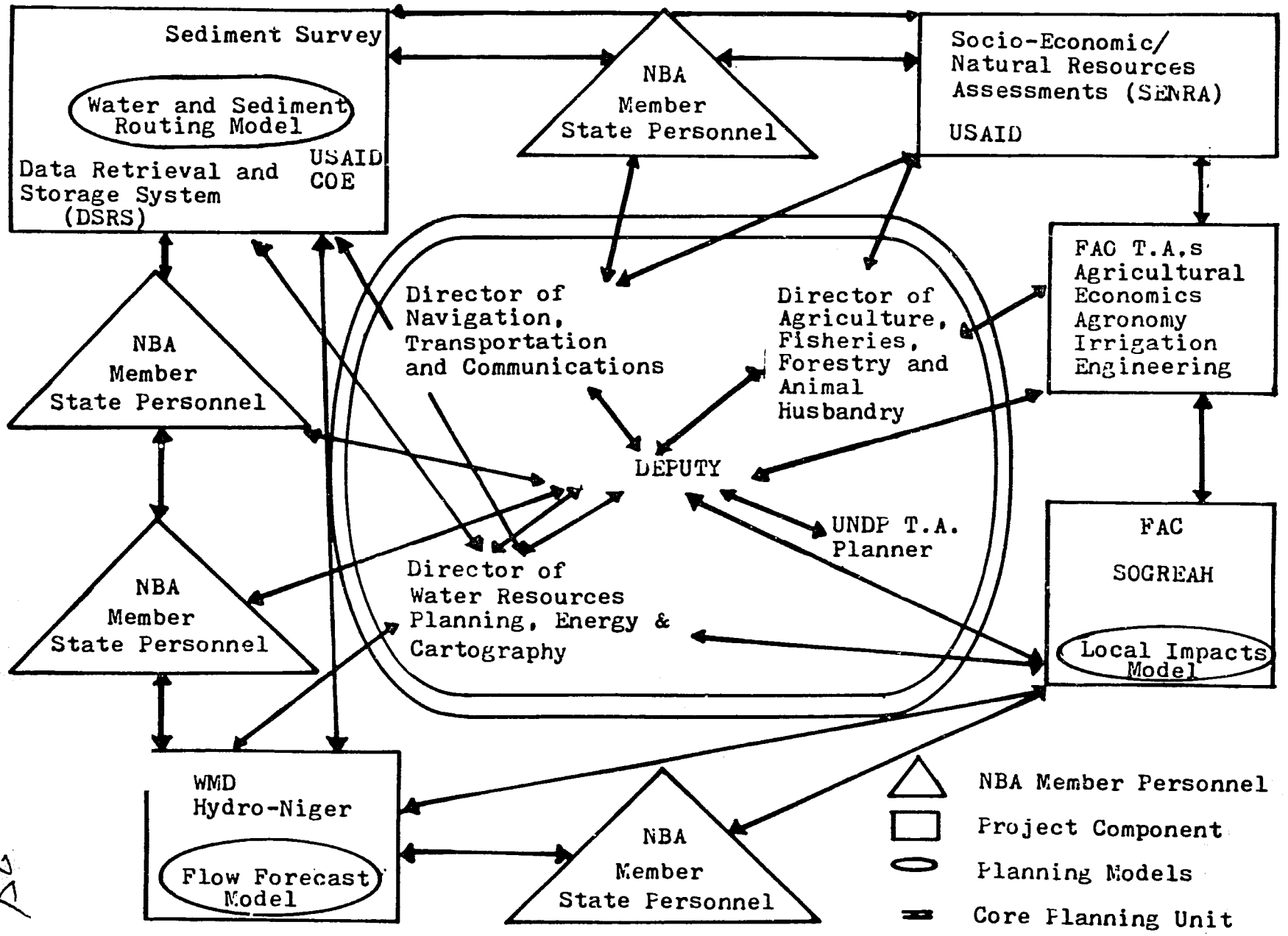


Figure 4.
Planning Unit: Institutional Design and Communication Flows



3. NBA Administration

The likelihood that the NBA planning unit will respond creatively to fulfill its primary function will be determined by both the type of administrators available to the secretariat and the kind of demand for secretariat services that the agency manages to generate among member-state clientele. The secretariat staff includes several senior technicians with years of experience in administration. For a professional planning organization of some 20 to 30 professionals at maximum staff levels, this provides adequate support. The problem that must be dealt with in this regard is simply the clear allocation of responsibility for the two major tasks that this report assumes will face the secretariat over the next four years. The first is management of the planning activity. The second is management of relations between the secretariat and NBA member states.

Two approaches can be suggested. In both, the executive secretary must continue to serve as the overall coordinator of secretariat activities. Assuming this, he could either take personal charge of the planning unit and delegate authority for external relations to the deputy executive secretary or assign the deputy responsibility for the planning unit and handle external relations himself. The latter solution appears preferable for reasons discussed in the following subsections.

4. Executive Secretary's Role

The executive secretary cannot delegate his role as overall coordinator. He needs to maintain a broad view of secretariat activities, while at the same time, carefully and actively monitoring relationships with member states. That type of political role is best handled by the head of the secretariat. If the executive secretary maintains close contact with member-state political officials, he will inevitably inform himself about their assessment of the secretariat's activities as well as the services and products they find most useful.

With this sort of regularly updated overview of the secretariat's performance, seen from the perspective of the member states that finance the agency's activities, the executive secretary could provide active and extremely valuable guidance to the technicians working in the planning unit. An understanding of policy orientations at high levels in the member states will be indispensable in developing intervention options that are politically feasible. Without that kind of information, planning unit technicians will undoubtedly waste a great deal of time working on inappropriate river system development scenarios, simply because they lack the knowledge to exclude certain packages as not feasible.

At the same time, the executive secretary can keep the political fences mended with member states, as suggested below in Sections V.D and V.E., both by creating and coordinating NBA national committees in the member states, and by guiding the secretariat's documentation center personnel in the preparation of an NBA newsletter, technical studies and other useful materials for distribution to the member states.

Under this plan, the executive secretary would exercise direct operational control over the administration and documentation directorates. From his position at the apex of the secretariat, the executive secretary has the best overview of activities, and the greatest capacity to coordinate efforts in the planning unit as well as in the two support directorates, to build the productive capacity of the secretariat as an agency dedicated to NRB planning.

5. Role of the Deputy Executive Secretary

In this approach, the deputy executive secretary would be placed in full operational charge of planning unit activities. As a water resources technician and experienced administrator, the current deputy is well prepared to provide overall guidance to technicians. He also has the ability to make sure that they concentrate on the complicated intellectual tasks involved in coordinating information produced by the three technical directions and the three models. The deputy would also protect technicians in the planning unit--those individuals who now head the three NBA technical directorates, as well as the member-state and donor technical assistance personnel working with them--from all unnecessary administrative duties.

6. Collaboration Between the Executive and Deputy Secretaries

Under this scenario, the executive and deputy secretaries would have to work together closely, in a highly supportive fashion. The deputy would look to the executive secretary for guidance in developing intervention proposals that are politically acceptable to the entire community of NRB states. At the same time, the deputy would have to keep the executive secretary informed of possibilities and problems encountered as planning unit efforts move forward. Only in this way will the executive secretary be able to describe with precision the capabilities and limitations of the NBA secretariat in discussions with National Committee personnel in the member states. Accurate information on these issues will go a long way to preclude false expectations, and false fears, about NBA activities. It will reduce the time needed to come to clear recognition of bargaining positions and will set a standard of

YD

openness that will serve member states well in subsequent interactions over intervention options.

D. Secretariat Relations with Member States

There are two glaring weaknesses in the secretariat's relationships with member states thus far:

- the secretariat still does not produce a newsletter, despite a 1981 COM decision authorizing such a publication; and
- official NBA national committees have not been established in every member state.

This section and the next (V.D and V.E) discuss these problems, but the thrust of the argument is simple--until member states recognize that the secretariat can serve their interests, support from those countries, in the form of monetary contributions and political backing, will continue to languish.

To overcome the first weakness mentioned above, two strategies must be employed:

- marketing, i.e., developing a capacity within the secretariat to inform member states of agency activities; and
- providing member states with real services and benefits.

1. NBA Newsletter

The NBA newsletter, authorized by a 1981 COM decision, has yet to be produced. This situation cannot be allowed to continue, as it perpetuates the dangerous atmosphere of nonexistent and erroneous information about secretariat activities that now pervades the NBA member states. If contributions from member states are motivated in any way at all by perceptions of the value of secretariat activities, then the failure to inform contributors about efforts that are now laying the groundwork for effective indicative NRB planning simply ensures that "bad news," whether real or rumored, will continue to dominate member-state discussions of NBA affairs.

By the same token, each failure to publicize good news is a missed opportunity to build support for and interest in NBA activities. Until member-state technicians and political decision-makers sense that they can benefit from participation in NBA activities, in terms of both protecting themselves against

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negative developments and seeking (either alone or with other countries) ways to promote water-dependent development in the NRB, secretariat personnel will have a difficult time trying to establish effective national committees in the member states. Conversely, once individuals from member states who have a potential interest in NBA activities realize that they can be significantly helped or hindered by the organization's activities, the interest of member states in NBA affairs will probably increase sharply.

Thus, a newsletter is quite clearly an organizational imperative for the NBA Secretariat. The newsletter should appear regularly, cover topics of interest to the member states and serve as a means of building support for the secretariat by making readers more fully aware of NBA activities and developments. The publication's size and quality of the graphics are of little consequence, at least during an initial period. Indeed, placing too much emphasis on fancy formats, first-rate illustrations and multicolor printing will only impede publication by setting a standard that will be very difficult to achieve under current financial constraints. On the other hand, regular publication, clear prose and subjects of interest to readers are critically important. If the secretariat sets a reasonable publication schedule and sticks to it, readers will at least be able to see that the secretariat can function in a reliable fashion.

Interesting articles can be produced on a variety of topics:

- secretariat activities, particularly interviews with member-state technicians and politicians;
- technical, political and planning issues of general interest to readers--e.g., descriptions of the various models now being developed and their capabilities (along the lines of Appendix A) as well as discussions of proposed intervention options and water allocation rules;
- columns, editorials and letters from readers; and
- reviews of significant publications.

If the initial issues of the newsletter contain no more than five or six printed pages, text preparation and publication should pose no insurmountable problems. Given the microcomputer and copier facilities that are currently available at the technical center and FAO project, preparation and copying of the newsletter could be accomplished entirely in-house, which would place no additional budgetary strain on the secretariat. The documentation center should be equipped with a microcomputer that is compatible with those at the technical center, so that text

produced by the latter can easily be transferred on diskette to the documentation center for translation into French and/or English, before final processing and publication. It appears that this microcomputer can be purchased using funds remaining in the budget for the first phase of project.

The NBA Documentation Center has been designated to bear major responsibility for publication of the newsletter. The director of the documentation center should be named editor for an initial trial period and can continue in this position if the newsletter meets expectations. If the director has difficulties with the job, he should be replaced by someone who is better able to produce an acceptable publication. The newsletter is of such importance that the editor must demonstrate consistent competence.

Given the importance of the newsletter in building support for the NBA, the executive secretary should have supervisory oversight of newsletter activities. He should also appoint a small advisory committee, including both member-state personnel assigned to the NBA and donor technical assistants, to monitor its publication. Terms of membership on the advisory committee should be for two years, with the possibility of one renewal, to ensure that new perspectives are regularly introduced into editorial discussions.

During the initial year of newsletter publication, the secretariat's goal should be to distribute 50 copies in each member state to influential persons, who are or may potentially be involved in NBA matters. Distribution lists for the newsletter should be prepared after discussions with committee members. Obviously, all of the individuals on each member-state committee should receive a copy. The cheapest way to distribute the newsletter may be bulk shipment to a designated individual on each NBA national committee for subsequent mailing at national postage rates.

2. Services to Member States

If the secretariat is to fulfill its role as collector, processor and distributor of reliable information about NRB development issues and projects, the documentation center must once again function both as a repository for materials relevant to the NRB and a source of available information for interested parties from member states, donors and others. The documentation center already has the equipment to copy documents onto microfiche for low-cost duplication and distribution. While this equipment has not been operational in recent years due to a lack of basic (and relatively inexpensive) parts and supplies, this situation could easily be remedied. It would then be possible to provide member states with information relevant to their own

planning processes as well as efforts to coordinate activities affecting the development of NRB resources.

Librarians at the documentation center should again produce annotated bibliographies of the center's holdings for public use. These could be circulated to member-state committees both on microfiche and in printed form. Anyone wishing to consult a document could ask for whole item on microfiche. To draw attention to the value of this service, new materials--e.g., books, reports and articles--of major importance should be annotated and these references published as a regular feature in the newsletter. Clearly, this bibliographic service will have to function efficiently, if it is to be worthwhile for member-state officials and others. While these materials do have an intrinsic value, the documentation center must use them to convince technicians and decision-makers in member states that the secretariat has an important role to play in gathering and distributing information.

The secretariat must eventually develop other services. Most notable is the ability to analyze member-state development plans that impinge on the use of NRB waters in order to inform technicians, decision-makers and donors of probable conflicts as well as opportunities for mutually productive collaboration in developing NRB resources. Secretariat personnel might also become involved at some point in providing impartial, on-site expertise concerning the consequences of proposed interventions. This capability should grow naturally from the river monitoring and modeling activities now being expanded at the secretariat and, through its efforts, in the member states.

A further service that the secretariat might eventually provide would be short- or medium-term, on-the-job training courses in river system analysis, planning and management. Personnel from member states could be cycled through the NBA technical center on a regular basis to familiarize them with secretariat activities and capabilities, and improve their skills in specific areas. During an initial period, these individuals could be drawn from the membership of the national committees.

E. NBA National Committees

The second weakness in the executive secretariat's performance has been the failure to establish a permanent NBA national committee in each member state. This has resulted in inadequate, sporadic communications in both directions between member states and the secretariat. While some states have apparently formed a de facto group of technicians who bear ongoing responsibility for NBA activities, often as a part of their own professional activities at the national level, this is certainly not the case in every member country.

Time, momentum and development opportunities have been wasted because as a group, secretariat personnel remain uninformed about changes on the national scene in the different member states. At the same time, available talent in member countries is underutilized because no one is reponsible and nobody regularly receives credit for devoting time to NBA-related activties.

Technicians from the different national arenas could actively assist the NBA in several ways. All of them could contribute to building secretariat-member state networks as well as supporting activities that have yet to be developed. These efforts will put member-state officials, who have a common interest in NRB development, in contact, thus creating a viable political community for NBA activities, where differences can be identified, openly disucssed and resolved, and opportunities for collaboration can be developed in a continuing process that is not limited to the one week of COM meetings held each year. Appropriate activities in this respect include:

- acquiring information that is relevant to planning activities, in support of efforts by the NBA's technical directorates and the documentation center to build a data base at the secretariat (NBA precedents for this activity already exist);

- preparing concept papers to aid the secretariat in planning activities, or supplying technical or political position papers in response to specific requests from NBA units that periodically need such input;

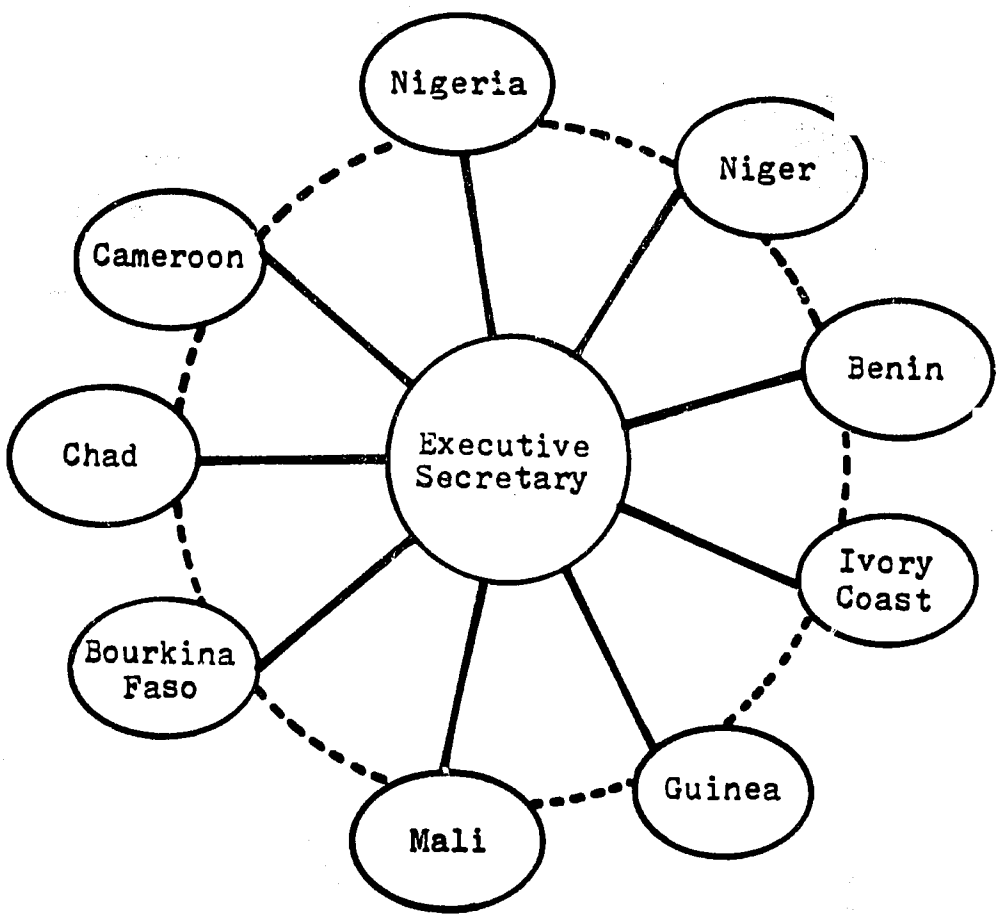
- providing constructive criticism of the secretariat's performance before problems escalate to crisis levels; and

- lobbying for the interests of the regional NBA community within member-state governments and vice versa.

At present, if member-state officials do engage in such activities, it is more a matter of personal desire than because they bear direct responsibility for these matters. This sitaution must be remedied. (See Figure 5 on the next page.)

The executive secretary should make the formation of national committees his top priority. Every member state should have an NBA committee established with permanent members appointed by the end of 1986. These committees need not be large--five to 10 individuals would constitute a group that is small enough to communicate seriously, yet large enough to have an impact.

Figure 5.
NBA Secretariat and Member State Committees Relations



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The executive secretary might wish to convene several meetings of member-state personnel at the secretariat to work out a general strategy for forming the NBA national committees. They should be able to suggest individuals in their home countries who have the requisite technical and political expertise to make useful contributions to discussions and lobbying efforts in their national arenas. They should also be able to identify the most relevant ministries and positions within them to be targeted for participation on the national committee. From those two sets of information, a group of candidate members can be generated for each national committee.

One strategy session should also be held to solicit ideas about the best way to ensure that member-country governments appoint some or all of the targeted individuals to posts on the national committees. Tactics in this regard will undoubtedly vary with the different political climates in the member states, and it would probably be worthwhile to give some attention to this matter before the NBA national committee campaign is launched.

A final point to be discussed in a strategy session is defining the tasks of member-state committees. This is problematical because without legitimate activities, the committees will be idle, serving as just one more indication of the NBA's ineffectiveness. On the other hand, if the tasks assigned the national committees are too difficult, the members may give up before they even begin.

It would seem best to develop a graduated series of activities that might:

- get the national committees started on some useful work;
- build the committees' confidence in their ability to provide meaningful support to the NBA; and
- lay the groundwork for more delicate and difficult endeavors as the NBA planning process matures--e.g., double-edged lobbying to build NBA support in the member states while also educating national communities about the processes, opportunities and limits of river basin planning.

F. Donor Coordination

To date, coordination among donor and lending organizations involved in NBA activities has occurred only on an informal, ad hoc basis. Although the donor community has had informal contacts with the NBA's COM over the years, no formal mechanisms

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currently exist to structure contacts among donors or between them and the COM.

During September and October, 1985, a series of meetings was held in Niamey for representatives from the local missions and headquarters of UNDP, FAO and USAID. All expressed concern about the deteriorating state of affairs within the NBA Executive Secretariat. This situation is the result of both management irregularities within the secretariat itself and nonpayment of member-state contributions. This has seriously impaired the secretariat's ability to function as an administrative support organization for technical assistance personnel from member states and donors, who are attempting to carry out technical and planning activities, and fulfill its role as a coordinating mechanism for NRB development efforts.

Donor representatives at the meetings concluded that formal mechanisms for inter-donor coordination and donor-COM communication were essential. A decision was made to explore three options with varying degrees of donor intervention in the management of the NBA Secretariat's activities. (These three options are described in detail in Appendix D.) The options chosen were intended to serve as an analytic tool to help clarify the implications of various levels of intervention. They also provide a starting point for eventual institutional design work that might produce a variation or combination of several elements from the different options. The main elements of each of the three options are briefly outlined below:

- minimum--no real donor intervention in secretariat management; informal, ad hoc, inter-donor coordination; and legal standing for donors to communicate directly by letter with the COM and Council of Experts as well as indirectly through the executive secretary;

- moderate--donor sharing of secretariat management activities at the donors' discretion (the final decision to be based on a finding that without donor support, the secretariat could not adequately backstop projects to assist the NBA); formal donor coordination committee with a small support staff; and formal authorization for the committee to initiate discussions of NRB development issues and participate in open COM meetings at the committee's request; and

- maximum--donors supplement secretariat staff, as necessary, and take over management of NBA activities; donor committee supervises management of the secretariat, and controls and guides the NBA development process within NBA statutory management;

and by statute, donor committee representatives must attend open COM meetings.

The document in Appendix D was communicated to the executive secretary and his deputy on an informal basis, as well as to a number of donor and lender organizations that are potentially interested in participating in a joint donor effort to revitalize the NBA. A meeting held under UNDP auspices to poll donors' opinions and prepare a formal proposal for the COM was first set for late October, 1985 and then rescheduled for mid-November. If that meeting agrees on a donor coordination option, it will be transmitted to the COM for discussion at the December, 1985 NBA meetings in Niamey. Subsequent developments will depend on the COM's response to any such proposal.

G. Office Space for Planning Unit Personnel

Office space for USAID/COE and SENRA technical assistants, as well as NBA personnel associated with them as counterparts or in other ways, has been programmed at various levels over the life of the project as a function of changing team size. The consensus among the technical assistants and NBA staff interviewed favors a central office for the planning unit to facilitate interaction among the project's various components. It is essential that NBA and technical assistance personnel have easy access to each other on a daily basis, if the kinds of intensive exchanges necessary to produce technically and politically feasible intervention scenarios are to occur.

The COE team has made office arrangements for most of the personnel who will be directly involved in planning unit activities on a long-term basis. They have leased a large building near the NBA technical center. This two-story NBA/COE unit can accommodate a total of 17 people as follows:

- five COE subproject professionals,
- three COE subproject administrative assistants,
- three NBA technical directors,
- one UNDP technical assistance planner,
- three FAO technical assistants, and
- two administrative assistants.

If circumstances warrant, it may be possible for this building to handle one or two more individuals by reorganizing the work areas, although this would undoubtedly involve undesirable restriction of the individual office spaces. This

same building will also house the COE computer center, including DSRS, WSRM and word processing facilities. Given the concentration of technical expertise and equipment in this building, it would be highly desirable as a matter of policy to locate the planning unit here as well.

NBA member-country personnel who are on temporary duty in Niamey with the SENRA or COE projects will operate out of the existing NBA technical center. This space will become available as soon as the individuals that are directly involved in planning unit operations vacate the technical center for the new NBA/COE unit. This move will free up office space for six more people at the NBA technical center.

The USAID/SENRA subcontract provides funds for fifteen (15) months of office space for team members while research and analysis are underway in West Africa and Niamey (see Appendix E). At the end of that period (in the middle of fiscal year 1987), the two remaining long-term team members and their NBA counterparts should be given office space in the NBA/COE center, so as to integrate them fully into the planning unit. Four offices should be available in the center at that time, if the FAO team finishes its work before April, 1987, as scheduled.

H. Financial Controls

The NBA Executive Secretariat already has personnel who are qualified to maintain a double-entry bookkeeping system of accounts, which could provide the secretariat with a system of reliable financial controls for its operations. However, in the past, various irregularities have prevented this system from functioning effectively. Thus, several innovations are in order that involve both institutional and technical changes.

First, personnel in the NBA secretariat who are responsible for accounting services (the head and assistant accountants) should be placed on a separate payroll that is administered by an entity outside the secretariat. This would insulate the accountants from temptations engendered by long delays in the payment of salaries and undue pressure from their superiors in the secretariat. However, it is likely that administrative hurdles will make this change very difficult to effect.

The second change is more easily accomplished. It would simply increase the access of interested parties to NBA accounts by computerizing them. Once the NBA accounts are computerized, they could be made readily available to concerned parties--e.g., member-state representatives, secretariat personnel at the director level and above, and donor organizations that are involved or interested in NBA projects.

When the accounts are computerized, they could be printed out on a monthly basis and circulated within the NBA Secretariat. Hard copies and disks could also be furnished to both the COM's financial controller and the commissioner of accounts, who are responsible under NBA regulations for reviewing NBA financial matters. This would be helpful for both external and internal auditing purposes. Also, if disk copies were furnished monthly to those two officials, as well as the UNDP, FAO and USAID projects, the organization's books would be immune to tampering for all practical purposes.

This approach would provide a system of multiple controls. Exposure to public scrutiny would reduce both the temptation to manipulate the secretariat's books and the likelihood that illegal manipulations would be rewarded. It would also reinforce the positions of the accountant and financial controller by widening the circle of individuals who are ready and able to monitor NBA financial operations.

Third, the COE team will be establishing a computerized financial monitoring system for the project. The software for this system will operate on the IBM PCs that are already in place at the NBA technical center. The same computer programs could be made available to the secretariat, and COE personnel could provide the secretariat's accountant with short-term training in the software's use and application.

This same system should also be employed (with any necessary modifications) to keep track of the accounts for the USAID/SENRA project component. If other donors--e.g., FAO or UNDP--consider it desirable, they could use the same system for their financial activities as well. The adoption of a common accounting system would considerably heighten awareness within the secretariat of the evolution of NBA finances, and would make the in-house planning and adjustment of activity schedules far easier. Technical assistance personnel from both NBA member states and donors might well make more efficient use of their time as a result. Furthermore, instituting a computerized accounting system would provide an advantage specific to USAID that would also benefit the NBA--the two NBA/USAID project components, COE and SENRA, could be certified by USAID.

APPENDIX A

Water and Sediment Routing Model and the Data Storage and Retrieval System

1.0 Background

The revised implementation plan is intended to provide, among other things, the basis and guidelines for Phase II of the NBA/COE project. Revisions in the implementation plan stem from lessons learned in Phase I, recommendations from the December, 1984, USAID evaluation of Projects 0915 and 0944, and from the continuing dialogue concerning project direction among NBA, COE and USAID personnel. Many revisions in Phase II reflect the 1984 evaluation recommendations. However, close scrutiny by NBA, COE, USAID/Niger, REDSO/Abidjan and other donors has led to the conclusion that other recommendations exceeded the scope of project goals and objectives, or were impractical given limited funds and/or manpower.

Appendix A contains four sections in addition to this introduction. The first reviews the data requirements of the water and sediment routing model (WSRM). The second examines practical applications of the model. The third comments briefly on the data storage and retrieval system (DSRS) developed during Phase I of the project as a tool to manage river system relevant data. The fourth outlines personnel requirements under the Phase II COE project for data gathering efforts, the DSRS and development of the water and sediment routing model.

2.0 The Water and Sediment Routing Model: Data Needs

A primary activity scheduled for Phase II of the project is the development, calibration and use of a water and sediment routing model on the NBA computer. The model will allow prediction of changes in flow, water level and sediment transport (erosion and deposition) which will occur in the river channel up and down stream from project interventions in the basin.

The Phase I study produced a volume titled "Hydrologic and Meteorologic Data Needs." It listed the long-term future data needs for establishing and maintaining a comprehensive water and sediment routing model for the entire basin. These needs are listed in the 1984 evaluation.

The logical strategy proposed for Phase II is to begin by collecting data at the level of detail necessary for establishing and calibrating the Phase II water and sediment routing model. Achieving the level of data and detail proposed for model operation in the Phase I study is a long-term and on-going effort which is neither feasible nor necessary to initiate development, calibration and use. Instead, the model will be enhanced and expanded as the data base is expanded.

2.1 Input Data Required to Develop the Model

The computer model is based on mathematical and physical laws governing the flow of water and the interaction of flowing water with sediments (sand, silt and clay) in the river channels and tributaries.

The mathematical and physical laws of water and sediment movement do not vary from one river basin to another, or from one location to another in a

given basin. However, the physical characteristics of each basin are different They vary from basin to basin, vary from one location to another in a given basin, and change with time at a given point in a basin. In order to develop a model which accurately represents the movement of water and sediment under various conditions, it is necessary to define these variable physical characteristics of the basin with a data base of sufficient accuracy and density.

The following sections describe the different types of data needed to develop the model, the techniques and sources of collection, the status of existing data, and additional data needs. Specifically, the data necessary to develop the model are:

- River Channel Geometry--cross sections, river distances, and elevation;
- Rating Curves--the relation between river discharge and water surface elevation at key locations along the river;
- Sediment Data--the particle size distribution and discharge/sediment transport relations at key locations;
- Hydrographs--historical records of river discharge and elevation at key locations;
- Precipitation--historical records of rainfall in the river basin.

2.1.1 Channel Geometry

The physical shape of the river channel governs how water flows through it. For the model, physical shape is defined in terms of channel cross-sections surveyed at suitable intervals of river distance. Each cross-section consists of enough points surveyed across the flood plain and channel bottom perpendicular to the flow to accurately show the area flooded, or flow area, for any water level. The river distances between cross-sections and their elevations, referenced to a common datum (mean sea level), must be established in order to determine the slope from one section to the next.

The model's ability to generate accurate output (predictions) is linked to the number and accuracy of the cross-sections loaded into the computer program. The reliability of the model is directly related to the cross-section data in the river reach in question. In other words, if there is a high density of cross-sections in a twenty-kilometer stretch of the river, the model can make reliable predictions for that reach.

However, reliable predictions cannot be made by the model for points on the river many kilometers from a cross-section, especially if the river (or channel) geometry, i.e., slope and cross-sections, changes abruptly in that reach of river.

Currently, there is a large amount of channel geometry data available which can be entered into the model. However, it will be necessary in Phase II to augment this data with additional surveys. Some additional cross-sections are needed in reaches of the river where none exist, or in areas of special interest. Many of the existing cross-sections must be checked by resurveying because changes have occurred through erosion or deposition in the stream bed in the years since they were last surveyed.

Updating channel geometry by survey is a necessary, on-going activity. The NBA will commission river surveys during and after completion of Phase II in order to regularly readjust, upgrade and verify the computer model.

The Phase I Geomorphological Study provides a solid basis for determining the number and location of additional cross-sections that must be surveyed and monitored to develop the computer model to an acceptable initial level of predictive power. This data will be gathered in Phase II by a private surveying company under contract. As new channel geometry data is gathered from any and all sources, it will be verified and entered into the computer model to upgrade it.

2.2.2 Rating Curves

Rating curves define the relation between river discharge (flow rate) and stage (water surface elevation) at key cross-sections, or gauging stations, on the river. Their accuracy and density directly affect the reliability of the model in the river reach in question. Rating curves are established at each gauging station by periodic direct measurement of discharge for various water levels. Discharge measurement is a highly specialized technique, requiring a trained and experienced crew with proper equipment.

The technique involves measuring the current velocity and depth at many intervals across the river at the gauging station. Depth at each interval is measured by sounding techniques. Velocity is measured by lowering an instrument with a propeller or vanes (like an anemometer) which indicates the speed of flow. The flow rate at each interval is estimated by multiplying the depth and distance between intervals (the flow area) times the velocity. The total discharge is estimated by adding the flow in each interval. Depth and velocity are measured from a boat held steady at each interval by an outboard motor, or by a cable stretched across the river. The position in the river, or interval location, is determined by marking the cable at the desired intervals, or by triangulation with a sextant to fixed points on the river bank.

In order to establish a complete rating curve, discharge measurements must be made at low and high flow, and at several points in between. A curve is plotted through these points (discharge versus stage) so flow at any given time may be estimated simply by reading the water level on a gauge placed in the river and entering the water level in the rating curve. Usually, water levels are read and recorded daily, and daily discharge estimates are made from the rating curves.

Keeping rating curves current demands constant effort by the field discharge measurement crews. Most gauging stations on the Niger are at points where the river bed is erodable and therefore changeable over time. Establishing the upper and lower limits of the curve (extreme drought and flood) requires waiting until these events happen, and then working fast to assure measurements are taken accurately at these critical points. The lack of precision inherent in discharge measurement requires, to establish a precise curve, that the average of several points be taken.

Field teams currently measuring discharge and thus established rating curves are administered by the water resources ministries of the respective member countries. In order to strengthen these teams and establish performance standards, the NBA/COE are providing them on-the-job training and some equipment.

Aside from upgrading and standardization, this approach gives the NBA/COE a means of verifying the quality of data being gathered and a measure of control over field work.

2.2.3 Sediment Data

At present there is very little quantitative data on sediment transport in the Niger River. However, the sediment transport component is known to be very active and unstable. A thorough understanding of the sediment transport component and how it is affected by physical interventions on the river (dams, diversions, dikes, channelization, etc.) is absolutely essential in project and basin planning and design.

Sediment data is gathered in order to determine the relations between river discharge and sediment transport for the respective reaches of the river. These relations are complex. They depend upon the physical nature (size, shape, and density distribution) of the suspended and bed material in the river, as well as on channel geometry. Any intervention on the river that changes these parameters (flow, channel geometry, nature and amount of sediment) will affect the sediment balance up and down stream. These relations will be explained in more detail in the following section on use of the water and sediment routing model (see Section 3.0).

In order to collect enough sediment data to develop the model, Phase II of the project has begun a sediment data collection program. The possible approaches to sediment data collection, and the resources available to undertake it, were analyzed. It was then decided to establish the sediment data collection program within the NBA/COE, rather than contracting for the work or relying on member-country capabilities. (See Figure A.1 on the following page.)

For the sediment data collection program, regional offices will be established at Bamako, Mali, and at Lokoja, Nigeria. The central office in Niamey, Niger, will serve as the third sediment data collection center.

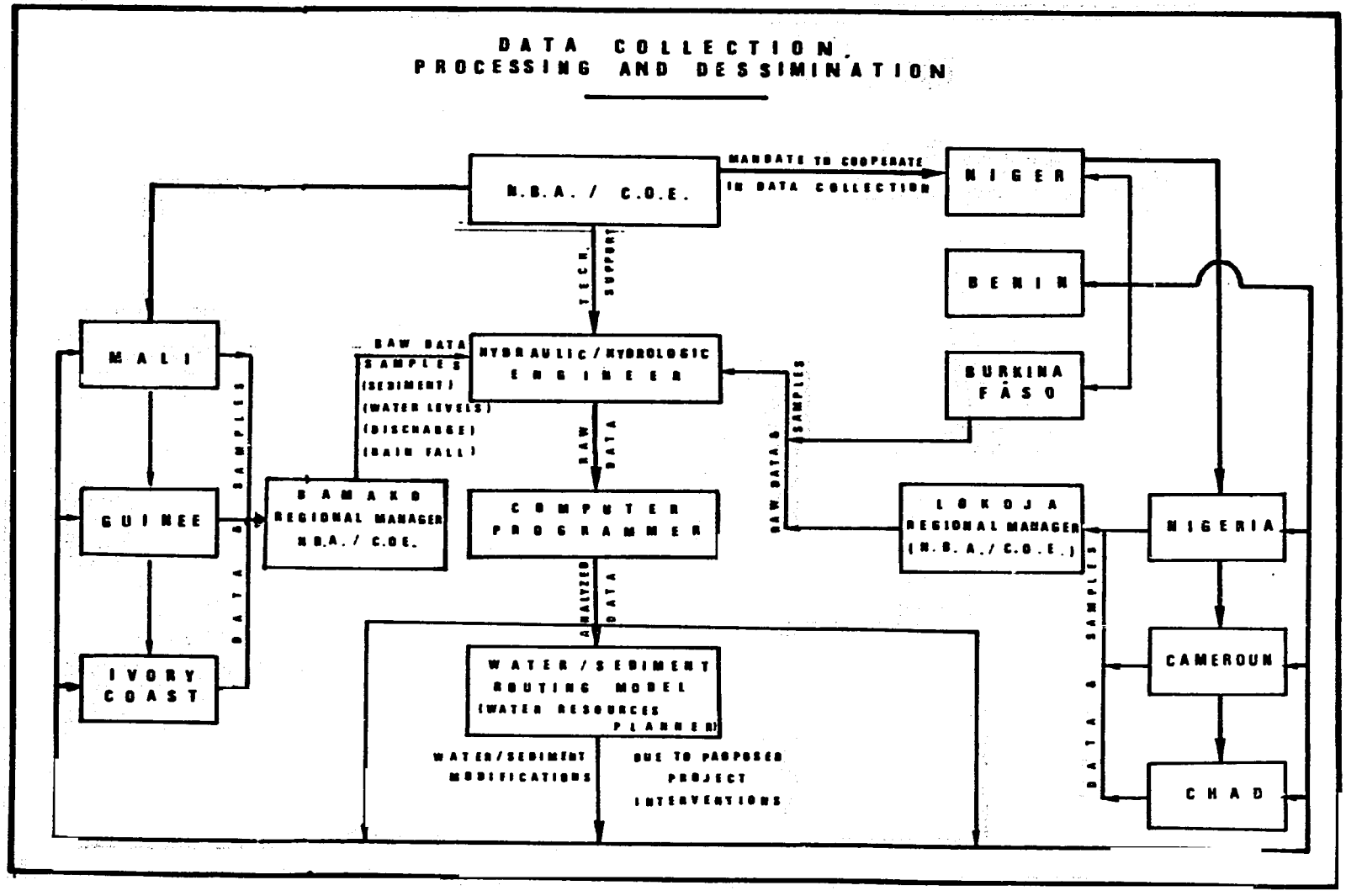
Each center will be staffed by a manager trained and experienced in sediment data collection. The regional managers will work directly for the COE under a data collection project manager in the central office.

Each of the three offices will be equipped with the supplies necessary to gather the sediment samples. Supplies include boats, motors, cables, etc., and vehicles to get to sample sites. Supplies also include special equipment used to obtain samples of water and suspended sediment in the river, and of bed material being washed along the river bottom. Laboratory equipment to analyze samples will be installed at the NBA office in Niamey, Niger.

Sediment transport relates directly to river discharge. Thus, sediment sampling goes hand in hand with discharge measurements. For this reason, as well as others mentioned in Section 2.2.2, "Rating Curves," the NBA/COE sediment data collection teams will work directly with member-country discharge measurement teams. Discharge and sediment data collection will be gathered on a fixed schedule at each site.

Twelve initial sites have been chosen for sediment data collection. This number will provide a sound base for establishing the model. As time and

Figure A.1


DATA COLLECTION,
PROCESSING AND DESSIMINATION
N.B.A. / C.O.E.
MANDATE TO COOPERATE
IN DATA COLLECTION
NIGER
BENIN
BURKINA FASO
NIGERIA
CAMEROUN
CHAD
MALI
GUINEE
IVORY COAST
DATA & SAMPLES
TECH. SUPPORT
RAW DATA
SAMPLES
(SEDIMENT)
(WATER LEVELS)
(DISCHARGE)
(RAIN FALL)
HYDRAULIC / HYDROLOGIC ENGINEER
RAW DATA
BAMAKO REGIONAL MANAGER N.B.A. / C.O.E.
COMPUTER PROGRAMMER
RAW DATA & SAMPLES
LOKOJA REGIONAL MANAGER (N.B.A./C.O.E.)
DATA & SAMPLES
ANALYZED DATA
WATER / SEDIMENT ROUTING MODEL (WATER RESOURCES PLANNER)
WATER/SEDIMENT MODIFICATIONS
DUE TO PROPOSED PROJECT INTERVENTIONS

resources allow, the base will be expanded to refine the model. All the twelve key sediment data collection sites are at active gauging stations with many years of daily water level records and periodically responsible, both for the stations in his region, and for collaboration with discharge measurement crews from respective member countries.

2.2.4 Hydrographs

A hydrograph is a plot or relation of how water elevation (stage) and/or discharge vary with time at a given point on the river. Hydrographs may be based on real data recorded from an actual event. Hydrographs may also represent synthetic data (empirically generated from rainfall or other measurements), or they may represent purely hypothetical events.

A hydrograph may have a short time base, showing the rise and fall of the river generated by an isolated storm or operation of a control structure (opening or closing of dam spillways, for example). The time base may be a year long, showing annual rise and fall. Or it may be a longer period showing water levels or flow for the complete period of record at a given gauging station.

Historical hydrograph data is indispensable. It enables the computer model to assess the effects any intervention or combination of interventions would have on the normal patterns of flow and sediment transport. Historical data is usually analyzed statistically in order to estimate the probabilities of high or low flows occurring in a given year, or at a given time of year.

For example, the historical data may be analyzed and loaded into the computer model to project effects a dam or irrigation project would have on river flow, water level and sediment movement during the driest or wettest year to be expected in ten years, fifty years or a hundred years. The usefulness of such data in working through intra- or inter-state water allocation formula is obvious.

This kind of data is currently being collected by member countries at about 170 gauging stations in the Niger River Basin. It is being stored in the NBA/COE computer system set up in Phase I of the project.

2.2.5 Rainfall

The Phase II Water and Sediment Routing Model will not use rainfall data as a direct input. However, rainfall data will be used to generate synthetic hydrographs, which in turn can be used in the model where measured hydrographs are not available. Daily rainfall data is now regularly gathered by member countries and stored in the computer for future use.

2.2.6 Water Quality Data

Little water quality data exists on the Niger River. Water quality is not required or used in the Phase II routing model. However, it was decided that it would be wise to begin collecting some basic water quality data as part of the sediment data collection program. These data can be collected with little extra cost and effort, and can be stored for future use. They will provide a baseline to monitor changes. It is planned to collect water temperature,

dissolved oxygen levels, pH, and electrical conductivity along with each sediment sampling. Electrical conductivity serves as an indirect measurement of salinity.

3.0 Water and Sediment Routing Model: Output and Use

Once the model is developed and calibrated using physical data from the basin, it will be used to determine how any physical interventions or combinations of interventions will affect discharge, water level and sediment movement up and down stream. The function of the model is to serve as a basin-wide planning tool. It will help NBA personnel and others to determine gradually how to use limited water resources most efficiently and fairly within and among all basin countries. The model will be used to analyze existing or proposed interventions on channels, such as dams, water diversions, river stabilization and channelization works, or embankments. The model will be used for design and feasibility studies of proposed projects as well as to optimize operations of existing projects. The types of project interventions that will rely on the model for overall basin planning are irrigation and drainage, hydroelectric power, municipal and industrial water supply, flood and drought control, fisheries and navigation.

The following example illustrates a possible application of the model. Assume, as part of an overall basin development scenario, that two dams are proposed. They are to be located above and below the inland delta in Mali. Between them, a large diversion for irrigation is projected. Both dams will be designed as multipurpose structures to provide power, hold water for irrigation, and facilitate navigation by regulating flow levels.

All three interventions will profoundly affect flow and sediment characteristics of the river.

The upper dam will trap much of the sediment that would otherwise move down stream. The dam will also greatly alter downstream hydrographs (variations in water level, or stage, and/or discharge at a given point in the river over time; see Section 2.2.4). The reservoir and upstream channel will begin to silt up. This will alter channel geometry and water levels for many kilometers upstream from the reservoir. How far upstream? How much? How fast? How will it affect existing and proposed upstream users and projects? How will the effective reservoir storage alter with time?

Water leaving the new upper reservoir will carry much less sediment. Large amounts of suspended material will have settled out in the still waters of the reservoir. Thus, water flowing out of the reservoir has an unutilized potential for carrying sediment (for a given water discharge rate). It will continue to pick up sediment below the dam until a new equilibrium of suspended material occurs in that moving water. In the process, large parts of the channel will be scoured out.

The newly dislodged material will be deposited somewhere downstream. Again, the questions are where, how much, and how fast. At the irrigation diversion, some of the sediment will be diverted out of the river. Downstream flows (and related sediment transport potential) are again altered. What design, operation and equipment will be necessary to prevent the diversion and downstream irrigation channels from silting up? What effect will the

diversion have on flows and depths for navigation downstream? How about the downstream reservoir? It will back up water, altering water levels and velocities through the inland delta. What effects will these modified levels have on recessional agriculture? navigation? delta fisheries?

This model, being developed in Phase II of the COE project, will complement other models being developed for NBA use in forecasting flood and low flow conditions, and analyzing river hydraulics.

The forecasting model, developed by NBA's Hydro Niger project, with the assistance of the World Meteorological Organization (WMO) and funding from OPEC and the EEC, under UNDP coordination, is being used already to predict short-term future flows and water levels from observed upstream short-term past rainfall and flow data. In other words, each year the rainfall and water levels in the upper watershed will be used by the model to predict when and how much the river will rise and fall at downstream locations during the same year. This model can also be used to generate synthetic flow data to be employed in the water and sediment routing model.

The river hydraulics model being developed by SOGREAH is an unsteady flow model used to study the short-term movement of flood waves on the river in short reaches. This model will analyze how flow and water level may vary on an hourly or daily basis at different locations below a dam or above a large diversion for various operations of these structures. For example, if the gates or turbines of Silingue Reservoir are open or shut, the model can predict how this will affect water levels in Bamako over the following hours. This model may also be used to generate input data for the water and sediment routing model.

The water and sediment routing model is used to evaluate the intermediate and long-term effects of specific project interventions on the river flow and geometry, both up and down stream. These three models are all designed for specific purposes, and do not duplicate each other in their outputs. But they share many of the same raw data inputs, and can be used in conjunction with each other, making their simultaneous development complementary and cost effective.

Finally, how will these projects modify flows downstream? Will they reduce or augment flows at Niamey in a critically dry year like 1984-85? Could these hypothetical interventions be operated to the benefit of both up- and down-stream users? Answers to these perplexing questions will be provided by the water and sediment routing model.

The Participating Agency Service Agreement (PASA) with the COE for Phase II states that after the model is made operational, the NBA will select up to three proposed projects to be analyzed using the model. In addition to the projects selected by the NBA, the model will be used to study the interventions needed to provide navigation with minimum depths of one, two and three meters. These analytic outputs were established to provide specific minimum requirements during Phase II of the project.

However, the intent of the COE and USAID is to exploit the model as much as possible to facilitate sound, basin-wide planning. This may well involve additional runs to test variations of several more intervention scenarios in various arenas of water use.

At the end of the PASA period, the NBA will be left with the model in operating condition and a staff of individuals proficient in its use.

4.0 The Data Storage and Retrieval System (DSRS)

A major task of Phase I activities was development of a computerized DSRS for the primary purpose of storing and analyzing data needed to develop the Phase II water and sediment routing model. The DSRS will interface directly with the model. In addition to developing the DSRS software and hardware, the required data was collected from member countries, verified, put into a common base and loaded into the DSRS.

The DSRS was developed primarily as a data base for the Phase II river model. However, it has equal or greater value as a centralized, updated data base that can provide analyzed data to any and all users. For example, if a member country or project needs information on river level or flow, rainfall, etc., at a given location, it can be obtained directly from the DSRS. In addition to any or all raw data (daily flows, levels, etc.) the DSRS will provide data analyses such as:

- mean annual maximum or minimum water level;
- average flow; and
- probabilities of flow or water levels being equaled or exceeded in a given year.

In order to maintain the DSRS as a useful tool, it must be updated regularly. This is thus a major, on-going activity in Phase II. It includes collection of daily water levels from 172 river gauging stations, discharge data from 101 stations where rating curves exist, and rainfall data from 569 stations. Once the data have been collected from the member countries and participating agencies, they must beverified, loaded into the DSRS and analyzed.

Collecting data from member-country agencies requires a firm work plan, schedule and priority responsibility. The primary responsibility will rest with the Project Manager for sediment data collection. He in turn will delegate responsibility to his regional managers for all work in countries within their respective regions.

All data will be collected on an annual basis and the DSRS maintained with a target maximum lag of no more than two (2) years. Data collection activities will require up to four (4) person-months of travel per year from capitals and regional centers. A flow chart for data collection and dissemination is show in Figure 1.

5.0 Phase II Personnel Requirements: Data Gathering, DSRS and Model Development

Phase II activities in data gathering and processing, and development of the computer routing model will require the following staff:

Program Manager (hydraulic engineer) for data collection based at the NBA Executive Secretariat in Niamey

Regional Manager based in Bamako, Mali

Regional Manager based in Lokoja, Nigeria

Computer Center Manager (Computer Programmer) based at the NBA Executive Secretariat in Niamey and responsible for operating the DSRS

Laboratory and Computer Assistant for analyzing samples and data in Niamey

Water Resources Planner based at the NBA Executive Secretariat in Niamey, responsible for helping develop and operate the water and sediment routing model

Secretary/Translator based at the NBA Executive Secretariat in Niamey

Driver/Mechanic based at the NBA Executive Secretariat in Niamey

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APPENDIX B

Contractor Scope of Work for Socio-Economic and Natural Resources Assessments (SENRA)

1.0 General Objectives

The contractor will provide the technical assistance, supplies commodities, management and back-up support required to produce:

- a reconnaissance-level baseline of the Niger River Basin (NRB) south of 17 degrees 30 minutes north latitude, consisting of a natural, social and economic resources atlas of the NRB, an atlas descriptive text, and a data needs volume;

- an effects analysis of future water resource development interventions in the NRB; and

- based on the baseline and effects analysis, the written physical, social, economic and other documentation and analyses required to produce, when fully integrated with COE engineering analyses, written, multidisciplinary alternatives assessments addressing various defined major water resource development intervention scenarios in the NRB.

These interventions, currently undefined with respect to both specifications and geographical locations, are likely to include:

- single and multipurpose impoundments;

- a diverse array of water management structures;

- water withdrawal;

- dredging;

- irrigation works; and

- perhaps other associated infrastructure and/or activities.

The contractor will provide the long-, medium- and short-term technical assistance personnel required to accomplish these objectives; technical assistance personnel will work in tandem with NBA-designated professional counterparts, and in cooperation with other donor specialists working in association with NBA on basin technical issues.

The two long-term advisors will be provided by the contractor for a period of three years and will furnish advisory assistance to NBA both during and after completion of the baseline and effects analysis. The long-term advisors will also be responsible for preparing the analyses required to produce the integrated

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engineering, physical, social and economic alternatives assessments described above, in coordination with COE personnel. The contractor will also be responsible for managing, overseeing and providing top quality practical, applied, on-the-job training for counterparts, as well as for organizing short-term U.S. training in four specialized areas.

2.0 Specific Objectives

Specific objectives can be grouped into seven activity categories, i.e., data collection; atlas production; atlas text preparation; data needs volume preparation; effects analysis preparation; continuing technical assistance; and training.

2.1 Data Collection

Data will be collected in the general fields of economics, social science, soils, vegetation, irrigated agriculture, fisheries, terrestrial ecology, geohydrology, public health and cultural resources, for that part of the NRB lying south of the 17 degrees 30 minutes north latitude line.

The contractor will provide:

- long-term (39 months) personnel in the areas of natural resources economics and social science (the former will also serve as project manager);
- medium-term (18 months) personnel in the areas of soils/vegetation, irrigated agriculture, aquatic ecology/freshwater and estuarine fisheries, and terrestrial ecology; and
- short-term (four months) personnel in the areas of geohydrology, public health, cultural resources, and perhaps other areas as required.

Terms of reference, including required outputs and minimum qualifications, are attached for all described long-, medium- and short-term personnel.

Technical personnel will be responsible, under the management oversight of the natural resources economist/project manager, for traveling to all NBA mainstem states (Guinea, Mali, Niger, Benin, Nigeria), all tributary states (e.g., Ivory Coast, Burkina Faso, Cameroon, Chad) and selected European states (e.g., England, France, Switzerland, Italy) to obtain existing published and/or approved documentation on their specific technical fields for that part of the NRB lying south of the 17 degree 30 minute line. To the extent possible, these documents will be photocopied using available and/or portable copiers furnished by the contractor. The documents will be used in preparation of the atlas, atlas

text, data needs volume and effects analysis, and ultimately deposited with the NBA documentation center in Niamey, Niger.

No on-the-ground or primary data will be collected or used for the purposes of fulfilling this contract, and no proprietary information, unpublished information or other information unavailable to the general public (e.g., classified, guarded or otherwise restricted data) will be obtained, photocopied or used.

Specific data to be collected will include, but not necessarily be restricted to, the following:

- social science--documentation on administrative areas; geographical distribution of ethnic groups, demography, cyclical and noncyclical (i.e., permanent or semi-permanent) transhumance patterns; and agricultural, pastoral, fishing and other economic production/subsistence systems;

- soils and vegetation--documentation on soil types, subgroups, major groups or as available and practicable for mapping at a 1:500,000 scale level (FAO and/or U.S. soil classification systems); general structure and dominant species of vegetational systems; prime farmland within the NRB context; and prime pastureland within the NRB context;

- irrigated agriculture--documentation on geographical extent of irrigated and non-irrigated lands; soil, moisture and other constraints to irrigation; and land classification as it relates to sustained irrigability of lands;

- aquatic ecology and fisheries--documentation on important fish species distribution patterns, habitats, life cycles and movements; water quality parameters; important fishing areas; commercial and artisanal fishing patterns; offtake; and related fishing-sector data as they apply to NRB;

- terrestrial ecology--documentation on parks, refuges, protected forests and other areas; important ecological areas; and endangered or other important species habitats and/or distributions in the NRB;

- geohydrology--documentation as it relates to areal extent, depth, recharge characteristics and other parameters of major and minor aquifers in the NRB; and locations, depths, extents, exploitation history and related aspects of important mineral and other geological deposits in the NRB;

- public health--documentation as it relates to geographic distribution of schistosomiasis, onchocercosis, dracunculiasis and other major water-related diseases; and trypanosomiasis and other major non-water related diseases in the NRB;

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- cultural resources--documentation as it relates to important archeological, cultural, religious, touristic and other sites in the NRB.

There exists a very considerable body of literature on these and other NRB natural, social and economic resources both in Niamey and in other capitals and locations in the basin. While existing data and maps will be used exclusively to prepare the hard copy outputs, it is not anticipated that all of the information obtained during the data collection phase will ultimately be graphically represented on the atlas.

During the data collection as well as other phases, the contractor and technical assistance team will maximize, to the extent practicable, coordination, consultation and cooperation with COE personnel in Vicksburg and Niamey; USAID/Niamey; NBA personnel; NBA planning unit personnel; and donor technical and non-technical personnel working on related issues in Niamey and the NRB in general. The contractor should be aware that NBA staff and other donors are currently collecting considerable information (e.g., in the area of irrigated agriculture), and that all or most of this will have direct relevance to the preparation of hard outputs required under this contract.

The contractor will, after data collection, be responsible for data assessment and compilation; production and distribution of draft atlas, atlas text, data needs and effects analysis volumes; review and incorporation of comments into the draft documents after the end of the review period; and production and distribution of final editions of the four documents.

2.2 Atlas Cartograhic Production

2.2.1 General

Data for the socioeconomic and natural resource parameters will be recorded and published in an atlas format similar to that of the geomorphic atlas recently published under COE auspices. The area to be considered for the atlas is the NRB south of the 17 degrees 30 minutes north latitude.

2.2.2 Map Scales

Map products using three different scales will be used to record data--1:1,000,000; 1:500,000; and 1:250,000.

2.2.3 Map Base

The map base for the 1:1,000,000 and 1:500,000 scales will use Landat MSS imagery for the photomosaic base. The contractor

will use that imagery which is currently most readily available and cost effective. Imagery acquired during the geomorphic analysis will be made available to the contractor, who will use it whenever possible.

The map base for the 1:250,000 scale map product will be the map base at this scale used for the geomorphic atlas. This map base will be furnished at no cost to the contractor.

2.2.4 Map Products

Map products for scales 1:1,000,000 and 1:500,000 will be photomosaics using Landsat MSS imagery (black and white). These photomosaics will be prepared without ground truthing for accuracy. Checks for accuracy will be made from available topographic maps of the area. The product will be a semi-controlled mosaic.

Map bases for the 1:250,000 scale map are already available and were traced from photomosaics prepared generally as described in the first paragraph of Section 2.2.4.

2.2.5 Map Size

Two map sizes for the atlas are envisioned as possible alternatives: 24" x 36", and 12" x 18". The contractor will provide estimates of the cost of each size atlas in his proposal. Size will be determined prior to contract award.

2.2.6 Recording of Data

For the map products at scales at 1:1,000,000 and 1:500,000 data will be recorded with one color (black) overprints of the basic photomosaic.

At the 1:250,000 scale, data will be recorded in black on a black and white base.

Map indices will be developed for data recording for each basic map using black overprints in various modes such as cross hatching, line weight, etc. Simplicity in map indices will be necessary and each map index will be approved by the contracting officers representation before use in the final product.

Each map sheet will include a location index.

2.2.7 Map Description

The total number of map sheets will be dependent on selection of atlas size as described in Section 2.2.5

It is currently anticipated that seven map sets will be required to map the desired themes. One scenario for theme groupings is provided below, broken down by required scales:

1:1,000,000 -- Multispectral Scanner Base

- administrative divisions; disease distribution
- groundwater resources; important mineral and geological deposits

1:500,000 -- Multispectral Scanner Base

- soils; vegetation
- parks, reserves, important ecological areas; cultural resources
- prime farmland; prime pastureland; irrigation and irrigation potential
- agricultural, pastoral, fishing and other important economic production/subsistence systems; cyclical and non-cyclical transhumance patterns; demography

1:250,000 -- Line Base River and Tributary Maps

- fisheries resources

An additional map at 1:500,000 may well be required to reduce clutter in one of the above listed maps or to record data not listed above.

Estimated number of sheets: At 1:1,000,000, 14 sheets for each total coverage map set using small format, and four for each map set using large format. At 1:500,000, 56 sheets for each map set using small format and 16 sheets using large format. At 1:250,000, 17 sheets using small format and five using large format. Total: 259 sheets using small format and 77 using large.

2.2.8 Personnel

The following types of personnel are anticipated to be required to develop the atlas:

- cartographers with experience in developing photomap products from Landsat imagery;
- cartographic draftsmen with experience in drafting on photomaps; and
- a photo interpreter with experience in arid and tropical areas.

2.2.9 Other

Two hundred copies of the draft atlas will be produced and distributed for review by the contractor, 150 in French and 50 in English. One thousand copies of the final atlas will be produced and distributed by the contractor, 750 in French and 250 in English. If a user's guide to the atlas is published (in pamphlet form), it will also appear in final in 750 French and 250 English copies. Distribution will be determined by NBA, USAID/Niamey, COE and the contract technical assistance team, after consultation with other NBA donors.

Maps will be printed on map stock paper.

The atlas cover will be at least double the weight of the map stock for individual map sheets.

An additional 200 unbound copies of each map sheet will be furnished to NBA for internal use.

It is anticipated that this effort will be produced in one-color overlays on photomosaics. However, an additional proposal for multicolor printing will be considered if presented by the contractor.

Any quality of product upgrade may be presented as an alternative cost to the basic product described herein, but the contractor must be able to deliver the alternative product on the same time schedule.

2.2.10 Schedule

The photo interpreter is to arrive in West Africa not later than day 60. The draft atlas text is to be available not later than day 390. The final atlas text is to be available not later than day 690, and the final product is to be at NBA in Niamey not later than day 840.

2.3 Atlas Descriptive Text

An atlas descriptive text will be prepared by the contract technical assistance team as a separate document, and will describe and discuss each of the major sectoral themes graphically represented in the atlas. A preliminary list of thematic contents and authors includes:

soils (soils/vegetation specialist),
vegetation (soils/vegetation specialist),
groundwater resources (geohydrologist),
surface water resources (geohydrologist),
important mineral and geological deposits (geohydrologist),
prime farm and pastureland (soils/vegetation specialist),
irrigation potential (irrigated agriculture specialist),
fisheries resources (fisheries specialist),
agricultural and other economic production/subsistence systems (social scientist),

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administrative divisions (social scientist)
ethnic groups (social scientist),
demography (social scientist),
transhumance patterns (social scientist),
disease (public health specialist),
parks, refuges and important ecological areas (terrestrial ecologist),
cultural resources (cultural resources specialist).

Two hundred copies of the draft atlas text will be produced and distributed for review by the contractor, 150 in French and 50 in English. One thousand copies of the final atlas text will be produced and distributed by the contractor, 750 in French and 250 in English. Distribution will be determined by NBA, USAID/Niamey, COE and the contract technical assistance team, after consultation with other NBA donors.

2.4 Data Needs Volume

A data needs volume will be prepared by the contractor as a separate text and will describe for each sector the degree to which primary and/or secondary data are insufficient for macro-planning, mid-level planning, and microplanning purposes. While covering the entire NRB south of the 17 degree 30 minute line, this discussion will be very strongly oriented towards planning as it relates to impoundment construction and development of other major water resource development interventions associated with the Niger River and its major tributaries.

It is currently anticipated that sections in the data needs volume will include:

soils,
vegetation,
groundwater resources,
surface water resources,
important mineral and geological deposits,
prime farm and pastureland,
irrigation potential,
fisheries resources,
agricultural and other economic production/subsistence systems,
administrative divisions,
ethnic groups,
demography,
transhumance patterns,
disease,
parks, refuges and important ecological areas, and
cultural resources.

Two hundred copies of the draft needs volume will be produced and distributed for review by the contractor, 150 in French and 50 in English. One thousand copies of the final data needs volume

will be produced and distributed by the contractor, 750 copies in French and 250 in English. Distribution of draft and final documents will be determined by the NBA, USAID/Niamey, COE and the contract technical assistance team, after consultation with other NBA donors.

2.5 Effects Analysis

The effects analysis will be entitled, "Physical, Economic, Social and Other Effects of Impoundments and Major Water Resource Development Interventions in the Niger River Basin." It is currently anticipated that it will include the following sections:

1.0 Physical Effects
- 1.1 Soils
- 1.2 Vegetation
- 1.3 Surface Water Resources
- 1.4 Groundwater Resources
- 1.5 Important Geological Deposits

2.0 Social Effects
- 2.1 Production/Subsistence Systems
- 2.2 Human Health
- 2.3 Demographics
- 2.4 Transhumance Patterns
- 2.5 Other Social Effects

3.0 Economic Effects
- 3.1 Irrigated and Non-Irrigated Agriculture
- 3.2 Fisheries
- 3.3 Rangeland Resources
- 3.4 Transportation
- 3.5 Industry
- 3.6 Other Economic Effects

4.0 Other Effects
- 4.1 Special Terrestrial Resources
- 4.2 Cultural Resources

For the purposes of the effects analysis, the contractor will address both positive and adverse impacts and, to the extent practicable, the relative economic tradeoffs involved in various intervention scenarios in various geographic zones. The contractor will approach this effects analysis from two perspectives--the intervention perspective (e.g., impoundments, water withdrawal, irrigation infrastructure) and the physiological perspective (e.g., upper watershed to the inland delta; inland delta; inland delta to the Kainji Reservoir in Nigeria; and from the Kainji Reservoir to the mouth of the Niger River). The contractor will refine this approach in close coordination, consultation and cooperation with appropriate COE, USAID, NBA, planning unit, and donor personnel.

Brainstorming, consultation, alternative scenario selection and evaluation, and draft effects analysis preparation will be conducted by long- and medium-term technical assistants in Niamey, Niger, during a period not to exceed 60 days. This process will not be conducted in a vacuum. Instead, it will be accomplished as a cooperative effort between the long- and medium-term technical assistance team and their respective counterparts. Finalization of the draft effects analysis will be performed in the United States, in tandem with long- and medium-term technical assistance counterparts. Short-term technical assistance personnel will write both draft and final sections for the effects analysis in the United States.

Two hundred copies of the draft effects analysis will be produced and distributed for review by the contractor, 150 of which will be in French and 50 of which will be in English. One thousand copies of the final effects analysis will be produced and disseminated by the contractor, 750 in French and 250 in English. Distribution of the draft and final documents will be determined by NBA, USAID/Niamey, COE and the contract technical assistance team, after consultation with other NBA donors.

2.6 Continuing Technical Assistance

Both the natural resources economist/project manager and the social scientist will be provided for a period of three years. These individuals will provide continuous assistance to the NBA planning unit and the NBA both during and after the data collection, document preparation, and document distribution stages of the project. After completion of the draft baseline documents and effects analysis, both long-term personnel will be responsible for performing the written analyses required to produce, when fully integrated with COE engineering analyses, integrated written alternatives assessments for various defined major water resource development intervention scenarios in the NRB. Primary responsibility for selection of alternative scenarios lies with COE and NBA; however, selection of the actual scenarios ultimately assessed may be significantly affected by the professional input of the long-term economist, the social scientist and other NBA donor personnel.

2.7 Training

Training will consist almost exclusively of on-the-job training. Each of the long-term and medium-term technical assistance personnel will have a professional counterpart with whom he or she will work and train throughout his or her period of activity on the project. The only exception to this may occur during certain stages of document preparation which will take place in the United States.

Following completion of the draft effects analysis, each of the four counterparts for the four medium-term positions

(i.e., the counterparts for the irrigated agriculture specialist, soils/vegetation specialist, fisheries specialist, and terrestrial ecologist) will undergo training of three to five months in the United States. They will be assigned to work with appropriate, applied professional personnel actually engaged on comparable projects in their respective fields of expertise. The contractor will arrange for and ensure quality control of this training. Very strong emphasis will be placed on training programs conducted by COE, the U.S. Bureau of Reclamation, the U.S. Fish and Wildlife Service, the U.S. Bureau of Land Management and state water development authorities or similar institutions working on large-scale water development projects in the United States.

3.0 Technical Personnnel Terms of Reference

3.1 Long-Term Technical Assistance

3.1.1 Applied Natural Resources Economist/Economist

Outputs

A. Manage overall project, including overseeing and assuring quality control of long-term, medium-term and short-term technical assistance; and baseline and effects analysis production, review and distribution activities.

B. Manage, oversee and ensure quality control of all participatory and other training activities.

C. Prepare concise, written descriptive discussion of economic effects of impoundments and other major water resources development interventions in the NRB, for the effects analysis. References, documentation and bibliography required.

D. Train NBA-designated participatory counterpart throughout period of assignment.

E. Provide long-term assistance to the planning unit and NBA in the area of natural resources economics as it relates to NRB planning and water resources development.

F. Prepare, in full coordination and cooperation with COE and NBA personnel, the written analyses required to produce, when fully integrated with COE engineering analyses, integrated written alternatives assessments addressing various defined major water resource development intervention scenarios in the NRB. Prepare these analyses with the assistance of the long-term social scientist, NBA-designated counterparts, donor technical personnel, COE technical personnel, NBA, and short-term technical assistance as required.

Qualifications

A. Master's or higher degree in natural resources economics, water resources development economics, river basin development economics, or closely allied field, with strong orientation towards evaluation of economic trade-offs involved in major water resources development interventions, particularly as they relate to agricultural and pastoral lands, fisheries, and other natural resources.

B. At least 10 years' applied work experience in natural resources economics, river basin development planning, and/or development economics, including: at least five years' experience in managing multidisciplinary team activities; four years' experience in Asia, Latin America or Africa, preferably West Africa; three years working in cooperation with the U.S. Army COE, U.S. Bureau of Reclamation, state water development authorities (SWDA), or similar national or extranational entities; and at least three years in assessing economic trade-offs associated with impoundments and other major water resources development interventions. Must have strong professional history of work experience in arid and semi-arid lands, as well as the humid and subhumid tropics.

C. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation and map and atlas production oversight experience.

D. Working knowledge of computer fundamentals, especially as they relate to social, economic and natural resources data storage, retrieval, interpretation and analysis.

E. Excellent writing skills.

F. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers and host-country counterparts.

F. FSI or equivalent 3/3 level in French.

3.1.2 Applied Social Scientist

Outputs

A. Collect existing published and/or approved documentation on administrative areas; geographical distribution of ethnic groups; demography; cyclical and non-cyclical transhumance patterns; and agricultural, pastoral, fishing and other economic production/subsistence systems.

B. Assure quality control in transfer of data on these themes to base maps at 1:1,000,000 and 1:500,000 scales.

C. Prepare concise written descriptions of data needs in these areas for the data needs document.

D. Prepare concise, written descriptive discussion(s) on these themes for the atlas descriptive text document.

E. Prepare concise, written, descriptive discussion(s) on the social effects of impoundments and other major water resource development interventions in the NRB for the effects analysis. References, documentation and bibliography required for both the atlas descriptive text and the effects analysis.

F. Train NBA-designated participatory counterpart throughout period of assignment.

G. Provide long-term assistance to the planning unit and NBA in the area of social sciences as it relates to NRB planning and water resources development.

H. Prepare, in full coordination and cooperation with COE and NBA personnel, the analyses required to produce, when fully integrated with COE engineering analyses, integrated written alternatives assessments addressing various defined major water resource development intervention scenarios in the NRB.

Qualifications

A. Master's or higher degree in sociology, socioeconomics or closely allied field.

B. At least 10 years' experience in evaluation of rural agricultural, pastoral and fishing production/subsistence systems, including: at least two years' applied field work; at least five years' African experience, preferably in West Africa; at least three years' professional experience in assessing positive and adverse impacts of major water resource development interventions on rural agricultural and pastoral production/subsistence systems; and at least two years' professional experience working in cooperation with COE, the U.S. Bureau of Reclamation, SWDAs, or similar national or extranational entities.

C. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation.

D. Working knowledge of computer fundamentals, especially as they relate to social and socioeconomic data storage, retrieval, interpretation and analysis.

E. Excellent writing skills.

F. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers and host-country counterparts.

G. FSI or equivalent 3/3 level in French.

3.2 Mid-Term Technical Assistance

3.2.1 Applied Soils/Vegetation Specialist

Outputs

A. Collect existing published and/or approved documentation on soils (to the greatest detail practicable for mapping at 1:500,000 scale); vegetation (general structure and dominant species); prime farmland within the NRB context; and prime pastureland within the NRB context.

B. Assure quality control in transfer of data on these themes to 1:500,000 scale base maps.

C. Prepare concise written descriptions of data needs in these areas for the data needs document.

D. Prepare concise written, descriptive discussions on these themes for the atlas descriptive text.

E. Prepare concise written, descriptive discussions on the soil and vegetational effects of impoundments and other major water resource development interventions in the NRB, for the effects analysis. References, documentation and bibliography required for atlas descriptive analysis and effects analysis.

F. Train NBA-designated participatory counterpart throughout period of assignment.

Qualifications

A. Master's or higher degree in soil science, range science, land reclamation or closely allied field.

B. At least seven years' applied work experience in soils and vegetation classification and/or mapping and evaluation, including: at least three years' related work experience in African arid and semi-arid lands, preferably in West Africa; two years professional work experience with COE, U.S. Bureau of Reclamation, SWDAs or similar national or extranational entities; and at least three years in assessing positive and adverse effects of major water development interventions on soil and vegetational resources as they relate to irrigated and non-irrigated agriculture and range productivity.

C. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation

D. Excellent writing skills.

E. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resources development engineers and host-country counterparts.

F. FSI or equivalent 3/3 level in French.

3.2.2 Applied Irrigated Agriculture Specialist

Outputs

A. Collect existing published and/or approved documentation on irrigated agriculture in the NRB, and potential soil, moisture and other constraints to development of irrigated and potentially irrigable lands.

B. Develop and apply a methodology for classification of lands in proximity to the Niger River and its major tributaries as to their potential for sustained conversion to irrigated agriculture, and for likely productive outputs under irrigation. Delineate and classify these lands on base maps at the scale of 1:500,000 including, as practicable, all lands within an economically feasible irrigable distance from the main river and tributary stems.

C. Assure quality control in transfer of data on this theme to the base maps.

D. Prepare a concise written description of data needs in the area of irrigated agricultural potential for the data needs document.

E. Prepare a concise, written, descriptive discussion of this theme for the atlas descriptive text, providing empirical information where useful and practicable.

F. Prepare concise, written descriptive discussion on the effects to irrigated and non-irrigated agriculture of impoundments and other major water resource development interventions in the NRB for the effects analysis. References, documentation and bibliography required for descriptive text and effects analysis.

G. Train NBA-designated participatory counterpart throughout period of assignment.

Qualifications

A. Master's or higher degree in agriculture, agronomy, irrigation engineering, or closely allied field.

B. At least eight years' applied work experience in irrigation agriculture, including: at least five years' experience in arid and semi-arid lands irrigation; at least three years' agricultural work experience in Africa, preferably West Africa; at least two years' agricultural work experience with COE, U.S. Bureau of Reclamation, SWDAs or similar national or extranational entities; at least two years in assessing positive and adverse effects of major water development interventions on irrigable and non-irrigated lands; substantial applied field experience in salinization, waterlogging, drainage and other problems in arid and semi-arid irrigated lands; and solid comprehension of empirical economic

costs and benefits of irrigation activities in arid and semi-arid lands.

C. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation.

D. Working knowledge of computer fundamentals, as they relate to data storage, retrieval, interpretation and analysis.

E. Excellent writing skills.

F. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers and host-country counterparts.

G. FSI or equivalent 3/3 level in French.

3.2.3 Applied Aquatic Ecologist/Freshwater and Estuarine Fisheries Specialist

Outputs

A. Collecting existing published and/or approved documentation on important fish species distribution patterns, habitats, life cycles and movements; water quality parameters; important fishing areas; commercial and artisanal fishing patterns; offtake; and related fishing-sector data as they apply to the NRB.

B. Assure quality control in the transfer of data on these themes to 1:250,000 scale base maps.

C. Prepare a concise written description of data needs in these areas for the data needs document.

D. Prepare a concise, written, descriptive discussion on these themes for the atlas descriptive text.

E. Prepare a concise, written, descriptive discussion on the effects of impoundments and other major water resource development interventions in the NRB to freshwater, estuarine and marine fisheries. References, documentation and bibliography required for descriptive text and effects analysis.

F. Train NBA-designated participatory counterpart throughout period of assignment.

Qualifications

A. Master's or higher degree in aquatic ecology, limnology, fisheries or biology, with strong orientation towards aquatic ecology and freshwater fisheries resources.

B. At least five years of practical, applied and related work experience, including: at least two years of related experience in West Africa; three years of professional experience in assessing positive and adverse impacts of impoundments and other major water resources development interventions on freshwater fisheries; and at least two years of professional experience working in cooperation with COE, U.S. Bureau of Reclamation, SWDAs or comparable national or extranational entities.

C. In-depth knowledge of worldwide, and particularly African, experience in effects of impoundments on fisheries productivity through time, as well as economics of freshwater riverine and impoundment fishing industries.

D. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation.

E. Working knowledge of computer fundamentals, as they relate to data storage, retrieval, interpretation and analysis.

F. Excellent writing skills.

G. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers and the host-country counterparts.

H. FSI or equivalent 3/3 level in French.

3.2.4 Applied Terrestrial Ecologist

Outputs

A. Collect existing published and/or approved documentation on parks, refuges, protected forests and other areas; important ecological areas; and endangered or other important species habitats and/or distributions.

B. Assure quality control in transfer of data on these themes to 1:500,000 scale base maps.

C. Prepare concise written decription(s) of data needs in these areas for the data needs document.

D. Prepare concise, written, descriptive discussion on the effects to special terrestrial resources of impoundments and other major water resource development interventions in the NRB for the effects analysis. References, documentation and bibliography required for the atlas descriptive text and the effects analysis.

E. Train NBA-designated participatory counterpart throughout period of assignment.

Qualifications

A. Master's or higher degree in applied ecology, ecology, biology, wildlife management, natural resources management or closely allied field.

B. At least five years of practical, applied and related work experience, including: at least two years of professional experience in Africa, preferably West Africa; at least three years work experience in assessing positive and adverse impacts of major water resources development interventions on vegetation, terrestrial vertebrates, and sensitive, protected or important ecological areas; and at least two years' professional work experience in cooperation with COE, U.S. Bureau of Reclamation, SWDA's or other similar national or extranational entities.

C. Significant cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation.

D. Excellent writing skills.

E. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers and host country counterparts.

F. FSI or equivalent 3/3 level in French.

3.3 Short-Term Technical Assistance

3.3.1 Geohydrologist

Outputs

A. Collect existing published and/or approved documentation on the areal extent, depth, recharge characteristics and other relevant data, as available, on major and minor aquifers in the NRB; and on the locations, depths, extents, exploitation history and related information on important mineral and other geological deposits in the NRB.

B. Assure quality control in transfer of data on these themes to 1:1,000,000 scale base maps.

C. Prepare concise written descriptions of data needs in these areas for the Data Needs Document.

D. Prepare concise, written, descriptive discussions on these themes for the Atlas Descriptive Text.

E. Prepare concise, written, descriptive discussion on the effects of impoundments and other major water resources development interventions on surface water resources, groundwater resources, and important geological deposits for the Effects Analysis. References, documentation and bibliography required for Descriptive Text and Effects Analysis.

Qualifications

A. M. Sc. or higher degree in hydrology, with considerable educational and/or work experience in economic geology.

B. At least five years' work experience in hydrology or economic geology, including at least two years' work experience in Africa.

C. Strong cartographic and remote sensing interpretational experience, including Landsat MSS and aerial photographic interpretation.

D. Excellent writing skills.

E. Excellent skills in professional, interpersonal working relationships.

F. FSI or equivalent 3/3 level in French.

3.3.2 Public Health Specialist

Outputs

A. Collect existing published and/or approved documentation on the geographic distribution of schistosomiasis, onchocercosis, dracunculiasis, and other major water-related diseases, as well as trypanosomiasis and other major non-water related diseases, in the NRB.

B. Assure quality control in transfer of data on these themes to 1:1,000,000 scale base maps.

C. Prepare concise, written description of data needs in this area and the area of public health in general for the Data Needs Document.

D. Prepare concise, written, descriptive discussion on this theme for the Atlas Descriptive Text.

E. Prepare concise, written descriptive discussion on the public health effects of impoundments and other major water resource development interventions in the NRB for the Effects Analysis. References, documentation and bibliography required for the Descriptive Text and Effects Analysis.

Qualifications

A. M.D., masters in public health, or comparable or higher degree in closely allied field.

B. At least five years practical, applied and related work experience, including: at least two years related work experience in Africa; and at least one year of professional experience in assessment of positive and adverse effects of impoundments and major water resource development interventions on water-related disease incidences and public health in general.

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C. Excellent writing skills.

D. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers.

E. FSI or equivalent 3/3 level in French.

3.3.3 Cultural Resources Specialist

Outputs

A. Collect existing published and/or approved documentation on the locations of important archeological, cultural, religious, touristic and other sites in the project area.

B. Assure quality control in transfer of data on these themes to 1:500,000 scale base maps.

C. Prepare concise, written description of data needs in these areas for the Data Needs Document.

D. Prepare concise, written, descriptive discussion on these themes for the Atlas Descriptive Text.

E. Prepare concise, written, descriptive discussion on the effects to cultural resources resulting from impoundments and other major resource development interventions in the NRB for the Effects Analysis. References, documentation and bibliography required for Atlas Descriptive Text and Effects Analysis.

Qualifications

A. Masters or higher degree in anthropology of archeology.

B. At least five years of practical, applied and related work experience, including: at least two years of related work experience in North or West Africa, at least two years of professional experience in assessing impacts of impoundments and other major water resource development interventions on cultural resources; at least two years of field experience, at least one of which should be in the area of salvage archeology; and at least two years of professional experience working in association with COE, U.S. Bureau of Reclamation, SWDA's or similar national or extranational entities on assessing and mitigating adverse impacts of major water resource development projects on cultural resources.

C. Excellent writing skills.

D. Excellent skills in professional, interpersonal working relationships, including working in cooperation with professional water resource development engineers.

E. FSI or equivalent 3/3 level in French.

4.0 Training

4.1 General

Training discussed here is to be undertaken as part of the SENRA efforts. The original project paper envisioned this portion of training would involve long-term advanced degree training for four individuals in the United States. The revision team investigations indicate training should focus instead principally on counterpart training during the various components of the SENRA efforts.

Most of the counterpart training will take place in West Africa while work is underway at various locations. However, some short-term training will occur in the United States, under the aegis of agencies or organizations involved in comprehensive river basin development.

4.2 Specific Training

4.2.1 Long-Term Counterpart

The SENRA effort involves two long-term (39 months) specialists to assist NBA and manage/participate in the contract effort in this area. Counterparts should be assigned to each of these individuals for the duration of the project period. These counterparts should be either current NBA staff or individuals who could be hired by NBA at the conclusion of the three-year training program. Most effective training would result if the two counterparts' educational backgrounds directly parallel those of the long-term specialists. Individuals with backgrounds in closely related areas will also be considered for this training. (Detailed descriptions of the technical specialists' qualifications are included in the SENRA work description, Section 3.1 above.)

The two counterparts must have at least a master's degree in their areas of specialization. Fluency in either French or English, with some ability in the other language, is required. Some additional language training can be taken as a part of the long-term assignment.

4.2.2 Participant Training (Data Collection and Analysis)

This training will consist of four counterparts for the four medium-term specialists in the SENRA contract effort. Those individuals are anticipated to be member-state technicians who will return to the member states at the conclusion of the counterpart training. Upon return they will then be technical specialists highly aware of NBA activities who can serve as additional points of contact for NBA work in the member states. Technical backgrounds for these individuals should be similar to that of the medium-term contract technical specialists who will be their counterparts. (Detailed descriptions of the SENRA medium-term specialists'

qualifications are included in the SENRA work description, Section 3.2, above.)

In all cases, these medium-term counterparts will require a bachelor's degree. Some work experience in the technical area is preferred but not required. Sources of these personnel include member-state agencies and universities, as well as other professionals in the member states. For the data analysis portion of this training to be the most effective, it should occur in close coordination with the COE engineering analysis of possible water resources interventions conducted as another portion of this project.

4.2.3 Participant Training (Short-Term Technical)

This training will consist of four technicians in the same areas of expertise as those in 4.2.2 above. The same individuals who participate in that training are not precluded from being selected for this portion of the training. Candidates for this training should be NBA member-state personnel who will continue to work closely with NBA after completion of the training.

The training will consist of short courses and counterpart training in water resources development and analysis in the United States with U.S. agencies (federal or state) or with other organizations involved in comprehensive river basin development planning. English language proficiency is required for most effective training.

5.0 Key Points of the Schedule

Key points of the schedule for the revised implementation plan are contained in Section III.D.

6.0 Project Management

The SENRA work under the NRBP will be contracted through a non-competitive bidding process. Proposals will be solicited from interested architectural and engineering firms. A negotiated contract will be awarded to an approved firm.

USAID management of this contract will be provided by the individual charged with administering the existing COE PASA agreement under the NRBP, Phase II. If the position were to become vacant and no direct hire were available to fill it, a personal services contractor (PSC) would be hired by USAID/Niger to take over management of the contract through to the end of the project.

In the event a non-engineer PSC were hired to administer the COE PASA and the SENRA contract, USAID/Niger will have to make provision for an annual review of technical aspects of NRBP project activities. This review will be undertaken by a three-person team, composed of a river systems planner or engineer, a social scientist and an environmentalist. These individuals could be recruited either from REDSO/Abidjan, or through an appropriate IQC firm. If this procedure became necessary within the first two years of Phase II, USAID/Niger might consider contracting with an IQC firm to provide a consistent team of technical reviewers over the life of the project.

Justification for Contracting Mode

This assessment work might be turned over under the COE PASA for administration by COE management personnel in Niamey and Vicksburg. The risks of this arrangement would outweigh apparent benefits. By transferring management responsibility to the COE, USAID could avoid using scarce direct hire management time to supervise NBA contracts. It might also be argued that consolidating control over the river system modeling and socio-economic and natural resources work in a single management unit would ensure integration of both studies.

Two counter arguments should be considered here. First, working out feasible intervention scenarios will be an extra-ordinarily tricky task. Success will depend on all parties to the process vigorously articulating their viewpoints before agreement is reached on this or that approach. If difficulties are not worked through at the secretariat planning unit level, likelihood that propositions will be approved by the NBA's political councils is slim indeed. Making the assessment contract technical assistance team subordinate to COE supervision could reduce technical assistance team incentives to defend their conclusions, particularly where those raise troublesome issues, as the process of defining intervention options moves forward.

Second, defining intervention options involves political interactions among various NBA and donor groups participating in the process. Obviously economic and technical considerations, e.g., dynamics of natural and engineered river systems, soils,

vegetation and fisheries, etc., will play a large part in defining the set of possible and the subset of desirable interventions. But the political framework within which those decisions will be reached will exert some influence on the quality of decisions.

USAID, as a firm matter of policy, does not want to dominate that process, despite the fact that the agency is currently supplying the largest share of donor financing to the NBA. The easiest way to encourage NBA and other donor staff to view the USAID NBA project, not as a monolithic effort, but as two separable activities, is to manage them separately. If other players in the planning game realize collaboration or disupte with one USAID-financed project group does not automatically imply the same relationship with the other, the risks of dissent are reduced, interactions will probably intensify, and the quality of discussion about options will likely rise.

APPENDIX C

Institutional Analysis of the NBA

Introduction

The Niger Basin Authority (NBA) faces an uncertain future. Its predecessor, the Niger River Commission (NRC), was founded in 1963 and had as its mission the promotion of navigation and economic development in the Niger River Basin (NRB). Very little was achieved during the NRC's 17 years. The NBA, formed in 1980 as a successor institution to the NRC, has a mandate to undertake not only river system analysis, but development activities throughout the NRB.

Since 1980, the NBA has been stagnant. Internal and financial management problems have plagued the agency. Furthermore, little visible progress has been made in the area of planning for multi-purpose NRB development, although some very important bases for indicative planning activities are either under development or already operational in the form of three predictive models, which for the first time, permit projections of river flow under varying circumstances (see Appendix A). Even less progress has been made by the NBA in attracting financing for, supervising the implementation of, nor operating NRB development projects, although all of these activities lie within the NBA's mandate.

Is this apparent inertia simply a matter of individuals and "organigrammmes"--i.e., the wrong people in the wrong slots? Or are other additional factors perhaps operating? This analysis argues for the second possibility, that the NBA's current mandate and the political structures which underlie basin planning activities stalemate initiatives at the level of the Executive Secretariat, rather than gradually promoting mutually beneficial interactions. In addressing these issues, this analysis adopts a broad perspective, focusing on the basin-wide context of planning and policymaking. It tries to highlight the major real or potential obstacles to progress and suggests possible solutions.

Appendix C begins with a statement of the NBA's problem. It then specifies some assumptions about necessary conditions for devising solutions to that problem. The appendix concludes with proposals for restricting the NBA mandate to reduce its task to manageable proportions, appropriate rules for making policy decisions and preparing development scenarios, and some suggestions for appropriate next steps.

The Problem: Managing a Common Property Resource

The starting point in preparing development scenarios for the NRB is the consideration of a number of complicating factors. Waters draining from basin watersheds into Niger tributaries and then into the Niger itself are a common pool flow resource. All basin waters, with the sole exception of those that originate entirely in Nigeria, move through an international arena. They are put to many beneficial in-stream and consumptive uses by a wide variety of user groups. In-stream uses (e.g., hydro-power, navigation and fisheries) both compete with and complement each other, depending on local circumstances.

Consumptive uses (for instance, irrigation and urban water supply), and the pollution problems that such uses may eventually present in the form of overloads of sewage and salts returned to the river system can become highly competitive, both within a given use as well as among uses. Water lost through evaporation in upstream irrigation projects will be available for neither downstream perimeters nor urban water supply. So long as the supply remains adequate to meet all demands, the problem is only a potential one. But the precarious water supply situation at Niamey in April, 1985 (resolved only by damming the river temporarily and curtailing outtake at upriver irrigation projects), demonstrated conclusively that Niger River waters can no longer meet all demands in years of low rainfall. Indeed, if current arid conditions continue, demand will predictably outstrip supply with increasing frequency at critical points in the irrigated agricultural production cycle.

Priorities among these uses also shift over time. Recent arid conditions have contributed at least partially to increased desertification. They have also lowered food production and raised very serious concerns about the future economic viability of NRB Sahelian and Sudanian Zone (SSZ) countries. Consequently, interest in irrigation projects, as a means of shoring up or reversing the trend of falling food production, has increased dramatically in SSZ and donor communities. The arid Sahelian countries of the Niger's main stem and its tributaries (Mali, Niger and Burkina Faso) consider this issue a particularly pressing one.

However, competing uses pose different sets of demands. This is particularly true for hydro-power production in downstream Nigeria, but also in the Sahelian states and quite possibly upstream Ivory Coast, Guinea and Cameroon, if evaporation rates at impoundment reservoirs increase significantly. Many similar illustrations could be added, but the point is clear--multiple uses exist, and many are actually or potentially competitive to some extent.

The implications of this predictable lack of "jointness" (the river's inability to satisfy all of the demands made on it at all times) have been perceived by NBA member states from the first beginnings of the NRC. However, the different perspectives of the various member states (upstream versus downstream location, arid versus humid environment, legal and administrative traditions, political orientations, etc.) appear to produce differing interpretations of the implications of the lack of jointness. This section will examine these perspectives in detail in an effort to suggest the full range of considerations that are potentially involved in producing a workable overall plan for the development of NRB waters.

Developing a complete Integrated Niger Basin Plan (INBP) would represent an enormous undertaking, if the NBA mandate, as it is currently formulated, were to guide that task. Two major types of factors account for the complexity of this task--technical problems in NRB system monitoring and political issues in determining appropriate uses of basin waters.

Technical Issues

Issues of data reliability arise whenever questions concerning system behavior are posed. The authority of NBA analyses and recommendations will hinge on the demonstrated reliability of monitoring data and model predictions. The models now operating or being calibrated are fairly well developed. Nonetheless, they will require increasingly accurate inputs as competing demands for river waters arise. The data collection methodologies, and respect for the detailed procedures of those methodologies are critical now and will become more so in the future. Careful training of technicians and tight supervision of data collection efforts will remain central concerns as long as the NBA Executive Secretariat continues to function as the organization charged, in part, with collecting data and coordinating information-gathering. All efforts to collect data must emphasize not only the acquisition, proper installation and maintenance of monitoring equipment, but also the creation of NBA-member state relations and incentives for technicians that will encourage and reinforce accuracy in data collection efforts.

Political Problems

The political complexities of engineering solutions to NRB development problems are striking. Viable propositions must obtain the support of nine member countries with diverse sociopolitical systems and very different perspectives on NRB development options as a consequence of their differing locations in the NRB and environmental situations. It is possible to envision two distinct approaches, which may be termed

"centralized" and "mixed centralized-decentralized" development options.

The centralized scenario favors the coordination of planning, political decision-making, and probably implementation and operations from a single center. This option makes the implicit assumption that "everything is related to everything else" in the realm of river basin development. Of course, this is true at some global level in political and economic terms, although not necessarily at lower levels. As far as physical and environmental relations are concerned, the assumption of interrelatedness appears reasonably accurate for many sub-basin contexts, but less so for the broad regional setting. For instance, changes in the character of rain forests in Guinea will not likely affect river flows in the Benue and its tributaries (with the only possible exception occurring in the final reaches of the Benue before its confluence with the Niger) through the medium of sediment transported by main stem waters. Similarly, what happens in Chad may well have some direct effect on events downstream in Cameroon and Nigeria. But the direct or indirect impact of Chadian physical and environmental phenomena on activities in Guinea, at the other end of the NRB, is likely to be tenuous and quite limited.

However, critical interrelationships at the sub-basin level clearly do exist. If each member country or project intervention undertaken in the NRB were to function as an autonomous unit, the likelihood of conflict among competing demands, destruction of productive opportunities and, hence, stalement or worse would be great. This would amount to highly inefficient use and ineffective conservation of the potential of the NRB water resource.

As things now stand, the centralized scenario may be the dominant orientation. Given the "one-world" assumption, people who adopt this approach conclude that efficient development of NRB resources can occur only through centralized information-gathering, monitoring and supervision of project implementation and intervention operations. In particular, some Francophone NBA member states seem to favor this option.

The centralized-decentralized scenario would rely on centralized information-gathering, but would use political communities of widely varying scale to undertake planning, implementation and operation activities. The fundamental reason in favor of the dispersion of planning and operational authority under this option is the assumption that it is necessary for efficient, equitable and environmentally sound development of the NRB. In this view, many problems related to NRB development do not concern all member states. Instead, many, if not most, are of direct interest to only a subset of the states. Examples of such subsets would include the riverine states along the Niger's

main stem or those on the Benue and its tributaries, or subcommunities of those groups, such as the members of the Liptako-Gourma Pact. Many other problems concern people from only a single state, and still others, those from a single subregion of a state.

Problems clearly differ significantly in their scope. For purposes of this discussion, the scope of a problem is defined as the geographic area and set of individuals affected by it, (i.e., those who will experience positive or negative consequences). This definition has important implications for transactions costs* involved in working out solutions to problems. If the political jurisdiction responsible for solving a given problem is a smaller geographic area than is affected by the problem itself or does not include all of the affected individuals, critical factors causing the problem or elements involved in the solution may not be taken into account.

An example of this situation is the problem of guaranteeing minimum flows for navigation in the Niger's Interior Delta in Mali. If the responsible jurisdiction were constituted from the Mali's Fifth and Sixth Regions, which physically encompass Interior Delta, it would clearly be too small. Most of the water flowing in the delta originates upstream in Guinea, Ivory Coast and southwestern Mali. Even if Mali were defined as the controlling jurisdiction, it would still be too small, since most of the flow in the delta arises in eastern Guinea, and a good deal of natural and artificial water retention capacity is located there. Thus, neither the Fifth-Sixth Regions nor Mali jurisdictions would be large enough to control the decision centers that regulate water flows, although Mali as the unit of governance would exercise more control for this purpose than a joint jurisdiction composed of the Fifth and Sixth Regions together.

If the scales of jurisdiction and problem were reversed--that is, if the jurisdiction charged with controlling navigation in the Interior Delta were comprised of all nine NBA members, it can be argued that the jurisdiction would be simply too large for the problem. Chad and Cameroon have no direct interest in delta navigation conditions, although Benin, Burkina Faso, Niger and Nigeria may have an indirect interest in improved transportation to and from the delta. Ivory Coast and Guinea might be directly concerned, if river transportation through and upstream from the delta would significantly reduce the costs of importing bulk goods. However, since both countries have reasonable access to sea transportation routes and relatively developed highway

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*The costs of arriving at an agreement, which may include time, money, energy and current or future opportunities that are foregone.

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infrastructures, river navigation may be of comparatively little interest to them. Only Mali, particularly its Fifth and Sixth Regions, has a strong direct interest in delta navigation.

In this hypothetical example, the number of member countries that are either uninterested or only slightly interested in the problem of maintaining sufficient water depth in the delta to permit navigation far outweighs the number which might see some value in such an operation. The transactions costs of including member states with little concern for the problem in the decision-making group responsible for organizing and maintaining navigation flows in the delta would be high. Representatives of uninterested states have an incentive to drive hard bargains before they agree to projects favoring delta navigation. The reason is apparent--if they do not engage in this sort of "log-rolling" behavior ("I'll vote for this one, if you'll agree to vote for a project I want in the future, when I call in your vote"), they are likely to find themselves unable to obtain support for projects they want. If representatives of an uninterested state are not certain they will need such support in the future, they may try to trade their votes for present benefits in the form of desirable, but low-priority or unnecessary, projects to be approved by the NBA and implemented within their national boundaries.

The same calculations also hold for situations where an existing general-purpose jurisdiction provides the framework for management of a common property resource that is smaller in scope than that jurisdiction. For instance, in geographic and population terms, the Interior Delta is a significant part of both the Fifth and Sixth Regions. But in each region, other areas and populations compete for attention. For this reason, it might be worthwhile to constitute a special district with its authority restricted to those areas of the delta where navigation is now or could be feasible. This jurisdiction would focus solely on regulating navigation flows or perhaps on a restricted set of problems concerning the management of river resources in that area.

However, issues that are of basin-wide or near basin-wide interest do exist. In these situations, failure to take into account all positions will lead to future discord. Representatives of states that feel they have been left out will undoubtedly seek redress and have several options for doing so. They can express their discontent by stalemating progress on important programs. They can refuse to authorize additional personnel for the secretariat. They can fail to cooperate fully with NBA Secretariat efforts to acquire data. They can withhold authorized contributions to the secretariat budget. Although at the moment there seems little likelihood of open hostility, if tensions were to escalate because some states believed their

interests were threatened in a significant way, more violent forms of redress might be adopted.

NRB Common Pool Resource Management Issues

Other issues, in addition to navigation along selected stretches of the Niger's main stem, Benue and possibly tributaries of both, appear to be of potentially significant interest to some or all member states. However, as with the navigation issue, none of these problems necessarily interest all states of the NRB community, although each will almost certainly be of critical interest to some member states or at least specific communities in one or more member states. These issues are:

- flood control,
- hydroelectric power,
- irrigation,
- water supply, and
- fisheries pollution.

It is unnecessary to consider each issues in detail. The important point is that all concern discrete sets of users. These sets vary in geographic size and population, depending on the use made of river waters (e.g., hydroelectric power, water supply, irrigation, fisheries, sewage disposal). Many of these issues are only intermittent problems (for example, flood control, water supply, irrigation, fisheries and pollution.) However, the complementary and competitive relationships among resource uses within a specific geographic arena are of great significance. Pollution loads, which pass unnoticed during periods of high water, may drive up the costs of providing potable water during the river's low stage or, if treatment is not possible, may threaten human health and destroy fisheries. Impounding water for hydroelectric power generation, irrigation, flood control or navigation improvement may disrupt fisheries and production systems based on flood-recession agriculture or herding.

Complicated decisions will have to be made about planning development related to each of these issues. Agreements must be reached about defining the boundaries of user groups for the various applications of the water resource. Interrelationships among uses and user groups will have to be explored in greater depth. As interventions are proposed and executed, it will be important to reassess their impacts on other uses on a continuing

basis for varying conditions of aridity and NRB development levels.

Current NBA Strengths and Weaknesses

The NBA Executive Secretariat appears moribund at present. The agency has performed poorly since its inception as the operative arm of the NRC. The decision to widen its mandate when the NBA was created does not seem justified at all by any subsequent improvement in performance. Indeed, since the late 1970s, the agency has foundered in management difficulties and a growing financial crisis. Currently, the funds to maintain indispensable office services (telex, electricity, telephone) and equipment (photocopiers, etc.), pay for staff salaries, housing allowances and other benefits, and finance staff travel are often unavailable.

Despite these fundamental weaknesses, under the terms of its mandate, the NBA Executive Secretariat is responsible to develop an INBP. It is also responsible for designing projects, soliciting funds from donors for interventions, supervising program implementation and operating installations. Given the enormity of this work load, there seems little likelihood that the agency can do all of it properly. In the meantime, staff attention is diverted from the NBA's priority task--collecting, analyzing and distributing data--by concerns about making ends meet without regular salary payments.

It is little wonder that NBA member-state political officials and donors view the Executive Secretariat with some skepticism. Whatever the role of past and present member-state officials in designing NBA institutions, the member states' current judgment about Executive Secretariat performance appears to decidedly negative. To some extent, this may explain the arrears that some states have run up in their authorized contributions to jointly approved NBA operating budgets.*

The NBA's current constitution includes a highly conservative basic rule for making operational decisions. Unanimity is required to authorize any new actions. Given this

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*The general financial difficulties plaguing some member states undoubtedly explain some of these arrears. However, the amounts due the NBA are so small (less than $100,000 annually), that it seems probable most would find the necessary funds if the Executive Secretariat's performance justified the expenditure in their view. It should be noted that two judgments are involved here--does the secretariat give a reasonable value for the money, and do officials of any given member state think the policies of the NBA should be pursued?

rule, any actions authorized by NBA political councils formally enjoy the highest possible level of support from the member states. However, it is not obvious that formal support automatically reflects real support. The unanimity base rule means the NBA can only take action if every member state approves. Pressures exist to demonstrate progress in developing the NRB resource base as well as comply with the wishes of senior or powerful political figures in the region. It would be reasonable to expect that some member states give their approval to certain actions, not because they really support them, but because they are loathe to derail a measure others have worked to promote or are hesitant to defy or embarrass a senior official who has invested prestige in favor of some action.

It seems reasonable to assume that the facade of unity, encouraged by the structure of the NBA's operational rules, masks a fairly high level of discontent, at least occasionally. Such situations can occur because the NBA constitution creates rule barriers to the expression of disagreement by member-state representatives. So long as an issue has not become prominent and/or no major political leader has committed himself to support it, disagreement can be articulated. Debates prior to votes on major issues may also provide forums where differences can be aired. (This seems to depend partly on the degree to which a particular leader has publicly stated his support or opposition on a point before the debate as well as the kinds of bloc voting patterns that may exist in the NBA organization). However, under the current charter, it is not possible in the final vote for any member state to articulate its dissent without defeating the issue.

Under these circumstances, some states may well feel unable to exert the kind of influence on NBA affairs that they would like. Others may resent having to support the organization when they expect to get very little in return--for instance, because of their marginal position in the NRB. Some states may experience both of these disadvantages--they feel little assurance that NBA activities will leave them better off.

Given calculations of this sort, these states may conclude that their interests are best served by an NBA which is too weak to act. If the organization cannot support an effective Executive Secretariat, programs and projects will not be likely to receive funding. Inaction may seem preferable to agreeing to development projects in other states which will reduce access to river waters, create trouble for them in their segments of the river or cost them money without any comparable returns. To achieve this outcome without openly opposing the wishes of major political figures from other NBA member states, "reluctant states" may give formal approval to actions that they have serious reservations about. However, later, they may express

their discontent by failing to provide their share of approved financial contributions.

When a few states express discontent by withholding contributions,* others may persist for a period in paying theirs. Eventually though, the remaining contributors will almost certainly conclude that they have better things to do with their funds than to transfer them to an organization which is patently incapable of using those monies effectively. At this point, the organization will fall of its own weight.

In turn, donors have been very reluctant to honor commitments to finance NBA activities, partly due to domestic budgetary difficulties and policy changes, but also because of legitimate concerns that the money will not be used effectively. In particular, donor agencies that are under pressure in their home countries to increase the efficiency of their operations have a strong short-term incentive to restrict or withdraw support from an organization like the NBA, which can show little progress despite nearly two decades of donor support (albeit admittedly spotty and irregular). NBA officials may well protest this judgment, but budget cutters in donor agency head offices are not interested in explanations, especially when it is clear that the lack of regular donor support does not entirely account for the Executive Secretariat's difficulties.

Managing the Niger: A Viable Approach?

This section specifies the implications of the two previous sections in terms of appropriate activities for the NBA Executive Secretariat. It presents several institutional design suggestions intended to stimulate reflection on possible ways to improve NBA performance through modification of the rules that currently govern agency activities. In general, this discussion stresses the importance of first developing an appropriately limited role for the secretariat, and second, the need for a set of constitutional rules that will encourage as much decentralization as possible of operational authority for detailed planning and implementation of water resource management

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*At present, one member state has no money to contribute to the NBA budget, and the other states have recognized this by relieving Chad of its obligation to help support the organization's budget. NBA contributions probably prove difficult on occasion for other states to support as well, but the arrears in payment are not due to any absolute inability to pay. Rather, they reflect judgments made by officials in states with arrears that the NBA is or should be a low-priorty activity.

projects, consonant with the need to preserve member-state support of the NBA.

To avoid many of the difficulties mentioned in the preceding section, the secretariat staff's attention should focus first on the collection, analysis and distribution of data about evolving river conditions and second, on clarifying the implications of an intervention or set of interventions versus those of other projects. Concentration on these two areas would fully utilize, but not overtax, the NBA Executive Secretariat's current organizational potential and would provide the basis for a viable NBA role in NRB resource management activities. In addition, by removing the secretariat from any direct role in promoting NRB interventions, it would reduce the chances that the NBA would develop into a supranational agency effectively capable of determining development options for the NRB. This should reduce possible concerns of some member states that they might lose out by helping to strengthen the NBA. In addition, the success of this approach will depend on rule changes in the NBA constitution of the sort suggested below.

The models that are currently or will soon become available for use by the NBA provide a very sophisticated means of projecting the consequences of different types and combinations of interventions through simulations. The three models can be used to explore in detail the nature, extent and consequences of interdependencies among various proposed uses for given stretches of the river or throughout the entire basin.

Managing NRB Resources to Preserve Jointness

A common pool resource, such as the Niger River and its tributaries, can only be managed effectively once demands on the resource begin to exceed the supply, if rules to ensure sustained-yield use are established and regularly enforced. The river contains a variable, but finite, quantity of water that can serve a variety of uses. Uses may be ranked by degrees of sensitivity. Higher uses, such as fisheries and water supply, to some extent, will be highly sensitive to certain types of pollution and the modification of stream flow patterns. Conversely, lower uses, such as pollution disposal (municipal wastes and irrigation salts), will be little affected by demands made on the river resource by fisheries and municipal water supply systems. To make equitable and efficient use of the resource, it is important to limit various uses by the requirement that they respect the condition of jointness--that is, the physical capability of the resource to satisfy a range of use types and a given total demand. In other words, all things being equal, new interventions should not impinge negatively on existing uses.

Problems will arise in the application of this rule just as soon as an intervention is proposed that would increase the river system's ability to satisfy certain uses at the expense of other uses. An example would be river impoundments for hydroelectric power generation. These would serve that use, possibly improve navigation and might create conditions favorable for new fisheries. However, they might adversely affect existing fisheries and flood-recession agriculture systems.

Rules Allocating Use Rights

A system of rules must be developed in the NBA to deal with these kinds of issues. This system must stipulate conditions under which existing uses may legitimately be adversely affected by new uses and to what extent, the kinds of compensation required in such cases, and recourse available to individuals as well as officials who wish to challenge a ruling. Since two different legal traditions--French code law and English common law--have been applied to different stretches of the Niger's main stem and tributaries, it will be indipensable to work through possible conflicting law issues as the new system of use rules is developed.

The new use rules must be integrated with the set of decision rules that govern the allocation of authority over particular interventions. It will be easier to contemplate the decentralization of authority over the planning, implementation and operation of project interventions if countries which are not directly involved in a particular intervention can be assured that they will retain residual authority to challenge decisions when, and if, they can demonstrate, in accord with the system of use rules, that their legitimate interests have been or will be damaged by a given intervention.

Under this system, the NBA would retain control over only those development projects that affect member states' interests basin-wide and cannot be handled effectively by a coalition of sub-basin management units. The NBA should strongly consider establishing special agencies, outside the purview of the Executive Secretariat, to handle these activities. All other project proposals would be turned over for detailed planning, financing, implementation and operation to either existing member-state jurisdictions or agencies (single countries or multinational organizations), or ad hoc special district jurisdictions or agencies, that have yet to be created. Member-state officials and individuals, up- or downstream or in the jurisdictions themselves, with grounds for challenging decisions of the operational subunits, could use either existing court systems or NBA dispute resolution instances to seek redress.

Role of the Executive Secretariat

The NBA Executive Secretariat would be restricted to the role of information processor. As part of their normal duties, staff would monitor NRB conditions, with special emphasis on the situation in the river and its tributaries, and would publicize these results regularly. This constantly updated flow of information would create a background condition for fair use of the resource. All member states would have a common standard for assessing the evolution of river conditions. The Executive Secretariat would provide a running evaluation of fluctuating demand and supply relations in different stretches of the river for different stages and conditions. It would also monitor the evolution of supply and demand relations at a global level, for the entire system.

Staff would also provide preliminary estimates of the impact of new intervention proposals, using the three models controlled by the NBA. These analyses would provide an initial reading of the probable consequences of any proposed project. Those projections would have to be complemented by assessments of probable consequences of changes in river flow and water-use patterns for environmental conditions and production systems that would potentially be affected.

If it were clear that a project would preserve the joint interests of other users, it would be authorized by the NBA and allocated for development and implementation to some smaller jurisdiction whenever possible. On the other hand, if the analysis suggested that a project would probably create negative impacts for other users, project proponents would bear the onus of developing additional information to demonstrate either that such negative impacts would not result or feasible mitigation procedures could make the project compatible with the interests of other users.* If the initial assessment were mixed or ambiguous, sponsors of the proposal would likewise bear the burden of demonstrating that jointness of use could be preserved if the project were undertaken. In cases where further investigation strongly suggested a proposed project would harm existing uses, but would generate appreciable benefits, NBA political bodies would have to decide whether to authorize the development.

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*This arrangement embodies a conservative approach to river system development. A more aggressive approach would shift the burden of proof to those opposing a development. However, in light of the potential for both damage from ill-conceived projects and political conflict in an international arena that serious negative consequences could generate, a conservative rule would seem to be justified.

Critical issues arise here concerning the structure of decision rules which might be developed to handle this set of issues. Two interrelated questions must be dealt with:

- what jurisdiction would take responsibility for developing and operating the intervention; and
- what sorts of rules would both promote appropriate development and, at the same time, assure all member states that their interests would be taken into account?

Allocating Authority for Interventions: Constitutional Rules

Various answers are possible here, although they will probably change over time, if any such arrangement is established. While the NBA Council of Ministers (COM) or Heads of State (HOS) would have to enact any such changes in the NBA's constitution, to stimulate reflection on these questions, it is perhaps worthwhile to sketch out some possibilities and their probable consequences in this section.

First, answers to the jurisdictions and rules questions are interrelated. Project development and implementation confer great power to define impacts and consequences of the intervention. Thus, member states might always want to reserve for themselves some form of veto on any proposed action. However, they might be willing to rely on the projections of NBA river systems models, if they believe those models are consistently being used in an impartial manner, and forego vetoes in any cases where the simulations demonstrated that a state would suffer no material harm from the proposed intervention. The risk involved in this solution would be that the representatives of some member states would veto an action outright, rather than allow it to proceed without their direct participation, because they did not trust model projections.*

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*Member states will be more likely to accept model projections without undue skepticism if they have representatives at the Executive Secretariat who are knowledgeable about the workings of the models, familiar with the specific processes by which recommendations or intervention scenarios are ranked and the ability to explain both to officials in their own countries. Assiduous respect for the NBA charter rule emphasizing the importance in selecting secretariat staff of first, competence and then, member-state representation seems a necessary condition for building a climate of confidence, not only within the secretariat, but also among member-state national committees and officials involved with NBA affairs.

Assuming no vetoes were cast, what should the rules be concerning the approval of development proposals? The voting group in any particular instance might be limited to those states which, in light of the models' projections, would stand to benefit or suffer significantly* from a proposal. This would have the advantage of including only interested parties in the decision group, while excluding those that would not be materially affected. By creating subcommittees of the NBA's decision-making groups, it would be possible to decide on more projects during the limited amount of time available for meetings each year.

A second option would be to simply include all states in the decision-making group for any proposed intervention or development scenario, whether or not their interests were directly at stake.** They could vote or not, as they chose, in all cases where no veto terminated further action on a case. This option would probably drive up the transactions costs of getting agreement on particular intervention proposals because more states would likely participate in each decision. This option would also forego the division of labor in structuring solutions (based on a state's model-defined direct interest in a particular intervention) incorporated in the first approach. To some extent, this would dampen the incentives for entrepreneurship in promoting NRB interventions because of the resulting slower pace and higher time cost of getting the approval from member-state representatives necessary to proceed with implementation.

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*The term "significant" will have to be defined through discussion and practice by NBA political councils, aided by the secretariat's technical and administrative staff. Rules defining impact significance can be established, although it must be recognized that this will be a difficult task. The main considerations would appear to be the need to arrive at a mutually acceptable set of definitions, to avoid enlarging the decision group by making the definitions too sensitive, so that even minor impacts are included, and to prevent reducing the size of the decision group by defining significance too broadly, to the point where member states which expect they will experience significant impacts from a proposed project or set of projects are precluded from playing a role in decisions about that intervention or scenario.

**This approach would obviate the need to define "significant" impacts in operational terms. This might be prudent, at least during an initial period, when member-state representatives might be relatively uncertain about the implications of accepting a determination that an intervention was "not significant" for their states.

On the other hand, member states would risk less damage to their interests in a situation where model predictions might not be entirely accurate. This higher level of security might make member-state representatives more willing to forego veto action before projects are proposed for intensive consideration.

Operational Rules

Operational decision rules would then have to be considered. What should the quorum be for transacting business? Unless the NBA is to continue to rely on a rule of unanimity as the basis for all business, it will be necessary to establish a quorum. This number should not be set too low because of the danger of precipitous action. Neither should it be set too high, since that would give one or a small number of countries the means to hamper NBA operations by simply refusing to participate. Considering the number of countries that border the Niger's main stem (Nigeria, Benin, Niger, Mali and Guinea), it would appear that a quorum of five would be a reasonable figure. This would encourage attendance by all the member states concerned to protect their interests, but would not allow those that are uninterested in issues on the agenda for a particular COM or HOS meeting to stalemate action by their absence. It would also sharply reduce the possibility that a small minority of NBA member states would approve projects that did not enjoy the support, or at least indifference (as opposed to opposition), of the other states.

What should the rule be for approval of a project--simple majority, extraordinary majority, unanimity? It would appear risky to rely on a simple majority rule, at least during an initial period, given a quorum of five states required for action. On the other hand, a unanimity rule would simply vest each member state with a veto over any NBA activity. An extraordinary majority (e.g, three-fifths or four-fifths of those present, given a quorum) would appear appropriate. If the number of voting representatives from each member state were increased, it would become possible to choose other types of extraordinary majorities.

If NBA state representatives decided to undertake this sort of restructuring of the institution's decision rules, it should be done in a frankly experimental manner. Because rule revision is a costly and time-consuming process, it should not be done lightly. However, when decision-making efficiency can be increased through rule changes that leave members and users more satisfied with the performance of the organization, such changes ought to be seriously considered. Subsequently, in the light of experience, further appropriate modifications may be identified. These should receive serious consideration in turn.

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Next Steps

If these reflections have any value, not as recommendations for future action, but as a starting point for a partial rethinking of the NBA's mission and institutions, it would be useful to circulate them to relevant officials in the member states. Depending on reactions, it might then be appropriate to gather more information from those officials with the aim of refining this analysis and possibly producing a set of firm recommendations at some point over the next year, perhaps by convening an ad hoc group. However, these steps should be coupled with evidence of greater efforts by the Executive Secretariat to improve relations with member states. Primarily, this will involve developing new communications possibilities through publication of a newsletter and regular contact between the Executive Secretariat and member states' NBA national committees.

APPENDIX D

NBA Donor Coordination Options

The Niger Basin Authority (NBA) Council of Ministers (COM) has recently invited donor organizations to submit proposals to establish a formal NBA-donor coordination structure. This invitation was issued in reply to a letter from USAID/Niger to the COM via the NBA Executive Secretary, Mr. Ibrahim Balde. That letter noted the need to establish a more effective partnership between donors and the NBA.

This present note summarizes results of several informal sessions held during September 1985 in Niamey by three NBA donor organizations strongly interested in improved NBA-donor coordination because of their continuing concern about NBA's performance as a regional organization. This was done at the request of and in consultation with the Executive Secretariat. Representatives of all three organizations (UNDP, FAO and USAID) discussed the currently low credibility of the NBA among donors and the likelihood that additional donor investment in NBA projects will not be forthcoming without demonstrated improvements in its planning capability and administrative performance.

River system modeling and analysis are demanding activities whose success depends on a high degree of coordination. Efficient execution of component tasks involved in these interrelated efforts requires careful, precise management. Donor representatives present agreed that if the NBA Executive Secretariat cannot provide adequate administrative support to professionals from member-state countries and donor organizations engaged in modeling, analysis and planning activities, their effectiveness will be seriously impaired. This in turn will adversely affect attempts to make the most productive use of both member-state and donor contributions.

Donor representatives present at these meetings concluded they should:

- poll other donor organizations potentially interested in collaborating within a formal NBA donor coordinating committee;
- explore ways to improve NBA-donor interaction and to formulate proposals calculated to improve the NBA's performance through increased donor coordination and collaboration in Secretariat activities; and
- meet again on October 25, 1985 at Niamey with interested members of the donor community to finalize proposals.

These proposals will be submitted to the NBA Executive Secretary in early November 1985 for transmission to and consideration by

the Committee of Experts and the COM at their December 1985 meetings in Niamey.

To facilitate discussion of several NBA-donor collaboration schemes, this note first presents a comparative illustration of three possible frameworks (Table I). That table compares the options from eight different perspectives--donor committee role, members, staffing, etc. Table II analyzes changes that would result in five different areas: donor coordination, secretariat management, donor financial support, donor access to COM and responsibility for results. Finally, Tables III and IV try to suggest, for the NBA and donors respectively, the probable advantages and disadvantages of those five changes. Commentary on each form of collaboration follows.

Donor representatives who wish to participate in the October meeting are invited to consider these frameworks and come prepared to discuss them. Amendments or alternative proposals calculated to improve chances for effective NBA-donor coordination will be welcomed.

Table I. DECISION GRID

NBA-Donor Collaboration Frameworks

Donor intervention options Elements for comparison	(Existing situation plus ad hoc donor coordination, donor access to NBA COM by letter) MINIMUM	(Somewhat stronger version of OMBS model; donor personnel share Secretariat technical and management tasks) MODERATE	(Mekong Model: heavy donor involvement in management of Secretariat internal activities) MAXIMUM
DONOR COMMITTEE ROLE	Informal, ad hoc donor and donor-NBA collaboration	Statutory committee and decision-making mechanism; takes lead as needed to address Niger River Basin (NRB) development issues/problems and seek funding mechanisms	Supervises management of Secretariat, chooses implementation agent, monitors progress; controls, guides NRB development process within NBA statutory mandate
DONOR MEMBERS	Membership undefined; will include core donors (UNDP, FAO, FED, USAID, FAC) plus others (CIDA, KFW, etc.)	Membership defined: major donors and others interested in NBA activities; unlimited additions to membership possible	Membership defined, limited to NBA core donors; others only if coordinate with core group

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Table I. DECISION GRID (continued)

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
DONOR COMMITTEE STAFFING	Donor representatives or T.A.s coordinate informally with each other	Full- or part-time coordinator runs donor committee, assures liaison among donors, manages donor-NBA (COM/HOS) relations	Donors provide Secretariat personnel required to supplement member-country staff; do management
MEETING FREQUENCY	As needed: at least once/year before COM semi-annual meeting	Monthly, quarterly or semi-annually, as donor committee judges appropriate	Daily, for on-going management of Secretariat activities
DONOR FINANCIAL SUPPORT LEVEL	Part of already programmed activities	Support for donor committee coordinator; additional funding for some Secretariat activities	Support for Secretariat daily operations as part of donor T.A. support funds
NBA EXECUTIVE SECRETARY ROLE	Dominant; runs daily operations, including data gathering, analysis, diffusion activities	Equal partner with donor senior T.A.; with him, manages data processing, other activities	Subordinate to donor senior manager; helps with data processing, other activities
DONOR PARTICIPATION IN NBA EXPERT, COM MEETINGS	By invitation (consideration of written submissions mandated by statute)	Statutory request (donor representatives attend COM open meetings if NBA duly notified)	Statutory provision (donor representative required to attend COM open meetings)
OVERALL DECISION-MAKING CONTROL	NBA (COM/HOS)	NBA (COM/HOS)	NBA (COM/HOS)

Table II. DECISION GRID

NBA-Donor Collaboration:
Changes from Existing Situation

Donor intervention options Elements for comparison	MINIMUM	MODERATE	MAXIMUM
DONOR COORDINATION	More inter-donor coordination in programmed semi-annual meetings	Considerably more inter-donor coordination, monitoring of NBA progress and support for NBA on "as needed" basis	Highly organized inter-donor coordination on daily basis to support, manage Secretariat activities
SECRETARIAT MANAGEMENT	No donor involvement in Secretariat management	Substantially increased donor involvement in Secretariat management	Management of Secretariat becomes donor responsibility
FINANCIAL SUPPORT	No increase in donor financial support for Secretariat	Some increase in donor financial support for Secretariat	Marked rise in donor financial support for Secretariat
DONOR ACCESS TO COM	Organized donor access to NBA meetings rises somewhat	Donor access to NBA meetings increases greatly	Donor access to NBA meetings increases greatly
RESPONSIBILITY FOR RESULTS	NBA entirely responsible for achieving results; conditions for achieving results	NBA and donors share responsibility for achieving results; donors achieve some control of conditions to assure results	NBA can pass responsibility for achieving results to donors; latter can establish conditions to get results

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Table III. DECISION GRID

NBA Perspectives

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
DONOR COORDINATION			
Advantages	Donor positions clarified	Donors regularly coordinate their positions	Donors coordinate activities daily
Disadvantages	Donor monitoring of Secretariat rises	Increased donor awareness of member state coordination issues	Intimate donor awareness of member state coordination issues
SECRETARIAT MANAGEMENT			
Advantages	NBA appointee retains full control over Secretariat management	Secretariat management improves over time; information processing tasks accomplished with great reliability	Secretariat management improves in short run, information processing as first priority
Disadvantages	Management discontinuities continue in Secretariat management	NBA accepts co-management of Secretariat by donor senior T.A. personnel	NBA accepts extensive donor control over Secretariat activities
FINANCIAL SUPPORT			
Advantages	NBA states can effectively censure Secretariat performance by withholding contributions	NBA state contributions less critical to achievement of NBA goals	Secretariat activities largely insulated against NBA state financial difficulties
Disadvantages	Secretariat performance will continue to suffer for lack of adequate means	NBA states lose some ability to censure Secretariat performance by withholding contributions	NBA states lose ability to censure Secretariat by withholding contributions

Table III. DECISION GRID (continued)

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
DONOR ACCESS TO COM			
Advantages	COM can avoid directly confronting donor concerns	COM gains clearer understanding of donor concerns and desires	COM gains clearer understanding of donor concerns and desires
Disadvantages	COM may fail to grasp intensity of donor concerns	COM must confront donor positions	COM must confront donor positions
RESPONSIBILITY FOR RESULTS			
Advantages	Results largely within control of NBA	Donors partly responsible for achieving results	NBA can press donors to produce results
Disadvantages	Donor willingness to participate probably remains limited	NBA sacrifices some control over results	Some control over types of results passes to donors

Table IV. DECISION GRID

Donor Perspectives

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
DONOR COORDINATION			
Advantages	Greater mutual understanding of donor positions through infrequent, "as needed" meetings	Greater mutual understanding of donor positions; updated through regular meetings	Intensive donor interchange and ability to coordinate on daily basis
Disadvantages	Need to coordinate may not be perceived early enough	Necessity of investing time in coordinating some donor activities	Necessity of integrating all donor positions thoroughly

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Table IV. DECISION GRID (continued)

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
SECRETARIAT MANAGEMENT Advantages	No direct responsibility for management problems	Increased ability to influence Secretariat management practices and deal with donor concerns as needed	Extensive control over Secretariat management practices; substantial ability to address donor concerns
Disadvantages	Inability to deal with Secretariat management problems	Necessity of accepting some responsibility for Secretariat management problems	Must bear full responsibility for Secretariat management problems
FINANCIAL SUPPORT Advantages	Retains NBA state contribution as real indicator of member interest in NBA activities	Increased opportunity to assist Secretariat staff to use aid funds efficiently to achieve NBA goals	Greatly increased ability to assist Secretariat staff with NBA-mandated activities
Disadvantages	Lack of funds may impede Secretariat functioning, lead to inefficient use of aid funds	Partial loss of member-state contributions as indicator of members' evaluation of Secretariat performance	Member-state contributions no longer indicate members' evaluation of Secretariat
DONOR ACCESS TO COM Advantages	Somewhat greater ability to coordinate with NBA's experts, COM	Greatly increased ability to coordinate with NBA's experts, COM	Greatly increased ability to coordinate with NBA's experts, COM
Disadvantages	Increased responsibility for donor-NBA coordination	Greatly increased responsibility for donor-NBA coordination	Greatly increased responsibility for donor-NBA coordination

Table IV. DECISION GRID (continued)

Donor intervention options	MINIMUM	MODERATE	MAXIMUM
RESPONSIBILITY FOR RESULTS			
Advantages	Little responsibility for achieving outputs as planned	Improved ability to ensure results are produced as planned	Major upgrade in ability to ensure results produced
Disadvantages	Risks of inefficient use of aid funds remain high	Responsibility for failure to produce results rises	Major responsibility for failure to produce output

Minimum Level of NBA-Donor Collaboration

The minimum option would change the existing situation only slightly. If accepted by the NBA, this option would give the donor coordination committee legal standing to communicate directly, by letter, with the NBA's Committee of Experts and COM, as well as directly with these bodies via the Executive Secretary. The NBA could invite donor representatives to attend NBA meetings in person. This might improve donor-NBA coordination by creating an arena for face-to-face discussion where both donor and NBA representatives could air views and together seek solutions to common problems.

In addition, this option would structure, in a marginally more defined manner, the interactions among NBA donors. Representatives of donor organizations now involved with NBA do occasionally consult each other; under the minimum option, they would do so more regularly, at least twice a year, before the COM meetings, to organize communication with that body.

The role of the Executive Secretary would remain unchanged: he would continue to bear ultimate responsibility for the performance of the Secretariat and authority to direct its operations, subject only to the oversight of the COM, within the limits set by existing NBA political and administrative decisions.

Moderate Level of NBA-Donor Collaboration

Under the moderate-level option, donors would be formally recognized as a group authorized to take positions on NBA policies and performance, to suggest changes and, by implication, to condition continued support on NBA's ability to meet certain specified

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performance criteria.

If donors as a group agreed the NBA was progressing satisfactorily, they could avoid formal involvement in NBA affairs at their discretion, except insofar as their technical assistants participated in Secretariat activities.

Several points about this option merit mentions:

- It might become necessary at some point to work out a set of inter-donor decision-making arrangements, if experience demonstrated unanimous concensus on donor positions was both difficult to achieve and highly desirable.

- It would be important for donors and the NBA together to determine whether their coordinating committee should be viewed, by both the NBA and other donors, as the sole avenue through which any donor could interact with the NBA. If so, decision making within the organized donor group may become more difficult.

- The moderate option does not give donors direct control over day-to-day operations of the NBA Secretariat. However, the senior T.A. responsible, with the Executive Secretary, for joint management of Secretariat affairs would probably be able to exert strong influence, if mandated to do so by a COM decision.

- Donors and the NBA might wish to stipulate, in case the moderate collaboration option were adopted, that it would be superseded by the institutional arrangements of the maximum collaboration option, unless the Executive Secretariat demonstrated to the satisfaction of both member states and donors within a specified time period that management improvements were forthcoming.

Maximum Level of NBA-Donor Collaboration

The maximum collaboration option involves very strong donor input to Secretariat activities. In effect, the NBA would delegate authority for day-to-day operations to the senior donor technician there. The Executive Secretary would coordinate NBA activities with member states.

Again, comments are in order:

- This option involves a high level of risk for donors. If something goes wrong in the organization, NBA states can reasonably charge donors with responsibility.

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- Crafting politically acceptable proposals for Niger River Basin development might be much more difficult under the maximum than under the moderate option: any NBA states dissatisfied with proposals would find it easy to cast doubt on their value because of the largely donor-controlled process by which they had been produced.

- Are donors prepared to provide additional levels of support to the NBA Secretariat? If so, what are the implications for NBA state commitment to supporting the organization's activities when the donors withdraw?

- The maximum collaboration option might conceivably be adopted for a limited period of time, or until the Executive Secretariat consistently demonstrated ability to meet specified performance criteria, at which point donor-NBA collaboration could revert to the moderate or minimum level.

APPENDIX E

Cost Analysis for Phase II of NRBP Project

General Information

The cost analysis presented in this appendix for Phase II of the NRBP project (project number 625-0944) is based on changes in the outputs for the SENRA component (see Appendix B), modification of the river systems analysis of the COE component (see Appendix A) and the changes in training for SENRA NBA personnel (see Appendix B).

Assumptions

The COE river systems analysis currently underway will continue as planned, i.e., there will be no significant changes in the current USAID PASA agreement with the COE's Vicksburg District.

The sediment data collection as tentatively approved will continue as scheduled.

The SENRA contract will be awarded not later than October 1, 1986.

Training for the SENRA NBA personnel will be initiated not later than October 1, 1986.

The inflation rate through 1989 will average five percent.

The contingency allowance will be calculated at 10 percent of direct computed cost plus inflation.

The project completion date will be September 1989.

The current estimates included in this annex are based on the September 1985 costs and exchange rate.

Detailed Cost

Detailed costs are included in the current COE PASA and separate detailed estimates. A fiscal summary of costs by fiscal year is also attached.

Cost Summary

COE Rivers Systems Analysis (current PASA)	$4,066,000
Sediment Data Collection (local currency)	309,000
COE Local Support Long-Term Personnel (River Systems Analysis)	552,000
SENRA Project Component	3,512,000
Kandadji Dam Impact Assessment	636,000
Evaluation	90,000
Training	630,000
Inflation	689,900
Contingencies	1,012,700
TOTAL	$11,466,600

Socio-Economic/Natural Resources Assessment (SENRA) with Extension Contract--Cost Estimate

1.0 Personnel

1.1 Pre-Field Work

Project Manager, three person-months at $5,000 ..... $15,000

Senior Technical Specialist, three person-months at 4,500 13,500

Technical Specialists (four), four person-months at 4,000 16,000

1.2 Niamey Office

Project Manager, 36 person-months at 5,000 ..... $180,000

Senior Technical Specialist, 36 person-months at 4,500 162,000

1.3 Field Work (Including Return for Generic Impact Assessments)

Technical Specialists (four), 44 person-months at 4,000 ..... $176,000

1.4 Text and Analysis

Project Manager (for atlas production in the U.S.), six person-months at 5,000 ..... $30,000

Technical Specialists (four), 24 person-months at 4,000 96,000

Clerical, 15 person-months at 1,500 22,500

Drafting, four person-months at 1,800 7,200

Text Translator, 10 person-months at 4,000 40,000

1.5 Map Production and Related Activities

Senior Cartographer, eight person-months at 3,000 ..... $24,000

Photo Interpreter, six person-months at 4,000 24,000

Junior Cartographer, six person-months at 2,500 15,000

Draftsmen, 18 person-months at 1,800 32,400

TABLE 1

Niger Basin Planning Cost Analysis

ITEM	THRU FY85	FY86	FY87	FY88	FY89	TOTAL
River Systems Analysis Current PASA	200,000	1,266,000	1,300,000	1,200,000	100,000	4,066,000
River Systems Analysis Sediment Data PASA		159,000	150,000			309,000
River Systems Local Support	60,000	150,000	150,000	150,000	12,000	522,000
Socioeconomic Natural Resources			1,385,600	1,385,600	740,800	3,512,000
Kandadji Dam Impact Assessment				336,000	300,000	636,000
Training River Systems	33,000	16,000	71,000	70,000		190,000
Training Socioeconomic			150,000	150,000	140,000	440,000
Project Redesign Mid-term	35,000			55,000		90,000
SUBTOTAL	328,000	1,591,000	3,206,600	3,346,600	1,292,800	9,765,000
Inflation @ 5%/yr			160,300	334,700	193,900	688,900
Contingencies @ 10%		159,100	336,700	368,200	148,700	1,012,700
TOTAL	328,000	1,750,100	3,703,600	4,049,500	1,635,400	11,466,600

1.6 Long-Term Back-Up Support from Contractor's Home Office

Project Manager, six person-months at 5,000	$30,000
Clerical, six person-months at 1,500	9,000
Translation, four person-months at 4,000	16,000
PERSONNEL SUBTOTAL	$908,600

1.7 Special Consultants

Special Consultants, 300 person-days at $400	$120,000
PERSONNEL TOTAL	$1,028,600

2.0 Contractor Overhead

Contractor Overhead at 110 percent of $908,600	$999.460

3.0 Special Costs--Long-Term Personnel

Moving to Niamey, two at $40,000	$80,000
Storage, household effects, 72 months at 400	28,800
Schooling, 12 project-years at 12,500	72,000
Housing and utilities, 72 months at 1,000	72,000
House maintenance, 72 months at 500	36,000
Travel:	
Family round trips, 9 people x 2 trips at 2,500	20,000
Home trips, 4 people x 2 trips at 2,500	40,000
School trips, 4 children x 3 trips x 1,000	12,000
Automobiles, two at 18,000	36,000
Automobile gas and maintenance, six project-years at 4,000	24,000
Miscellaneous supplies, six project-years at 5,000	30,000
SPECIAL COSTS TOTAL	$528,000

4.0 Travel

Project Manager:

Two trips to U.S. per year x three years at $2,500	$15,000
Six trips in Africa per year x three years at 650	11,700

Senior Technical Specialist:

One trip to U.S. per year x three years at 2,500	7,500
Six trips in Africa per year x three years at 650	11,700

Technical Specialists:

Four people x three trips in Africa at 2,500	30,000
Photo Interpreter, one trip to Africa at 2,500	2,500
Trips in U.S., 20 at 500	10,000
Car rental in West Africa, four technical specialists, 20 months at 1500	30,000
Technical Specialists (in-country), four at 2,000	8,000
Consultant Travel, six trips at 2,500	15,000
Contractor backstop travel, six trips at 2,500	15,000
TRAVEL TOTAL	$156,400

5.0 Per Diem

Project Manager:

30 days in U.S. per year x three at $80	$7,200
180 days in Africa at 100	18,000

Senior Technical Specialist:

15 days in U.S. per year at 80	3,600
300 days in Africa at 100	30,000

Technical Specialists, four x 11 months x 30 days at 100	132,000
Photo Interpreter, 30 days at 100	3,000
Atlas preparation in U.S., 100 days at 80	8,000
Contractor backstop, six trips x 20 days at 80	12,000
PER DIEM TOTAL	$213,000

6.0 Equipment and Supplies (Not Including Special Costs)

Copiers, five at $3,000	$15,000
Xerox and miscellaneous supplies (Africa)	25,000
Niamey office space	15,000
Niamey office support	15,000
Aerial survey	50,000
Computer equipment	50,000
Nigerian expediter	5,000
Map and cartographic supplies	30,000
Atlas production (draft, limited number; final, 1,000 copies)	50,000
Text reproduction	15,000
Communications costs	20,000
Miscellaneous supplies	10,000
EQUIPMENT AND SUPPLIES TOTAL	$300,000

7.0 Fee

Fee at 15 percent of direct labor plus overhead $286,200

GRAND TOTAL $3,512,460

Kandadji Dam Environmental Assessment Contract--Cost Estimate

1.0 Personnel

Data collection, technical specialists, nine person-months at $4,000 ..... $36,000

Impact assessment:

Technical specialists, 10 person-months at 4,000 40,000
Technical specialist (terrestrial biologist), four person-months at 3,000 12,000

Report preparation:

Technical specialist, nine person-months at 4,000 36,000
Technical specialist (terrestrial biologist), one person-month at 3,000 3,000
Clerical, three person-months at 1,500 4,500
Translator, two person-months at 4,000 8,000

Project Manager:

Project Manager, four person-months at 4,000 16,000
Clerical, four person-months at 1,500 6,000

PERSONNEL SUBTOTAL $161,500

2.0 Overhead

Overhead at 110 percent $177,600

3.0 Travel

Trips to Africa, nine at $2,500 ..... $22,500

Trips in Africa, seven at 650 4,550

Trips in U.S., 12 at 500 6,000

Car rental, 100 days at 100 10,000

Driver, 100 days at 10 1,000

TRAVEL TOTAL $44,450

4.0 Per Diem

In Africa, 220 days at $100 (of which many in field at <100, so day total greater)	$22,000
In U.S., 70 days at 80	5,600
PER DIEM TOTAL	$27,600

5.0 Equipment and Supplies

Testing equipment	$23,000
Communications	5,000
Printing and Reproduction	12,000
EQUIPMENT AND SUPPLIES TOTAL	$40,000

6.0 Fee

Fee at 12 percent of personnel and overhead (see 1.0 and 2.0)	$40,700
KANDADJI SUBCONTRACT TOTAL	$491,450

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Kandadji Dam Environmental Assessment Program Management Costs

1.0 Personnel

Program manager, six person-months at $4,500	$27,000
Technical specialists, six person-months at 4,000	24,000
Technical, three person-months at 2,500	7,500
PERSONNEL TOTAL	$8,500

2.0 Overhead

Overhead at 80 percent	$46,800

3.0 Travel

Trips to Africa, three at $2,500	$7,500
Trips in Africa, four at 650	2,600
Trips in U.S., 10 at 500	5,000
TRAVEL TOTAL	$17,100

4.0 Per Diem

In Africa, 100 days at $100	$10,000
In U.S., 40 days at 500	3,000
PER DIEM TOTAL	$13,000

5.0 Support

Miscellaneous supplies	$1,000
Reproduction	2,000
Communications	2,000
Housing	8,000
SUPPORT TOTAL	$13,000

PROGRAM MANAGEMENT TOTAL $144,000

KANDADJI TOTAL: SUBCONTRACT AND PROGRAM MANAGEMENT $635,850

(rounded) $636,000

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Training Costs: Socio-Economic and Natural Resources

1.0 Counterpart Training (two individuals)

Initial round trip, four (individual plus three dependents) x two at $650	$5,200
Additional home trips, four x five at 650	26,000
Round trips to U.S., two x two at 2,500	10,000
Trips in Africa, six per year, at 650 x three x two	23,400
Per diem in U.S., 60 days at 75 x two	9,000
Per diem in Africa, 18 trips x 14 days x 100 x two	50,400
Maintenance allowance, three years x 360 x 30 x two	64,800
COUNTERPART TRAINING SUBTOTAL	$188,800

2.0 Participatory Training in Data Collection

Travel in West Africa, six x four at $650	$15,600
Travel to Europe, four trips at 1,000	4,000
Per diem in Africa, six months x 30 at 100 x four	72,000
Per diem in Europe, one month x 30 at 100 x four	12,000
TRAINING IN DATA COLLECTION SUBTOTAL	$103,600

3.0 Participatory Training in Data Analysis

Round trip to Niamey, four at $650	$2,600
Per diem, four x 90 days at 70	25,200
TRAINING IN DATA ANALYSIS SUBTOTAL	$27,800

4.0 Technical Training in United States (four individuals)

Round trip to U.S., five at $2,500	$12,500
Maintenance allowance, six months at 1.000 x four	24,000
Travel in U.S., three trips x four at 1,000	12,000
Short trip per diem, four x 30 at 75	9,000
Short course tuition and agency support, four at 15,000	60,000
U.S. TECHNICAL TRAINING SUBTOTAL	$117,500
SENRA TRAINING COSTS TOTAL	$437,700
(rounded)	$440,000

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Training Costs: River Systems Analysis

1.0 Training--Sediment Data Collection

Six trips to U.S. at $2,500	$15,000
Six x 30 days per diem at 50	9,000
Six trips to Niamey at 650	3,900
Six x 30 days per diem at 70	14,700
SEDIMENT DATA COLLECTION TOTAL	$42,600

2.0 Management Training (three individuals)

Three trips to U.S. at $2,500	$7,500
90 days per diem x three at 50	13,500
Three trips in U.S. at 700	2,100
High cost per diem, 15 days at ($75-$50) x two	750
MANAGEMENT TRAINING TOTAL	$23,850

3.0 Counterpart Training--Model Development (two individuals)

Two trips to U.S. at $2,500	$5,000
30 days per diem x two at 50	3,000
330 days x two at 30 (maintenance allowance)	19,800
Four trips in U.S. at 700	2,800
30 days per diem x two at 50 in U.S.	3,000
MODEL DEVELOPMENT TRAINING TOTAL	$33,600

4.0 Technical Training--Navigation Analysis (four individuals)

Four trips to U.S. at $2,500	$10,000
Four x 30 days at 50	6,000
330 days x four at 30	39,600
Eight trips in U.S. at 700	5,600
50 days per diem in U.S. at 50	2,500
Agency cost, short course tuition	$26,250
NAVIGATION ANALYSIS TRAINING TOTAL	$89,950
RIVER SYSTEMS TRAINING TOTAL	$190,000

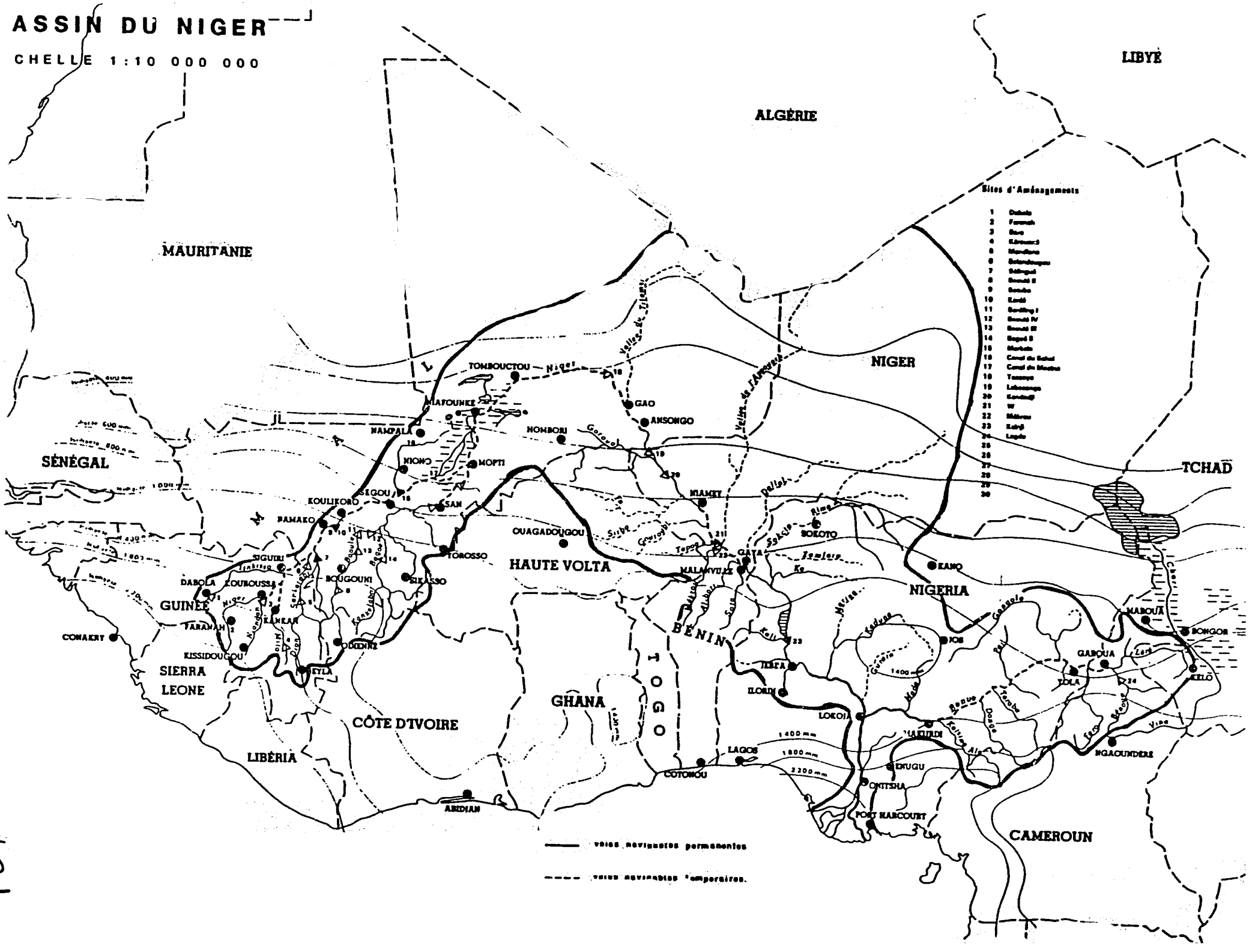
APPENDIX F

Individuals Consulted

Balde, Ibrahima Sory, Executive Secretary, NBA/Niamey
Barry, Abdoul K., Regional Projects Officer, Regional Bureau for Africa, UNDP/New York
Barry, Alpou, Director, HydroNiger, NBA/Niamey
Beidou, Bagnan, Director, Water Resources, Ministry of Hydraulics and Environment, Republic of Niger, Niamey
Benedict, Peter, Director, USAID/Niger
Berthelot, Roger M., Principal Technical Advisor, UNDP/New York
Bourahim, Youssouph, Computer Center Manager, NBA/COE/Niamey
Cashion, Gerald, Niger Project Development Officer, AFR/DR/SWAP/USAID/W
Christian, Sam, River Systems Planner, NBA/COE/Niamey
Diallo, P. Ibrahim, Cartographer Engineer, Directorate for Water Resources, Planning, Energy and Cartography, NBA/Niamey
Ebolo, Josue E., Director, Documentation Center, NBA/Niamey
Garba, Djibrilla, Graphic Artist, Directorate for Water Resources Planning, Energy and Cartography, NBA/Niamey
Gould, Dr. Michael, Assistant General Development Officer and Engineer, USAID/Niamey
Kante, Mamadou, Country Director, Financial Management Project, USAID/Niger
Kone, Mahamoud, ESP, FAO/Rome
Kornerup, Else, Assistant Regional Representative, UNDP/Niamey
Maxwell, Dayton, General Development Officer, USAID/Niamey
Niasse, Ibrahim, Irrigation Engineer, NBA/FAO/Niamey
Olobatoke, Sam O., Director, Directorate for Agriculture, Fisheries, Forestry and Animal Husbandry
Omikorede, Samuel O., Documentalist, Documentation Center, NBA/Niamey
Oluwu, Joseph, Deputy Executive Secretary, NBA/Niamey
Osegbue, Steven, Deputy Controller, USAID/Niamey
Rice, John, Engineer, NBA/COE/Niamey
Robin, Charles, Economist/Agronomist, NBA/FAO/Niamey
Saab, Rhea, Projects Officer, UNDP/Niamey
Yacouba, Bako, Water Resources Directorate, Ministry of Hydraulics and Environment, Republic of Niger, Niamey
Zinzindohoue, Jean-Marie, Director, Directorate for Water Resources, Planning, Energy and Cartography, NBA/Niamey

APPENDIX G

Map of Niger River Basin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LIBÉRIA
CÔTE D'IVOIRE
HAUTE VOLTA
GHANA
TOGO
BÉNIN
NIGERIA
CAMEROUN
TOMBOUCTOU
GAO
ANSONGO
MAFOUNKE
NAMPALA
HOMBORI
NIONO
MOPTI
SEGOU
KOULIKORO
BAMAKO
SAN
MANGE
OUAGADOUGOU
TOROSSO
SIKASSO
SIGUIRI
BOUGOUNI
DABOLA
KOUROUSSA
FARANAH
KANKAN
KISSIDOUGOU
DOUENTZ
SEYLA
CONAKRY
ABIDJAN
COTONOU
LAGOS
ILORIN
ILESA
LOKOJA
JOS
KANO
SOKOTO
GATA
MALANVILLE
MAROUA
GAROUA
YOLA
KELO
BONGOR
NGAOUNDERE
ONITSHA
EKUGU
PORT HARCOURT
Sites d'Aménagements
voies navigables permanentes
voies navigables temporaires

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