

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

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UNCLASSIFIED

AID-DLC/P-2035

May 29, 1974

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Dahomey - Cotonou Bridge/Dam

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed Ten Million Nine Hundred Thousand dollars (\$10,900,000) to the Government of the Republic of Dahomey (Borrower) to assist in financing the foreign exchange and local currency costs of goods and services for the supervisory engineering and construction of a bridge and approaches across the Cotonou Lagoon and supervisory engineering services for: (a) construction of a dam at the mouth of Cotonou Lagoon, (b) repairs to the existing bridge at Avenue de la République

This loan proposal is scheduled for consideration by the Development Loan Staff Committee on Thursday, June 6, 1974. Also, please note your concurrence or objection is due by close of business on Tuesday, June 11, 1974. If you are a voting member a poll sheet has been enclosed for your response.

Development Loan Committee
Office of Development
Program Review

Attachments:

Summary and Recommendations
Project Analysis
ANNEXES A1 - L

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May 29, 1974

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May 29, 1974

DAHOMY-COTONOU BRIDGE AND DAMSUMMARY AND RECOMMENDATION:

- A. BORROWER: Military Revolutionary Government of Dahomey (MRGD)
- B. LOAN AMOUNT: The AID Loan will be for \$10.90 million
- C. TERMS:
- (1) Maturity: Forty (40) years including a 10-year grace period.
 - (2) Interest: Two per cent (2%) per annum during the grace period and three per cent (3%) per annum thereafter.
 - (3) Repayment: Interest and principal in U.S. Dollars.

D. TOTAL COST OF THE PROJECT: (millions)

AID	\$10.86
AFDB	2.78
MRGD	1.01
FED Grant	.80
Total	<u>\$15.45</u>

E. PURPOSE OF THE LOAN:

- (1) To relieve a major transportation bottleneck at the existing bridge which is preventing the effective movement of international traffic through Cotonou on the East/West (Ghana, Togo, Dahomey, Nigeria) highway axis and the movements of goods and people within the city of Cotonou.
- (2) To reconstitute the ecology of the Cotonou Lagoon in order to reestablish the fishing industry.

- (3) To promote and support West African regional cooperation and economic development by encouraging East/West trade in addition to the traditional North/South trading patterns.

F. DESCRIPTION OF THE AID LOAN

The AID loan will be utilized for financing the foreign exchange and most local currency costs for the construction of the new bridge and approaches at Boulevard Saint Michael and supervisory services for both the AID and AFDB financed contracts.

G. DESCRIPTION OF THE AFDB LOAN

The AFDB has agreed in principle to finance the foreign exchange costs and roughly 60% of local currency costs for the construction of a dam at the mouth of the Cotonou Lagoon and the reconstruction of the existing bridge i.e., replacing the existing concrete deck with wider sidewalks; rehabilitation of the bridge lighting system and the painting of the steel girders.

While the AFDB is committed to participate in this project in principle, their lending terms will not be defined until an AFDB team presents an appraisal report to the AFDB Board of Directors in July 1974. It is anticipated, however, that the AFDB will offer their most concessional standard terms i.e., 20-year repayment period; 7% per annum; * MRGD financing between 30% and 50% of local currency costs of the bank's project portion i.e., the dam construction and repair work on the existing bridge.

H. THE EUROPEAN DEVELOPMENT FUND (FED) GRANT

This grant should be executed in 1975 and will finance the construction of the 5.0 kilometer two-lane roadway linking the proposed new bridge at Boulevard Saint Michel with International Route No. 11. FED representatives have conservatively estimated construction costs at about \$800,000.

* plus 3/4% commitment fee

I. THE PROJECT: SUMMARY DESCRIPTION

* The total project consists of the following elements:

- (1) the construction of a new four-lane bridge and approaches across the Cotonou Lagoon at Boulevard Saint Michel;
- (2) the construction of a dam located near the mouth of the lagoon;
- (3) repairs to the existing 46-year-old bridge;
- (4) construction of 5.0 kilometers of access roads under a FED-financed grant.

J. BACKGROUND OF THE ACTIVITY

The construction of a new highway bridge over the Cotonou lagoon and the concomitant building of a dam at the entrance of the lagoon has been a priority project for Dahomey for the past several years. The present bridge which handles international highway, railroad, and intra-urban traffic was built in 1928 and has become completely inadequate for current requirements. At the same time, the opening of the new port at Cotonou in 1965 resulted in severe ecological changes in the lagoon.

On October 3, 1969, at a meeting in Washington D.C. attended by representatives from the U.S. State Department, A.I.D. and a delegation of Dahomeans (who had requested U.S. assistance in determining the requirements for a new bridge and dam across the Quemee River at Cotonou to replace the 40-year-old existing bridge), A.I.D. agreed to grant finance a team to make a reconnaissance survey and prepare a report.

The reconnaissance was carried out by Sanders and Thomas, Inc. AID concurred in the need for a follow-up, in-depth, economic technical feasibility study.

*Elements (1), (2) and (3) include supervisory engineering services.

On June 14, 1971, REDSO advised the AFDB that AID agreed in principle to the use of the AID Grant to the AFDB to finance the final design of the bridge and dam. This decision assumed that the Bank was prepared to finance the construction of the dam, bridge and repair work to the existing bridge and that the Government of Dahomey was prepared to negotiate with the AFDB for a loan. It was thought at that time that the bank loan would be on African Development Fund (AFD) concessional terms since the IBRD considered Dahomey an "IDA" country. If the Bank was not able to conclude an arrangement with the Government of Dahomey or if construction costs were estimated to exceed the Bank's limitation, A.I.D. was prepared to consider assuming the financing for the entire project. The Bank agreed in principle on July 1, 1971 to finance the design under the AID Grant if Dahomey would make the request. On July 23, 1971 the Bank advised that the Government of Dahomey had agreed to the design study.

In October 1973, the AFDB advised AID and the MRGD that (1) the only available financing would be the most liberal standard bank terms of 7% * interest; 20-year repayment period (2) the maximum limit of the AFDB for projects from their capital was three million dollars; therefore the Bank could not finance more than about 50% of the estimated project costs, perhaps construction of the dam and renovation of the existing bridge.

On October 11, 1973, pursuant to authorization from AID/Washington, a joint AFDB/REDSO team presented to the MRGD a proposed financial package for construction of the entire project. A.I.D. would finance the construction costs of the new bridge and the direct road approaches plus supervisory engineering costs. Financing of the dam and repairs to the old bridge would be undertaken by the AFDB.

In April 1974, the consultant, Sanders and Thomas, advised AFDB that final design and tender documents would be available by mid-May 1974.

* plus 3/4% commitment fee

K. EXPORT-IMPORT BANK CLEARANCE

Export-import clearance for this project was obtained in May 1974.

L. COUNTRY TEAM VIEW

The U.S. Ambassador to Dahomey and the Regional Development Office for the Entente States (RDO/NIAMEY) have recommended that the loan be made. See Annexes J and K.

M. STATUTORY CRITERIA

Satisfied: See Annex A.

N. Issues - None.

O. RECOMMENDATION

That AID authorize a loan in the amount of \$10.90 million to finance the foreign exchange and most local currency costs of constructing a bridge and approaches across the Cotonou Lagoon.

P. CAPITAL ASSISTANCE COMMITTEE MEMBERS

Field Project Design Officer:	Leroy Jackson, REDSO/WA
Regional Development Officer:	Albert Baron, Niamey/RDO
Engineer:	John Saccheri, REDSO/WA
Legal Advisor:	James Phippard, REDSO/WA

AID/W

Project Design Officer	Robert H. Bell, AFR/DS
Desk Officer:	Frank Miller, AFR/CWR
Engineer:	Jack Nelson, SER/ENGR
General Counsel:	Tom Muntsinger, GC/AFR

The loan will finance U.S. dollar and most local currency costs. CFA Francs (Communate Financiere Africane) are the common currency of the West African Monetary Union which includes Dahomey. Approximately CFA 230 = U.S. Dollar 1.00.

I. THE PROJECT

A. PROJECT DESCRIPTION

*The total project consists of the following elements:

1. the construction of a new bridge and approaches across the Cotonou Lagoon with a width of four lanes and located near Boulevard Saint Michel;
2. the construction of a dam, located near the mouth of the lagoon to eliminate the lagoon erosion which is currently taking place and to help reconstitute the fishing industry in the lake behind the lagoon, upstream from the dam;
3. repairs to the existing bridge deck with wider sidewalks; rehabilitation of the bridge lighting system and the painting of steel girders;
4. the construction of a two-lane 5.0 kilometer roadway connecting the Saint Michel bridge to International Route No. 11 via Avenue de la Republique. This element will be grant financed by FED at a cost of approximately \$800,000.

B. JUSTIFICATION AND RELATIONSHIP TO AID OBJECTIVES

The proposed project is in accord with AID's current policy in West Africa to support regional cooperation as an essential element for economic development and to assist the poorest of the poor African nations. With a per capita GNP of \$90 Dahomey is one of the poorest countries in Africa. The project accords with our efforts to carry out jointly financed projects with such international organizations as the African Development Bank, and FED, for regional development.

The rational economic development of West Africa depends to a considerable degree on the establishment of closer political, economic, and social ties among the countries. Modern transportation links between these states are one of the concrete requirements to foster closer relationships and economic ties. Considerable efforts are being made to develop economic understandings between the coastal countries: Ghana, Togo, Dahomey and Nigeria. Programs are being

* Elements (1), (2) and (3) include supervisory engineering services.

developed to increase trade among them, and to gradually coordinate industry and commercial policy. The Cotonou bridge is an integral part of the international highway which runs from Accra-Lome-Cotonou-Lagos. The importance of this transportation link has been recognized by the countries themselves and by other donors. Thus, FED has financed the reconstruction of the highway from Lome to Cotonou, and from Cotonou to the Nigerian border. FED has also agreed to finance the linkages from the new bridge to the highway.

The coastal countries are developing both their agricultural and industrial capacities, and there is considerable migration of labor among the countries. This requires mobility for both trade and labor forces. The project is also expected to have a favorable effect on the fishing industry in the Cotonou lagoon with the construction of the dam at its entrance. Approximately 50,000 people depend on this industry for their livelihood, and there are good indications that the dam, by controlling the in-flows and out-flows of the lagoon, will have a beneficial effect in restoring the ecological balance in the area (1).

From the purely investment point of view, the engineering studies have indicated a very high internal rate of return on the project, estimated at 26%.

C. RELATIONSHIP OF PROJECT TO MRGD OBJECTIVES

Cotcnou's city planners view the entire project for the reconstruction of the old train bridge; the construction of a new bridge; and approaches as extremely important to the orderly growth and development of the city and have allocated a high priority to the realization of this project.

(1) Source (1972) - Sanders and Thomas
Economic and Technical Feasibility Study for Bridge and Dam Across Cotonou Lagoon

In addition to coastal areas like Cotonou and Porto Novo becoming the business, administrative and cultural centers of Dahomey during the colonial period, tribal conflicts discouraged settlement and cultivation of the country's central northern half despite the fertile farm land available there. Consequently, approximately 50% of Dahomey's population of 3,000,000 live in only 10% of the land area. More than 75% of the urban population is concentrated in Cotonou, the commercial, cultural, and administrative center and Porto-Novo, the Capital. The completion of Cotonou's modern deep water port in 1965, which is equipped to handle ocean going vessels; the international airport; the International route No. 11 and the existing bridge have also been important factors contributing to Cotonou's growth. These are located along the Atlantic coastline and offer a quick means of access for the movement of merchandise to points within the country or to neighboring countries along the international route (Togo, Nigeria). The majority of commercial, financial, administrative and industrial facilities are also situated along this East-West axis.

The Dahomean Government views the construction of a new bridge over the lagoon as an essential factor contributing to political stability and an important inducement for private investors who now hesitate to establish factories in Cotonou's zoned industrial area because of bottlenecks at the existing bridge which would be costly to their business operations. There is also the problem of the increasing salinity of the Cotonou Lagoon which is killing off the fish and robbing Dahomey of a major source of revenue. (Approximately 80-85% of the economy depends on fishing and agriculture). If the loss from fishing is not overcome, there will be serious economic and political consequences in the form of unemployment and loss of revenue.

Since the construction of the modern deep water port, Cotonou's population has increased rapidly. Latest projections indicate that the city will grow

from 150,000 in 1970 to over 340,000 in 1990. This growth corresponds to an average rate of over 6% yearly.

City ordinances have established the area east of the Cotonou Lagoon which extends along the international route No. 11 towards Porto-Novo, as an industrial zone. For example, those facilities which tend to create certain sanitary and pollution hazards to the community (such as the emissions from a power plant or the effluents of a sewage treatment plant) are further restricted and are to be located beyond Km point 4, on the international route between the lagoon and Porto-Novo. As expansion of the city along the East-West axis reaches saturation, further growth in Cotonou will be concentrated North of the international route and Boulevard Saint-Michel and move North toward Lake Nokoue on both sides of the lagoon.

In terms of city planning, it is important to observe how the economic growth of Cotonou was aided through capital improvements, proper zoning, and development of available city lands. In this context we can relate the regional developments which have had, and will have, an effect on the city, and which also point to the type of capital improvement needed for city growth. The construction of the port, for example, was needed to provide a better cargo transportation facility and a better link to the ocean for Niger as well as for Dahomey. In turn, to make the Cotonou port fully useful for Niger traffic, AID Loan 620-H-002/8 is financing the reconstruction and paving of the northernmost 170 kms of highway between Niger and Dahomey while IDA is financing an additional 150 kms immediately to the south and adjoining the AID project. These improvements will in turn have their effect on increased economic activity in Cotonou. Similarly, in the near future, several large regional developments, when completed, will have a strong effect on Cotonou. Among these are the recently discovered limestone deposits at Onighlo near Porto-Novo and the exploration and drilling for offshore petroleum at Cotonou. In this connection

Dahomey is considering a refinery to process Dahomey's own petroleum or possibly Nigeria crude oil. The petroleum will probably be stored on the Eastern side of Cotonou and will also require an improved lagoon crossing for better access to the port and the rest of Dahomey. To take advantage of Dahomey's rapid increase in cotton productivity (7,400 tons in 1966/67 to 47,000 tons in 1972/73) a large textile factory at Parakou (IDATEX), is being constructed and another is envisaged for Cotonou as soon as financial support is obtained. The factory at Parakou will produce for export, grey cloth, bed linen, garments, etc., mainly to European markets.

All of these developments will help to stimulate increased employment and economic activity in Cotonou. Additional local development will follow the construction of a new roadway facility or a new bridge over the lagoon. Similar to the commercial area which developed around the Western approaches to the existing bridge, it is certain that new commercial establishments will spring up near the approaches of the new bridge. Construction of the new bridge will alleviate traffic congestions on the existing bridge which is inadequate for current traffic volumes. The present bridge was built in 1928 when Cotonou's population was about 20,000. The number is 204,000 today, and is growing at the rate of 6% per year.

The new bridge will be able to accommodate traffic projections 20 years hence, and will also provide fast and easy access from both sides of the lagoon to other points north of the international route. In addition to through international traffic, international route No. 11 is the most important east-west route in Dahomey. It includes the existing bridge across the Cotonou Lagoon. Because this coastal thoroughfare connects Accra (Ghana), Lome (Togo), Cotonou, Porto Novo and Lagos (Nigeria), its significance to the Dahomean economy cannot be overstated. As economic conditions improve in West Africa and inter-regional commerce grows, international vehicular travel through Cotonou is bound to assume

increasing importance. The dam, by stabilizing water elevations and velocities in the lagoon, will stop scour and erosions along the shores. This factor will clear certain areas near the lagoon and lake shores for possible development projects. The existing bridge will be repaired to continue to accommodate railway and local city traffic movements across the lagoon.

D. PROJECT ADMINISTRATION

The borrower will be the Military Revolutionary Government of the Republic of Dahomey (MRGD). The implementing agency will be the Department of Public Works (DPW) in the Ministry of Public Works, Mines and Transport. The DPW field organization consists of three districts, South, Central and North, each with three to four subdivisions. This project would fall within the province of the South district which has its seat at Cotonou.

E. MAINTENANCE OF THE FACILITIES

1. Costs

Little useful data is available in Dahomey concerning bridge maintenance costs. However, bridges generally do not need year-to-year maintenance. Once the repairs to the existing bridge are completed, only the steel girders will require repainting about every five years. Since the new bridge will be a concrete structure, practically no maintenance will be needed for at least the first ten years. At that time, the bridge deck may need some maintenance due to the wear and tear of the bridge surface. The road lighting system on both bridges will need yearly maintenance. Maintenance costs of roadway approaches are composed of two elements. One is a fixed cost for the deterioration of the road surface due to weather conditions and the other is a function of the volume of traffic using the road. The consultant has estimated that for the 20-year study period, the total maintenance costs for the project amounts to about 300 million Fr.CFA (approx. \$1.20 million). This averages about \$60,000/year.

2. MRGD Maintenance Capability

As indicated by the organization chart (Annex E), the Cotonou subdivision of the southern district will perform the maintenance tasks required. The DPW is currently being assisted in a highway maintenance program through a \$3.5 million IDA credit. This credit will provide for the overhaul and renewal of the maintenance equipment fleet and the strengthening and reorganization of the road maintenance organization. This factor will greatly enhance MRGD's highway and bridge maintenance capability. The AID-financed Regional Road Maintenance Training Center in Togo is also designed to assist the Entente States in the development of well-trained road maintenance personnel. In addition, the Funds d'Aide et Cooperation (FAC) is providing expatriate advisers to the Department through a continuing technical assistance program. These advisers occupy key management positions within the Department of Public Works and are an important factor in the efficient operations of the department.

F. IMPLEMENTATION PLAN

1. Management

It is planned that construction of the new bridge across the Cotonou lagoon and its roadway approaches, the construction of the dam near the mouth of the lagoon and the renovation and widening of the existing bridge be let under two separate contracts. Contract (A), covering the construction of the new bridge and the roadway approaches, will be under AID financing. Contract (B), covering the construction of the dam and the repairs to the existing bridge, will be under AFDB financing. MRGD's Ministry of Public Works, Mining and Energy, acting as the owner, will call for bids on both contracts. In order to minimize delays in construction scheduling and reduce certain construction costs, it will be necessary to coordinate the construction of the Dam (contract B) with that of the substructure for the new bridge (contract A). It would therefore be beneficial if work under both contracts were coordinated very closely. To insure this coordination among firms operating under separate contracts, it is proposed that one consultant

financed by AID be engaged to supervise construction operations under both contracts. Other measures have been taken to assure coordination and cost savings to the MRGD. As agreed with AID, the AFDB has instructed the consultant, Sanders and Thomas, to prepare bid documents for the bridge and roadway approaches (contract A) to U.S. specifications, and the documents for the Dam and repairs to the existing bridge (contract B) to international and U.S. specifications. This procedure could encourage an American contractor bidding on the AID-financed portion to also submit a more competitive bid on the AFDB-financed portion of the project.

The FED-financed road construction including supervisory engineering will be carried out by a European firm since this is a requirement of the FED grant.

2. Construction Work Plan

A coordinated plan of operations could realize great benefits in terms of construction time scheduling and cost savings. For example, total construction time for the construction of the new bridge and the approaches is 33 calendar months. Work on the repairs to the existing bridge could not begin before the new bridge is opened to traffic. Water borne construction operations on the new bridge would be facilitated if the greatest part of dam work were already in place, since the major function of the dam is to reduce water flow velocities in the lagoon, even during flood periods (October through December). Construction of the dam could be completed in nine months' long dry season (January through September). Working in coordination with this schedule, one-half width of the new bridge (two traffic lanes and one sidewalk) can be completed and opened to traffic in 21 months. Two roadway lanes, from Boulevard Saint Michel to the new bridge, and from the new bridge to the International Route, should be opened concurrently with the new bridge. Work on renovating the existing bridge could, in this manner, begin up to one year in advance. During the remaining last year of the overall construction period, work on the second half width of the new bridge and on the other two roadway approach lanes can be completed as scheduled. Several of the work items to be done on the existing bridge, such as relocation

of the utility lines, abutment repairs and cleaning and painting of steel girders, can be done at any time during the construction period.

A critical phase of this plan is to insure that setting up of the construction yard and procurement of rock materials for the dam are done promptly. As mentioned earlier, work on the substructure of the new bridge must be coordinated with the construction of the dam. Specifically, during the six months necessary to complete the first phase of the construction of the dam, the bridge beams and piles can be precast at the construction yard. As soon as the first phase of dam construction is completed (placing of apron and sand core), pile driving operations can begin. Of the total time needed for the construction of the bridge, more than half of that time may be needed for pile driving and installation of pile caps. Erection of bridge beams, bridge deck and lighting could be completed within a 12-month period. Construction of the superstructure can overlap by about 6 months work on pile driving and pile caps.

Construction of roadway approaches can be done in two stages. In the first stage, all the grading work can be completed. The paving work of the second stage can be delayed to allow certain sections of the embankment along the eastern approach placed over swampy terrain to stabilize itself.

G. TRANSPORT

Dahomey's transport system is simple and serves the needs of the country fairly well. Cotonou with its deep-water seaport and international airport, is linked with the rest of the country by a fairly extensive road network as well as a railway which penetrates deep into the interior. Apart from the need to expand the Cotonou port by 1977 and to improve access to remote areas (i.e. the Atakora region), the transport network is adequate to serve the country's present and foreseeable transport needs. The country's road network includes approximately 6,800 km of roads and track, a tenth of which are one- and two-lane paved routes. Road transport is the predominant mode for over 60 percent of freight and 82 percent of the total passenger traffic, with the remainder carried by rail. About two-thirds of total traffic is concentrated in the densely populated southern region where

important domestic markets such as Cotonou, Porto-Novo, etc. are located. The most important route in Dahomey is the international transport axis called the "Dahomey Route" which extends the length of the country (58 km). It consists of the Port of Cotonou, the railway from the port to Parakou, and the road link from Parakou to Malanville on the Niger border. The Dahomey Route is the main outlet to the sea for landlocked Niger carrying about 45 percent of its foreign trade. Niger's transit traffic accounts for about 60 percent of freight carried by Dahomey's railway and about 25 percent of traffic handled by the Port of Cotonou.

Recognizing the importance of transport activities in Dahomey's economy, the Dahomean government has given priority to the improvement of the country's transport network. Most important has been the recent improvement of highway maintenance and administration, which was financed by an IDA credit and by increased budgetary appropriations for maintenance. Until the late sixties, highway maintenance was insufficient because of lack of qualified staff maintenance equipment and budget funds. Hence, road maintenance fell far below requirements and the road system deteriorated. However, as a result of FED financing, some trunk roads have been upgraded mainly in the southern region. With the paving of the Parakou-Malanville Road--the road section of the Dahomey Route to Niger--financed by AID (Loan 625-H-002) and IDA and the completion of the paving of the coastal road by FED, the country's major transport network will be modernized. This task will be completed by 1977.

Road investments during the 1973-76 plan period may range from about CFAF 7.5 billion to about CFAF 10 billion, depending on the availability of foreign aid to improve secondary and feeder roads.

Dahomey's railway, managed by Organisation Commune Dahomey-Niger des Chemins de Fer et des Transports (OCDN) has received regular financial aid from FAC for track and equipment renewal. FAC is expected to continue supporting the railway and its future aid will probably range from CFAF 450 to 600 million during 1973-76. A government transport survey was

undertaken in 1969 to define the priority of an investment and maintenance program and to propose measures to improve the efficiency of OCDN's operations and planning of the transport section as a whole. While the Government has largely followed the survey's recommendations for the maintenance and investment program, continued efforts will have to be made to rationalize railway management and coordination, and planning of the different transport modes.

Future development of Dahomey's transport section will depend on better use of existing facilities and improved coordination and planning*.

II. EVALUATION

A. PROSPECTS FOR MRGD REPAYMENT OF LOAN

The present external debt burden of Dahomey is not excessive, since a large percentage of development assistance has been provided by France (FAC) and the Common Market Countries (FED) on a grant basis. Since Dahomey's independence, France has been a major donor of budgetary support, development programs, and technical assistance has amounted to some \$10 million in 1973, almost entirely on a grant basis.

FED has been a major contributor of project assistance and lending by the International Bank of Reconstruction and Development (IBRD) has expanded in the past six years. The proposed AID loan at concessional terms of 2% per annum during the grace period will not add an undue burden on the country's external debt servicing, since continued assistance on more concessional terms is expected from France and other donors. An intensive program for increased revenues from exports over the next several years is encouraging. Measures are also being taken to assure better control of government spending and more efficient tax collection. Since it is a member of the International Monetary Fund, the MRGD has a standby agreement which imposes certain financial constraints on the government to assure proper financial

* Information taken from IBRD report August 1973.

management. For these reasons, it is concluded that the MRGD would be able to repay the loan on schedule.

B. OTHER SOURCES OF FINANCING

AID, the FED and AFDB are participating in this project at the request of the MRGD. The IBRD has officially stated it is not interested in financing the project. Private financing is not available for this type of project and the Export-Import Bank has declined to participate.

C. IMPACT ON U.S. ECONOMY

This loan does not conflict with any U.S. business interests. To the contrary, a U.S. firm awarded the construction contract for the AID portion of the project will have a competitive advantage in bidding on the AFDB financed dam construction and bridge repair project valued at \$3.46 million.

D. IMPACT ON U.S. BALANCE OF PAYMENTS

About \$7.04 million (65% of the loan proceeds) will finance U.S. goods and services. The remainder will be used for direct purchase of CFA francs to finance local expenditures.

E. EFFECTS ON PRIVATE ENTERPRISE

All contracts financed under the loan will be with private firms. Since both the AID and AFDB projects contain local currency components, local Dahomean entrepreneurs will undoubtedly benefit from contractor use of local facilities.

F. REASONABLENESS OF MRGD CONTRIBUTION TO THE PROJECT IN RELATION TO AVAILABLE INVESTMENT RESOURCES

Political instability has troubled Dahomey since independence in 1960. During this period the nation

has had ten governments. Five of these, including the present one, have been headed by army officers who seized power in successful coups. Dahomey's instability has been primarily fueled by traditional tribal and regional antagonisms between the three principal regional groupings, the Arabized tribes of the North, the Fon and Mina in the west central region, and the Gouns-Yoruba group in the Southeast. A further destabilizing factor is the large number of students whose education has conditioned them to anticipate professional or clerical employment in the already swollen ranks of the civil service. The pressures on Dahomey's budget caused by the increasing administrative staff were so great that the country was in constant financial difficulties throughout the sixties. First budgetary outlays for materials and maintenance had to be curtailed. Dahomey's road network, schools, hospitals and public buildings deteriorated because of lack of maintenance. Schools lacked teaching materials and hospitals suffered from an insufficient supply of medicine. Secondly, the strained financial situation led to the accumulation of large payment arrears representing mainly unauthorized current expenditures by various ministries. Thirdly, to alleviate the budgetary situation, reserve funds from public enterprises and institutions were used to cover current budget expenditures. Finally, because of a lack of budgetary and overall government savings, Dahomey was unable to fund any investments. Up to 1969, public investments were financed almost entirely by foreign aid.

Between 1969 and 1970, favorable external demand for Dahomey's export crops and booming transit trade with Niger and Nigeria were important factors in Dahomey's economic upswing. Prices of most of Dahomey's exports were at a record high. At the same time post war difficulties in Nigeria led to the transit of sizable amounts of cocoa through Dahomey and re-export of imported consumer goods to Nigeria.

Today, the picture is much less optimistic because of:

- (1) An expected slowdown in palm oil output. The production volume of this product is likely to increase by less than 2 percent a year until 1976 owing to the recent drought, the aging of natural palm trees and the fact that much of the recently planted high-yielding trees will only mature in the second half of the decade. Cotton production is expected to grow rapidly, but its contribution to GDP is still comparatively modest.
- (2) The likelihood of slow progress in traditional agriculture. Action to increase domestic food production (rice and maize) will probably not be felt in terms of increased production until the second half of the decade.
- (3) The lack of new manufacturing plants. Although several industrial projects are under consideration, most of them will not be completed before the second half of the decade.
- (4) The fall-off in the border trade with Nigeria.
- (5) Increasingly unfavorable terms of trade resulting from the oil crisis.

Financing of the current development budget and current account deficit is expected to come mainly from the net inflow of public grants (FAC, FED) and loans on concessionary terms from various bilateral and multilateral aid institutions as well as private sources.

While the AFDB is not able to accord the MRGD, the soft loan terms provided by the African Development Fund for the Cotonou Dam construction, ADF Funds will finance two other Dahomean projects; the Oueme Irrigation Project (left bank) at 1.2 million units of account, and the Dogbo-Azore-Abomey road project at 3.2 million units of account.

By averaging the terms of the proposed AID loan with the most concessional standard terms offered by the AFDB we arrive at terms still within the minimum DAC guideline on concessional lending by International donors; i.e., 3% interest - 30 years for repayment.

The MRGD's contribution to the total project will be a considerable one since the MRGD will be requested to finance about \$1.01 million in local currency costs of out of a total of \$15.45 million.

G. REDSO/WA SUMMARY OF CONTRIBUTIONS TO PROJECT COSTS

	<u>Construction Items</u>	<u>Total (Millions)</u>	<u>Foreign Exchange Costs</u>	<u>%</u>	<u>Local Costs</u>	<u>%</u>
AID	New Bridge	6.12	4.89	80	1.23	20
	Approaches	3.71	1.33	36	2.38	64
	Supervision of construction - only AID and AFDB project	1.03	.82	80	.21	20
	SUB-TOTAL (1)	10.86	7.04	65	3.82	35
AFDB	Dam	1.42	1.17	82	.25	18
	Repairs to existing bridge	1.36	.93	68	.43	32
	SUB-TOTAL (2)	2.78	2.10	76	.68	24
FED	5.0 km two-lane road link	.80	.50	62	.30	38
	SUB-TOTAL (3)	.80	.50	62	.30	38
MRGD	Local currency costs	1.01*	-		1.01	100
	SUB-TOTAL (4)	1.01	-		1.01	
	GRAND TOTAL	15.45	9.64	62	5.81	38

*Figure equals \$330,000 MRGD contribution to the local costs of the AID project and \$680,000 contribution to the AFDB project.

H. CONDITIONS PRECEDENT

The major conditions precedent to initial disbursements required of the Borrower and/or Beneficiary in addition to standard conditions precedent are as follows:

1. Provide evidence that the MRGD has, or will make provisions for their local currency contribution to the A.I.D. project.
2. Provide A.I.D. with a signed accord which verifies that the funding of the dam construction and reconstruction of the existing bridge has been obtained.
3. Provide A.I.D. with an executed copy of construction contract for the dam and repairs to the existing bridge.
4. Provide evidence that the Service Des Routes et Ports of the Borrower has the organization and budgetary capacity to maintain and operate the project.

III. ECONOMIC ANALYSIS

The original internal rate of return (IRR) analysis performed by the consultant in 1972 economic and technical feasibility study showed a return of 34 percent for the combined bridge and dam project, using only the benefits derived from reduced vehicle operating costs. The consultant's sensitivity analysis based on a reduction of 10% in base 1970 traffic data, a 20% reduction in traffic growth rates, and a 15% reduction on both traffic diverted to the new bridge and vehicle operating costs still yielded a very respectable IRR 23% (or 16 % if fishing benefits were reduced by 50%).

In an attempt to show impact of revised cost estimates on the project's rate of return, the IRR has been recalculated by the consultant using 1974 cost estimates with benefits unchanged at 1972 levels. Using this approach yields an IRR of 26%. If fishing benefits are also concluded the IRR would be somewhat higher, at around 28%. It is important to note that these calculations understate the IRR since benefits have not been adjusted to reflect current conditions, e.g., higher costs of fuel and personnel for vehicle operation would be expected to increase the benefits from trip savings while increased prices for fish and shrimp products would similarly raise benefits from this source.

TECHNICAL ANALYSIS

A. TECHNICAL BACKGROUND AND CURRENT SITUATION

The existing bridge is a key link in the East-West International Highway which connects Nigeria with Ghana through Dahomey and Togo. It is the only bridge crossing of the Cotonou lagoon which separates the industrial zone from the commercial, residential and administrative centers of the city of Cotonou. It is also the only crossing of the Oueme river for 90 kms north of the Atlantic Ocean. This bridge was built in 1928 and carries all the east-west traffic of the O.C.D.M. Railroad as well as all the vehicular and pedestrian traffic crossing the lagoon. The Cotonou bridge is narrow (5.75 meters wide) for the large volumes of two-way mixed traffic it carries. To accommodate the fast growth of city traffic, the existing bridge has already been widened twice. It cannot be widened again economically. A detailed survey of the traffic crossing this bridge was made in November 1970 by Sanders and Thomas. The traffic survey included volume counts and origin/destination studies by vehicle category. Pased on results of these counts and local traffic records available for the 1960-1970 period, the consultant established traffic growth patterns to forecast the average two-way daily traffic from a base year 1970 up to the year 1996, as follows:

	<u>1970</u>	<u>1996</u>
Passenger cars, taxis, etc.	10,400	45,461
Buses and Trucks	2,290	7,285
Pedal and motor bicycles	17,200	149,621
Pedestrians	11,400	47,710
Train movements	8	-

In November 1970, the consultant determined that the maximum hourly traffic volume on the Cotonou Bridge was 1,000 vehicles/hour. He also estimated that the bridge can carry a maximum of 1,180 vehicles per hour. These volume counts are for two-way traffic. This traffic data would indicate that in 1970 the Cotonou bridge was already operating at near its ultimate design capacity. The total average daily traffic of 12,690 vehicles crossing the existing bridge in 1970 was estimated to increase at an average rate of about 5% per year, to over 52,700 vehicles in

1996. In his analysis of traffic patterns, speeds and delays on this existing bridge to determine capacity requirements for a new one, the consultant also applied the concept of level of service. Level of service is a measure of quality of operating conditions occurring in a roadway section. It is the effect of a number of factors, which include driver comfort and convenience, speed, travel time and traffic interruptions. Levels range from A, free-flow traffic, down to F, very congested traffic flow. These studies also considered delays caused by train movements across the bridge which occurred at an average frequency of eight times/day. Results of this analysis show that the opening of a new four-lane bridge in 1977 to alleviate traffic congestions on the existing bridge would also begin reaching its capacity in 1996, and a third bridge across the lagoon would need to be considered at that time.

B. DESIGN ALTERNATIVES CONSIDERED

1. Earlier Bridge-Dam Designs

Earlier design alternatives proposed by BCEOM in 1968 and by P. Holzmann A.G. in 1969 were examined and evaluated by the Consultant. The BCEOM proposal consisted of a dam located at Boulevard St. Michel which included a spillway. The spillway opening could be varied by placing or removing a series of sliding wooden planks. These planks were held in place by steel trusses which functioned as buttresses. Seventy-six trusses were distributed across the width of the spillway, spaced 1.10 meters on center. They contained 375 planks, 5 in each space between trusses. The foundation of the Dam required an elaborate design to resist the high energy of the discharge waters in the spillway area. The width of the dam at the top of the embankment was 20 meters and could accommodate a two-lane roadway. To provide room for the future bridge, the spillway was offset 32 meters downstream from the axis of the dam. The bridge would consist of three 37.5 meter spans. The deck would be 10.5 meters wide between 2.25 meter sidewalks, supported by five precast prestressed concrete T-beams.

The Holzman proposal consisted of a four-span 100-meter long bridge designed integrally with a spillway of the same length. The spillway contained

four hollow reinforced concrete gates sliding vertically within grooves located in massive bridge abutments and piers. Each gate was 24 meters long and weighed 113 tons. The gates were operated by electric motors located at one of the abutments. The width of the bridge deck would be 12 meters between two sidewalks 1.5 meters wide. The bridge and spillway would bear on spread footings. This dam-bridge proposal, as the one above, would be located in line with Boulevard St. Michel.

Both proposals were similar in concept and location across the lagoon. They provided complete control of the lagoon waters. Both structures were located across the lagoon at a point where the bridge length would be the shortest. However, both proposals had many disadvantages. The designs were complex and difficult to build and operate. The structures would need frequent maintenance. Both designs were costed at about double Sanders and Thomas' initial bridge-dam estimate proposed in 1970. Another important disadvantage was the fact that a dam located at the Boulevard St. Michel crossing would not provide the existing bridge nor the lagoon banks downstream with any protection against erosion.

C. LOCATION FOR THE NEW BRIDGE

Following detailed investigations in the field, the consultant (Sanders and Thomas) considered only two sites suitable for a new bridge crossing. These were: 1) a parallel bridge about 20 meters north of the existing crossing and, 2) a bridge location in line with the Boulevard St. Michel.

A bridge located near the existing site would have certain desirable aspects. Since it is there that the highest traffic demand exists, the new parallel bridge near the existing one would immediately attract all of the present traffic crossing the lagoon. It would also be easy to connect it to the International Route and relatively short approaches would be required. However, several important problems were connected with this location. One is the lack of sufficient room to set up a construction plant and be able to store construction equipment and materials near the job site. Also, due to the congested traffic conditions near the existing bridge, the access and

delivery of materials to the job site would be subject to many delays. This factor would tend to increase hauling costs of construction materials. Traffic studies undertaken by the Consultant indicate that by 1975 this area would have at least 5 hours of congested traffic conditions daily (level of Service E). Furthermore, the nearness of several cross streets to the west side of the existing bridge and the proposed location of the west bank boulevard would afford difficult channeling of the traffic at the western end of the bridge. Traffic on the western approach to the bridge would be subjected to heavy cross movements. This situation plus the train crossings on the existing bridge, would reduce the effectiveness of the new bridge in handling increased traffic loads in the future. Alternatively, a new bridge located in line with Boulevard St. Michel, about 2 kms upstream of the existing bridge would pose no problems and have several important advantages. The most important one is that it complements the future plans of the City of Cotonou. A bridge at that location would help shift the center of the city's expansion to the north. This location also has unlimited room on the eastern bank of the lagoon where a large construction yard could easily and conveniently be located. Construction operations would not be subject to any interference from the existing traffic. This will greatly facilitate construction operations and, therefore, reduce construction time and costs. In addition, this site can easily be re-connected to the International Route on both sides of the lagoon, although the approaches will be much longer than those at the parallel bridge. On the west side, the connection would be made through Boulevard St. Michel, a wide divided city street, and Avenue de la Republique, a two-lane cross city street in which construction has already been proposed at a cost of about \$.8 million under FED financing.

On the east side, the approach joins the International Route just east of the sports stadium and is 1.5 kms long. The initial connection with the International route will have a two-lane roadway section for the last .71 kms of the eastern approach. The road plan for the approaches also provides for future expansion with an additional two-lane extension between the end of the four lane eastern approach

section and km. point 7100 of the International route, which will be built when traffic demand increases. In view of the above the consultant recommends the Boulevard St. Michel site for the new bridge. This location is strongly supported by the MRGD.

D. LOCATION FOR THE DAM

As mentioned earlier, the investigations made by the Consultant indicates that the dam is needed for two basic reasons. One is to prevent erosion in the lagoon and the other is to help eliminate the causes which have upset the ecological balance in Lake Nokoue. The location of the dam north of the existing bridge would not be beneficial since it leaves a large part of the lagoon, and the existing bridge, open to erosions due to the fast flow of waters moving downstream to the ocean. Since the lagoon widens as it approaches the ocean, water flow is less restricted and fluid forces tend to decrease as it moves downstream towards the mouth of the lagoon. For these reasons, the consultant has selected a site for the proposed dam near the mouth of the lagoon. This recommendation has been accepted by the MRGD.

E. STRUCTURAL ELEMENTS FOR THE NEW BRIDGE

In determining the most suitable structural components for the New Bridge, the consultant carefully analyzed various design and cost alternatives. For example, since deep foundations were deemed the most feasible foundation system, the consultant considered five types of piles and recommended the use of precast-prestressed concrete cylinder piles. In the design of the roadway, careful consideration was given to safety, traffic growth composition, and level of service projected. Since traffic on the new bridge will be mixed and include a high percentage of pedal and motor bicycles, a 7.0 meter roadway for each direction of traffic, 2.5 meter sidewalks, narrow shoulders and median parapets were recommended. A comparative total cost analysis was made between the adjacent prestressed concrete box-girder system and the steel girder system. Results of the analysis clearly show prestressed concrete to be more economical

over the range of span lengths over 13 meters. The adjacent box-girder system at a 23 meter span length was retained. Certain esthetic features were considered in the design of pier shafts, pile caps, type of bridge lighting, and in the determination of the deck structure and of the optimum span length. The extra cost for including these esthetic features in the design of structural elements amounts to less than 4 percent of the total cost of the structure. All the recommendations above, and others, which were made by the consultant were approved by the MRGD-AFDB-AID technical committee which reviewed this project's Phase I studies in November 1973, in Cotonou.

F. TECHNICAL DETAILS OF THE PROJECT

The proposed project will consist of the following elements:

New Bridge Across Cotonou Lagoon

1. Description

The new bridge will be prestressed concrete structure, 22.5 meters wide, including sidewalks, and will consist of 15 spans 23 meters long for a total length of 345 meters. The superstructure is composed of two groups of eight adjacent precast concrete box girders with a 10 cm cast in place of a composite concrete cover.

The substructure consists of two abutments and 14 piers all supported on precast prestressed concrete piles. Abutments are of the stub type and piers consist of V-shaped columns tied by a precast prestressed concrete strut. The pile caps are proposed to be precast as a boat-like shell which will be floated to their final position. They will be used first as a template for driving piles and then will be filled with mass concrete to form the pile caps and become a base for the construction of the remainder of the pier. The concrete piles shall be embedded for a distance of six meters below the existing lagoon bottom.

G. ROADWAY APPROACHES TO THE NEW BRIDGE

1. Description

The roadway approaches to the new bridge connect to and pass by several important traffic areas. To avoid serious traffic

bottlenecks, improved intersections at each end of the project and an interchange near the new Dantokpa Market on the west side of the lagoon were included in the design of the approaches. The intersection located at the eastern terminus of the project will require relocation of the railroad tracks. The total length of the approaches amounts to 2.74 kms. The western approach which begins at Avenue Delorme and is a continuation of the existing Boulevard Saint Michel consists of 4 lanes divided by a median and is .51 km long. The interchange near the new Dantokpa market will also provide access to the proposed future West Shore Boulevard. The eastern approach extends for 1.52 kms as a four-lane roadway divided by a median. The final section of the eastern approach consists of a two-lane roadway, .71 kms long, and its terminus intersects with International route No. 11. The median is 14 meters wide on the east approach. The median areas are edged with curbs which are made of precast concrete. Shoulders are kept 3 meters wide on all roadways and their cross slope is four percent. Roadway cross slope is maintained at 3 percent. The embankment slopes are kept at 1:4 (vertical to horizontal) for fills less than 2 meters high and 1:2 for fills above 2 meters. Guardrail is provided when embankment height exceeds 2 meters. Preliminary design considerations indicate that the pavement structure will consist of 5 cms of bituminous surface course over 15 cms of latiritic sandstone base course supported by 15 cms of sub-base.

H. THE PROPOSED DAM

1. Description

The dam averages 3 meters high and is 520 meters long. It consists essentially of a sand core covered with a pervious rock blanket. The crest includes a 30 meter long sill, 2 meters deep, which will be closed by removable concrete blocks weighing 4 tons each. The purpose of this design is to permit MRGD's fisheries department to exercise more direct control of the water flows between the ocean and the lagoon. These massive concrete blocks will be placed on a precast concrete cradle. This section of the dam will be constructed by placing 8 precast concrete sections (each approximately 5.4 meters long and weighing 45 tons) on the proposed bottom and then correcting them in place. An impervious curtain under this portion of the dam will be built by cement mortar grouting. The work also includes improvement and rock protection of the lagoon banks adjacent to the dam. The dam is located near the mouth of the Cotonou lagoon where it connects with the Atlantic Ocean. It is intended to block partially the tidal inflow in the lagoon and is designed to permit the flood waters of the Oueme River to flow over the dam into the ocean.

I. WIDENING AND RENOVATION OF THE EXISTING BRIDGE

1. Description

The existing bridge is a combination railroad and vehicular bridge. It was constructed 46 years ago and consists of 29 riveted steel girder spans with a narrow concrete deck. The bridge carries an oil main, about 23 cms in diameter, and a water main, about 26 cms in diameter, across the lagoon. The deck is 5.75 meters wide between curbs and has two sidewalks of unequal width. The north sidewalk is 72 centimeters wide and the one on the south side is 90 centimeters wide. The reinforced concrete substructure consists of 28 delta frame piers and two abutments. The bridge substructure has been repaired under FAC financed funds. These repairs consist of the removal of the deteriorated concrete, reconcreting of the pier members and piles, the application of a coat of epoxy for protection against salt action and the placing of a rock blanket under the bridge. This blanket was needed to protect the bridge piles from further loss of embedment due to the heavy erosions of foundations during flood period.

To prolong its usefulness, the consultant recommends undertaking the following repairs to the bridge's super structure:

Replace the existing concrete deck with a new cast in place bridge deck and new precast concrete sidewalks, 2.0 meters wide. Replace the existing steel brackets with new ones. Remove the existing rail and fence and replace it with a new steel bridge railing. New stainless steel lighting poles will also replace the existing ones along the deck. The existing steel girders will be cleaned and painted as well.

J. SUMMARY OF PROJECT COSTS

<u>Construction Items</u>	<u>Total Amount (\$ mil)</u>	<u>FY</u>	<u>%</u>	<u>LC</u>	<u>%</u>
*New Bridge	5.57	4.44	(80)	1.13	(20)
10% physical contingency	.55	.45		.10	
Sub-total	<u>6.12</u>	<u>4.89</u>		<u>1.23</u>	
*Approach to the new bridge	3.37	1.21	(36)	2.16	(64)
10% physical contingency	.34	.12		.22	
Sub-total	<u>3.71</u>	<u>1.33</u>		<u>2.38</u>	
**Dam Construction	2.10	1.17	(56)	0.93	(44)
Sub-total	<u>2.10</u>	<u>1.17</u>		<u>0.93</u>	
**Renovation of existing bridge	1.36	.93	(68)	.43	(32)
Sub-total	<u>1.36</u>				
5 km Link	.80	.50	(62)	.30	(38)

* Includes 15% consultant allowance for cost escalation during construction

** Includes 10% consultant allowance for cost escalation during construction

<u>Construction Items</u>	<u>Total Amount (\$ mil)</u>	<u>FY</u>	<u>8</u>	<u>LC</u>	<u>8</u>
***Supervisory Services for AID and AFDB project elements = 10% of base construction cost plus 10% contingency	<u>1.36</u>	<u>.82</u>	<u>(60)</u>	<u>.54</u>	<u>(40)</u>
TOTAL	15.45	9.64		5.81	

*** AID estimate

K. DESIGN STANDARDS AND CONSTRUCTION MATERIALS

1. New and Existing Bridge

In order to maintain consistency with other highway structures built in Dahomey, French design standards were used. Live loads used in the design are specified in the 1970 edition of Special Publication No. 72-21 bis, part of division 61, Title II, of the joint specifications applicable to public works contracts. Truck loads applied to the design consist of two 30-ton trucks per lane. For the design of reinforced concrete and prestressed concrete structural members, French Special Publications 70-93 bis. and 65-15 bis. were applied.

2. Dam

The dam was designed to resist forces generated by floods flowing towards the ocean and those created by tidal inflows. Maximum estimated flood flow over the dam is in the order of 600 cubic meters/second. The maximum expected tidal elevation is approximately one meter above the spillway of the dam. The dam was designed to be pervious above elevation - 0.5 meters. The crest of the dam includes a 30 meter long sill, 2 meters deep, which will be closed by removable massive concrete blocks. By removing or replacing these concrete blocks from the sill periodically, the amount of tidal inflow can be controlled and, consequently, the quantity of salt water in the lagoon regulated.

3. Roadway Approaches

The proposed geometric design standards are in conformance with the Terms of Reference as well as the guidelines of the French national road standards and American road standards (A.A.S.H.O.). The various components of the roadway structure was designed in accordance with the guidelines of the Manual for Design of Roadway Pavements in Tropical Countries by CEBTP, modified by local experience and usage in Cotonou. The roadway widths recommended will provide sufficient capacity for mixed traffic, including bicycles, and safety in traffic movements. Additional width is provided for one and two lane roadways to allow for passing slower vehicles (bicycles). In the case of four-lane roadways no additional width is needed because passing can be

done using the adjacent lane. The standards recommended are as follows:

Ramps (one lane)	-	5 meters
Two lane roadways	-	5 meters each way
Four lane roadways	-	7 meters each way

Horizontal alignment is based on following design speeds:

Main line	-	50 km/hr
Ramps and Intersections	-	25 km/hr

Roadways will be superelevated as required by French national standards.

The following profile grades are used to provide ease of operation of trucks and other heavy vehicles:

Maximum gradients	-	2.2% main line
	-	3.3% ramps
Minimum gradients	-	0.4%

The drainage design is based on the maximum average 15 minute storm intensity with a 10-year recurrence based on records (1923 to 1973) for Cotonou. When applicable inlets, storm sewer pipe, culverts and ditches will be provided for adequate drainage of the project. Whenever possible drainage conduits will be placed for eventual connection with Cotonou's sewerage system.

4. Construction Materials

Sources of suitable construction materials were investigated and laboratory tests were made to determine their characteristics and qualities. Gravel supplies marketed locally from private stock yards are available in great quantities. The gravel is fairly well graded with good physical properties and is acceptable for use in quality concrete. Abundant supply and easy access to beach sand have made it the exclusive choice for concrete fine aggregate in the Cotonou area. Laboratory test results on beach sands indicate that special care must be taken in the washing of sand before its use in concrete mixes to insure that all ocean salts are eliminated. Approximately 50,000 tons of rock will be needed for the dam

construction. The rock will be quarried in Paouingnan, located about 200 kms north of Cotonou, and will be transported by rail to Cotonou. It has low porosity and the rate of chemical and physical disintegration should be sufficiently slow to insure long life. The paouingnan rock will provide good and long service.

Several borrow areas, both privately and publically owned, can supply this project with abundant supplies of red clayey sand (known as "Terre de Barre") and a yellow silty sand which can be used for embankments and roadway sub-base. The standard material used in Cotonou and most of Dahomey for base courses of paved roadways is latiritic sandstone which is quarried in Bokoutou, about 75 kms northeast of Cotonou. Tests conducted by the consultant on these roadway materials indicate that they are satisfactory. The consultant recommends their use in accordance with established best local practice. Cement is locally manufactured in Cotonou by the Societie des Ciments du Dahomey from clinkers originating in Europe. It is guaranteed to equal or exceed CPA 325 characteristics. Supply is regular. Tests performed on local cement were in accordance with French standards AFNOR P15-301 and P15-302. The cement complies in all respects with specifications C.P.A. 325 and will be able to develop high early strengths if ground to adequate fineness. However, for high strength concrete mixes the consultant recommends the use of CPA 400. Following results of concrete tests, the consultant recommends adopting these standards for the concrete mix types shown below:

Cast in Place, Pier and Pile Cap Concrete

- a - Strength = 245 kg/cm^2 at 28 days
- b - Mix design strength - 280 kg/cm^2
- c - Use local CPA 325 mix and 3 aggregate mix
- d - Water-cement ratio = 0.405 for slump and workability will be satisfactory
- e - Cement factor = 400 kg/cm^3
- f - Air content - 4%
- g - Use a water-reducing dispersing admixture

Precast, Prestressed Concrete

- a - Strength - 350 kg/cm² at 28 days
- b - Mix design strength = 400 kg/cm²
- c - Use a three aggregate mix and local CPA 400 mix
- d - Water-cement ratio = 0.390
- e - Cement factor = 450 kg/cm²
- f - No air-entraining is to be used
- g - Use a water-reducing dispersing admixture

L. TECHNICAL SOUNDNESS OF PROJECT

The studies performed by Sanders and Thomas provide a sound technical basis for concluding that the new bridge across the lagoon is required to alleviate the congested traffic conditions on the existing bridge, that the renovation and widening of the existing bridge is needed to extend its usefulness and that the dam to be built at the mouth of the lagoon will stop scour and shore erosions in the Cotonou lagoon. Refinement of design details including reconsideration of certain design alternatives for structural elements of these facilities are currently being undertaken by the U.S. consultant on this project in his preparation of final plans, cost estimates and contract documents for which AID's approval will be a condition precedent to construction. Provision has been made for the satisfactory operation of the facilities, as well as for the continual maintenance of the new bridge, the existing bridge and the dam. A reasonably firm estimate of cost to the U.S. Government for its contribution to this activity has been computed. A satisfactory plan for the execution of this activity has been prepared. Therefore, it is concluded that the facilities to be financed under the loan can be constructed in a sound manner, that costs should not exceed those estimated for these facilities, and that there is a reasonable basis for concluding that they will be effectively utilized.

M. IMPLEMENTATION SCHEDULE

The following timetable which also includes a reasonable number of delays normally experienced is an estimate of key actions required to implement this project:

1. Receive request from MRGD for AID loan Apr 1974
2. Plans, specifications and IFB documents completed May 1974
3. Submission of Capital Assistance Paper May 1974
4. AID loan authorized May 1974
5. AFDB Project Appraisal Mission May 1974
6. Prequalification Questionnaires received and evaluated May 1974
7. Prequalified firms approved Jul 1974
8. AID loan executed Jul 1974
9. AFDB loan negotiated and authorized Jul 1974
10. AFDB loan executed Aug 1974
11. Conditions Precedent to AID and AFDB loans met Sep 1974
12. Contract for supervision of construction signed Sep 1974
13. Bid documents issued Sep 1974
14. Bid opening Nov 1974
15. Bid awards Jan 1975
16. Construction contracts signed Feb 1975
17. L/Com for construction services opened and Notice to Proceed issued Mar 1975
18. Contractor mobilization; begin construction Jun 1975
19. Dam construction begins Jan 1976
20. Dam construction ends Sep 1976
21. Construction completion (33 mos) Mar 1978
22. Issue certificate of completion and begin maintenance period Apr 1978
23. End maintenance period and maintenance certificate issued Apr 1979
24. Terminal Disbursement Date Oct 1979 -

N. ENVIRONMENTAL CONSIDERATIONS

The environmental impact of this project has been fully considered by the consultants and is discussed in detail in Annex D.

O. MONITORING AND EVALUATION

1. Monitoring:

Monitoring for this project will be conducted mainly by REDSO/WA in the usual manner for all standard AFR capital projects.

2. Evaluation:

This is a straight-forward, construction-type capital project and therefore end-of-project rather than interim evaluation is considered more appropriate and meaningful. Since in terms of Agency de-emphasis on transport capital projects per se AID is unlikely to repeat this kind of undertaking, evaluation as a means of reviewing and applying lessons learned and experience gained would appear to be more useful for AFDB. Therefore, REDSO/WA will explore, in the context of discussions with AFDB on evaluation role and methodology, the feasibility of a joint evaluation or one conducted solely by AFDB, with perhaps informal technical assistance or advice by REDSO/WA staff. Such an evaluation would pay particular attention to the impact of the integrated project upon trade and commerce in the area including evidences of development in the zones of influence, industrial expansion in the Cotonou environs and fish and shrimp production trends. To the extent practical, the evaluation should also attempt to analyze the equity impact of the project, i.e., the relative benefits conferred upon the major high and/or low income groups in the zones of influence.

CHECKLIST OF STATUTORY CRITERIA

In the right-hand margin, for each item, write answer or, as appropriate, a summary of required discussion. As necessary, reference the section of the Capital Assistance Paper, or other clearly identified and available document, in which the matter is further discussed.

The following abbreviations are used in the checklist:

FAA - Foreign Assistance Act of 1961, as amended

FAA, 1973 - Foreign Assistance Act of 1973

App. - Foreign Assistance and Related Program Appropriation Act, 1974

MMA - Merchant Marine Act of 1936, as amended.

I. FULFILLMENT OF STATUTORY OBJECTIVES

A. Needs Which the Loan is Addressing

1. FAA Section 103. Discuss the extent to which the loan will alleviate starvation, hunger and malnutrition, and will provide basic services to poor people enhancing their capacity for self-help.

Not Applicable

2. FAA Section 104. Discuss the extent to which the loan will increase the opportunities and motivation for family planning; will reduce the rate of population growth; will prevent and combat disease; and will help provide health services for the great majority of the population.

Not Applicable

3. FAA Section 105. Discuss the extent to which the loan will reduce illiteracy, extend basic education, and increase manpower training in skills related to development.

Not Applicable

4. FAA Section 106. Discuss the extent to which the loan will help solve economic and social development problems in fields such as transportation, power, industry, urban development, and export development.

The project will increase employment and decrease social unrest by encouraging new entrepreneurial and large scale investment activities in the area. The project is also consistent with the logical growth of the city. See Section T of the CAP.

5. FAA Section 107. Discuss the extent to which the loan will support the general economy of the recipient country; or will support development programs conducted by private or international organizations.

This is a multi-donor project which will support existing donor and host government efforts to modernize Dahomey's transport sector.

B. Use of Loan Funds

1. FAA Section 110. What assurances have been or will be made that the recipient country will provide at least 25% of the costs of the entire program, project or activity with respect to which such assistance is to be furnished under Sections 103-107 of the FAA?

Since this is a multi-donor and regional project the 25% requirement is not applicable. The Dahomean government will contribute a specified amount for local currency costs of the project. See CAP section I & II.

2. FAA Section 111. Discuss the extent to which the loan will strengthen the participation of the urban and rural poor in their country's development, and will assist in the development of cooperatives which will enable and encourage greater numbers of poor people to help themselves toward a better life.

The project will not involve the development of cooperatives but should be significant factor in increasing new urban job opportunities; orderly development of Cotonou.

3. FAA Section 112. Will any part of the loan be used to conduct any police training or related program (other than assistance rendered under Section 515(c) of the Omnibus Crime Control and Safe Streets Act of 1968 or with respect to any authority of the Drug Enforcement Administration of the FBI) in a foreign country?

No

4. FAA Section 113. Describe the extent to which the programs, projects or activities to be financed under the loan give particular attention to the integration of women into the national economy of the recipient country.

Not Applicable

5. FAA Section 114. Will any part of the loan be used to pay for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?

No

II. COUNTRY PERFORMANCE

A. Progress Towards Country Goals

1. FAA §§201(b)(5), 201(b)(7), 201(b)(8), 209. Discuss the extent to which the country is:

(a) Making appropriate efforts to increase food production and improve means for food storage and distribution.

Dahomey is implementing several projects to increase food production. It is also participating in the Entente Regional Livestock program, including the construction of a modern slaughterhouse. A grain storage program has been successfully completed.

(b) Creating a favorable climate for foreign and domestic private enterprise and investment;

Dahomey encourages both foreign investors and national entrepreneurs. It is participating in the Entente African Enterprises program. There are no specific restrictions on private enterprise development and investment.

(c) Increasing the people's role in the developmental process:

Development projects in Dahomey include active participation on the village level. Considerable efforts are continuing at all levels in education.

(d) Allocating expenditures to development rather than to unnecessary military purposes or intervention in other free countries' affairs:

The level of military expenditures in Dahomey is limited to that required to assure internal order. The major share of the MRGD budget and priorities are expenditures for development.

(e) Willing to contribute funds to the project or program:

The Borrower will contribute funds to the project within its budgetary limitations.

(f) Making economic, social and political reforms such as tax collection improvements and changes in land tenure arrangement; and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom, initiative, and private enterprise;

The Borrower currently has a program concerned with the more efficient control of government spending, the formation of a more equitable tax base and more effective tax collection. There are several newspapers of divergent political opinions. Private enterprise is encouraged both for national entrepreneurs and foreign investors.

(g) Responding to the vital economic, political and social concerns of its people, and demonstrating a clear determination to take effective self-help measures.

B. Relations with the United States

1. FAA Sec. 620(c). If assistance is to a government, is the government indebted to any U.S. citizen for goods or services furnished or ordered where: (a) such citizen has exhausted available legal remedies, including arbitration, or (b) the debt is not denied or contested by the government, or (c) the indebtedness arises under such government's or a predecessor's unconditional guarantee?

2. FAA Sec. 620(d). If the loan is intended for construction or operation of any productive enterprise that will compete with U.S. enterprise, has the country agreed that it will establish appropriate procedures to prevent export to the U.S. of more than 20% of its enterprises annual production during the life of the loan?

3. FAA Sec. 620(e)(1). If assistance is to a government, has the country's government, or any agency or subdivision thereof, (a) nationalized or expropriated property owned by U.S. citizens or by any business entity not less than 50% beneficially owned by U.S. citizens, (b) taken steps to repudiate, or nullify existing contracts or agreements with such citizens or entity, or (c) imposed or enforced discriminatory taxes or other exactions, or restrictive maintenance or operation conditions? If so, and more than six months has elapsed since such occurrence, identify the document indicating that the government, or appropriate agency or subdivision thereof, has taken appropriate steps to discharge its obligations under international law toward such citizen or entity? If less than six months has elapsed, what steps, if any, has it taken to discharge its obligations?

Dahomey is attempting to effect economic and social reforms for the improvement of living standards by building a resource base, by increasing the production of export crops and by participating in regional development programs. Transportation projects can play an important role in bringing the economies of the various regions of Dahomey into greater harmony and country-wide development.

None to our knowledge

Not Applicable

No

4. FAA Sec. 620(i). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property, and failed to take appropriate measures to prevent a recurrence and to provide adequate compensation for such damage or destruction?

No

5. FAA Sec. 620(1). Has the government instituted an investment guaranty program under FAA Sec. 221(h)(1) 234(a)(1) for the specific risks of inconvertibility and expropriation or confiscation?

There is an AID Investment Guaranty agreement between the United States and Dahomey.

6. FAA §620(o). Fisherman's Protective Act of 1954, as amended, Section 5. Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? If, as a result of a seizure, the U.S.G. has made reimbursement under the provisions of the Fisherman's Protective Act and such amount has not been paid in full by the seizing country, identify the documentation which describes how the withholding of assistance under the FAA has been or will be accomplished.

No

7. FAA Sec. 620(a). Has the country been in default, during a period in excess of six months, in payment to the U.S. on any FAA loan?

No loan authorization will be made in the event of any default in excess of six months.

8. FAA Sec. 620(t). Have diplomatic relations between the country and the U.S. been severed? If so, have they been renewed?

No

C. Relations with Other Nations and the U.N.

1. FAA Sec. 620(i). Has the country been officially represented at any international conference when that representation included planning activities involving insurrection or subversion directed against the U.S. or countries receiving U.S. assistance? No

2. FAA Secs. 620(a), 620(n): Has the country sold, furnished, or permitted ships or aircraft under its registry to carry to Cuba or North Vietnam, items of economic, military or other assistance? No

3. FAA Sec. 620(u); App. Sec. 107. What is the status of the country's U.N. dues, assessments or other obligations? Does the loan agreement bar any use of funds to pay U.N. assessments, dues or arrearages? As of 4/25/74, the MRGD was \$128,444 in arrears in U.N. dues and assessments. The loan agreement limits the use of the funds to the importation of goods and services or the purchase of local goods and services for the specific project.

D. Military Situation

1. FAA Sec. 620(i). Has the country engaged in or prepared for aggressive military efforts directed against the U.S. or countries receiving U.S. assistance? No

2. FAA Sec. 620(s). What is (a) the percentage of the country's budget devoted to military purposes, and (b) the amount of the country's foreign exchange resources used to acquire military equipment, and (c) has the country spent money for sophisticated weapons systems purchased since the statutory limitation became effective? a) 10.5% in 1973 b) Most military equipment is provided through French assistance. Very little is purchased with Dahomean foreign exchange. c) No

2. (2) Is the country diverting U.S. development assistance or PL 480 sales to military expenditures? No

2. (3) Is the country diverting its own resources to unnecessary military expenditures? (Findings on these questions are to be made for each country at least once each fiscal year and, in addition, as often as may be required by a material change in relevant information.) No

III. CONDITION OF THE LOAN

A. General Soundness

Interest and Repayment

1. FAA §§201(d), 201(b)(2). Is the rate of interest excessive or unreasonable for the borrower? Are there reasonable prospects for repayment? What is the grace period interest rate; the following period interest rate? Is the rate of interest higher than the country's applicable legal rate of interest.

The rate of interest is not excessive or unreasonable. Repayment prospects are favorable. The grace period is 10 years with 2% interest rate per annum and 3% interest rate during the remaining 30 years. The rate of interest is less than the applicable legal rate in Dahomey.

Financing

1. FAA §201(b)(1). To what extent can financing on reasonable terms be obtained from other free-world sources, including private sources within the U.S.?

Financing for this project is also being provided by AFDB on concessional terms. Private financing for this project is not possible.

Economic and Technical Soundness

1. FAA §§201(b)(2), 201(c). The activity's economic and technical soundness to undertake loan; does the loan application, together with information and assurances, indicate that funds will be used in an economically and technically sound manner?

Yes. See sections in the CAP for technical, economic and financial analyses.

2. FAA 5611(a)(1). Have engineering, financial, and other plans necessary to carry out assistance, and a reasonable firm estimate of the cost of assistance to the U.S., been completed? **Yes. See sections II, III and IV of the CAP.**

3. FAA 5611(b); App. 8101. If the loan or grant is for a water or related land-resources construction project or program, do plans include a cost-benefit computation? Does the project or program meet the relevant U.S. construction standards and criteria used in determining feasibility? **Yes. See sections III and IV of CAP.**

4. FAA 5611(c). If this is a Capital Assistance Project with U.S. financing in excess of \$1 million, has the principal A.I.D. officer in the country certified as to the country's capability effectively to maintain and utilize the project? **Yes**

B. Relation to Achievement of Country and Regional Goals

Country Goals

1. FAA 59207, 291(a). What is this loan's relation to:

(a) Institutions needed for a democratic society and to assure maximum participation on the part of the people in the task of economic development?

A better transportation link will facilitate local and international traffic flows through Cotonou. This will in turn encourage greater entrepreneurial activities in the area creating additional employment and high incomes.

(b) Enabling the country to meet its food needs both from its own resources and through development, with U.S. help, of infrastructure to support increased agricultural productivity?

The construction of the dam should be a significant factor in re-establishing the fishing industry in the Cotonou Lagoon.

(c) Meeting increasing need for trained manpower?

Not Applicable

(d) Developing programs to meet public health needs?

Not Applicable

See Section I of CAP

(e) Assisting other important economic, political, and social development activities, including industrial development, growth of free labor unions; cooperatives and voluntary agencies; improvement of transportation and communication systems; capabilities for planning and public administration; urban development; and modernization of existing laws?

2. FAA §201(b)(4). Describe the activity's consistency with and relationship to other development activities, and its contribution to realizable long-range objectives.

See Section I of CAP

3. FAA §201(b)(9). How will the activity to be financed contribute to the achievement of self-sustaining growth?

As indicated in Section I, this project enhances an essential transportation link required for Dahomey's economic development.

4. FAA §201(f). If this is a project loan, describe how such project will promote the country's economic development, taking into account the country's human and material resource requirements and the relationship between ultimate objectives of the project and overall economic development.

See Section I

5. FAA §201(b)(3). In what ways does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities?

See Section I, C

6. FAA 5221(b). How does the program under which assistance is provided recognize the particular needs, desires, and capacities of the country's people; utilize the country's intellectual resources to encourage institutional development; and support civic education and training in skills required for effective participation in political processes.

See Section IC, D and F

7. FAA 5601(a). How will this loan encourage the country's efforts to:
(a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions?

a) See sections IB and IC. This project will facilitate international movements of both commodities and people along the West African East/West axis.
b) Historically, increased traffic flows also contribute to service industries in the affected areas.
c) Not applicable
d) Not applicable
e) See Section I of CAP and Annex C
f) Not applicable.

8. FAA §202(a). Indicate the amount of money under the loan which is: going directly to private enterprise; going to intermediate credit institutions or other borrowers for use by private enterprise; being used to finance imports from private sources; or otherwise being used to finance procurements from private sources.

The entire loan amounts will be used for the procurement of goods and services from private enterprises.

9. FAA §611(a)(2). What legislative action is required within the recipient country? What is the basis for a reasonable anticipation that such action will be completed in time to permit orderly accomplishment of purposes of loan?

None required

Regional Goals

1. FAA §619. If this loan is assisting a newly independent country, to what extent do the circumstances permit such assistance to be furnished through multilateral organizations or plans?

The total scope of the project is being financed in part by AFDB AID and FED

2. FAA §209. If this loan is directed at a problem or an opportunity that is regional in nature, how does assistance under this loan encourage a regional development program? What multilateral assistance is presently being furnished to the country?

See Sections I and IIF

C. Relation to U.S. Economy

Employment, Balance of Payments,
Private Enterprise.

1. FAA §§201(b)(6); 102. What are the possible effects of this loan on U.S. economy, with special reference to areas of substantial labor surplus? Describe the extent to which assistance is constituted of U.S. commodities and services, furnished in a manner consistent with improving the U.S. balance of payments position.

2. FAA §§612(b); 635(h). What steps have been taken to assure that, to the maximum extent possible, foreign currencies owned by the U.S. and local currencies contributed by the country are utilized to meet the cost of contractual and other services, and that U.S. foreign owned currencies are utilized in lieu of dollars?

3. FAA §601(d); App. SACB. If this loan is for a capital project, to what extent has the Agency encouraged utilization of engineering and professional services of U.S. firms and their affiliates? If the loan is to be used to finance direct costs for construction, will any of the contractors be persons other than qualified nationals of the country or qualified citizens of the U.S.? If so, has the required waiver been obtained?

There is no special applicability in reference to areas of substantial labor surplus. See Section II for discussion of the impact of the project on the U.S. economy.

No foreign currencies owned by the U.S. Government are available or could be used for implementation of this project. The MRGD will contribute to local currency costs to the extent possible within its budgetary limitations.

The loan agreement requires that the Borrower contract with a Dahomean or qualified Code 941 construction firm and supervisory engineering firm. Agency rules will be followed with regard to the employment of third country nationals.

4. FAA §608(a). Provide information measures to be taken to utilize U.S. Government excess personal property in lieu of the procurement of new items.

The loan agreement contains the standard AID provision.

5. FAA §602. What efforts have been made to assist U.S. small business to participate equitably in the furnishing of commodities and services financed by this loan?

USG and AID normal competitive bidding procedures will be followed.

6. FAA §621. If the loan provides technical assistance, how is private enterprise on a contract basis utilized? If the facilities of other Federal agencies will be utilized, in what ways are they particularly suitable are they competitive with private enterprise (if so, explain); and how can they be made available without undue interference with domestic programs?

Not applicable. Facilities of other Federal agencies will not be used in the project.

7. FAA §611(c). If this loan involves a contract for construction that obligates in excess of \$100,000, will it be on a competitive basis? If not, are there factors which make it impracticable?

The contract for construction will be on a competitive basis.

8. FAA §601(b). Describe the efforts made in connection with this loan to encourage and facilitate participation of private enterprise in achieving the purposes of the Act.

See Section IB and C of CAP

Procurement

1. FAA §604(a). Will commodity procurement be restricted to U.S. except as otherwise determined by the President?

Yes

2. FAA §604(b). Will any part of this loan be used for bulk commodity procurement at adjusted prices higher than the market price prevailing in the U.S. at time of purchase?

No

3. FAA §604(e). Will any part of this loan be used for procurement of any agricultural commodity or product thereof outside the U.S. when the domestic price of such commodity is less than parity?

No

4. FAA §604(f). Will the agency receive the necessary pre-payment certification from suppliers under a commodity import program agreement as to description and condition of commodities, and on the basis of such, determine eligibility and suitability for financing?

Not Applicable

D. Other Requirements

1. FAA §201(b). Is the country among the 20 countries in which development loan funds may be used to make loans in this fiscal year?

In light of the regional character of this project (see Section I), the loan falls outside this limitation and is classified as an Africa Regional project.

2. App. §109. Does the loan agreement provide, with respect to capital projects, for U.S. approval of contract terms and terms?

Yes

3. FAA §620(k). If the loan is for construction of a production enterprise, with respect to which the aggregate value of assistance to be furnished will exceed \$100 million, what preparation has been made to obtain the express approval of the congress?

Not Applicable

4. FAA §620(b), 620(f); Has the President determined that the country is not dominated or controlled by the international Communist movement? If the country is a Communist country (including but not limited to, the countries listed in FAA §620(f)) and the loan is intended for economic assistance, have the findings required by FAA §620(f) and App. §109(b) been made and reported to the Congress?

Yes

5. FAA Section 620(h). What steps have been taken to insure that the loan will not be used in a manner which, contrary to the best interest of the United States, promotes or assists the foreign aid projects of the Communist-bloc countries?

The standard AID loan provision is included in the loan agreement.

- 6 FAA Section 536(i). Will any part of this loan be used in financing non-U.S. manufactured automobiles? If so, has the required waiver been obtained?

No

7. FAA Section 620(g). Will any part of this loan be used to compensate owners for expropriated or nationalized property? If any assistance has been used for such purpose in the past, has appropriate reimbursement been made to the U.S. for sums diverted?

No

8. FAA Section 201(f). If this is a project loan, what provisions have been made for appropriate participation by the recipient country's private enterprise?

Dahomey's private enterprise will have an opportunity to contribute goods and services to the project by supplying materials and other local services.

9. App. Section 103. Will any funds under the loan be used to pay pensions, etc., for persons who are serving or who have served in the recipient country's armed forces?

No

10. MMA Section 901.b. Does the loan agreement provide for compliance with U.S. shipping requirements that at least 50% of the gross tonnage of all commodities financed with funds made available under this loan (computed separately by geographic area for dry bulk carriers, dry cargo liners, and tankers) be transported on privately-owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates for U.S. flag vessels and that at least 50% of the gross freight revenue generated by all shipments financed with funds made available under this loan and transported on dry cargo liners be paid to or for the benefit of privately-owned U.S. flag commercial vessels?

Yes

11. FAA Section 481. Has the President determined that the recipient country has failed to take adequate steps to prevent narcotic drugs produced or procured in, or transported through, such country from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents or from entering the United States unlawfully?

No. To the best of our knowledge Dahomey cooperates with the U.S. and international organizations in the control of narcotic drugs.

12. App. Section 110. Is the loan being used to transfer funds to world lending institutions under FAA Sec. 209(d) and Sec. 251(h)?

No

13. App. Section 601. Are any of these funds being used for publicity or propaganda within the United States?

No

14. FAA Section 612(d) and Section 40 of PL 93 189 (FAA of 1973). Does the United States own host country excess foreign currency and, if so, what arrangements have been made for its release in compliance with Section 40 (FAA of 1973)?

No

15. FAA Section 604(d). Will provisions be made for placing marine insurance in the U.S. if the recipient country discriminates against any marine insurance company authorized to do business in the U.S.?

Yes

16. Section 29 of PL 93 - 189 (FAA of 1973). Is there a military base located in the recipient country which base was constructed or is being maintained or operated with funds furnished by the U.S., and in which U.S. personnel carry our military operations? If so, has a determination been made that the government of such recipient country has, consistent with security, authorized access to such military base on a regular basis to bona fide news media correspondents of the U.S.

No

17. FAA Section 610(c). Will a grant be made to the recipient country to pay all or part of such shipping differential as is determined by the Secretary of Commerce to exist between U.S. foreign flag vessel charter or freight rates?

No

18. App. Section 113. Will any of the loan funds be used to acquire currency of recipient country from non-U.S. Treasury sources when excess currency of that country is on deposit in U.S. Treasury?

No

19. App. Section 114. Have the House and Senate Committees on Appropriations been notified five days in advance of the availability for obligation of funds for the purposes of this project?

This project was included in the Congressional Presentation for FY74.

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

CAPITAL ASSISTANCE LOAN AUTHORIZATION

Provided from: Development Assistance Appropriations

Africa Regional: Dahomey-Cotonou Bridge and Dam

Pursuant to the authority vested in the Administrator of the Agency for International Development (A.I.D.) by the Foreign Assistance Act of 1961, as amended (the Act), and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 1, Section 106, of the Act, to the Government of the Republic of Dahomey (Borrower) of not to exceed ten million nine hundred thousand dollars (\$10,900,000) to assist in financing the foreign exchange and local currency costs of goods and services for the supervisory engineering and construction of a bridge and approaches across the Cotonou Lagoon and supervisory engineering services for: (a) construction of a dam at the mouth of Cotonou Lagoon, (b) repairs to the existing bridge at Avenue de la Republique, subject to the following terms and conditions:

1. Interest Rate and Terms of Repayment

The Borrower shall, in United States dollars:

- (a) Repay the loan to A.I.D. within forty (40) years, including a grace period of not to exceed ten (10) years.
- (b) Pay A.I.D. interest on the unrepaid principal and any interest accrued thereon at the rate of two percent (2%) per annum during the grace period and three percent (3%) per annum thereafter.

2. Other Terms and Conditions

- (a) Goods and services financed under this loan shall be procured from Dehoney and/or from countries included in Code 941 of the A.I.D. Geographic Code Book.
- (b) Such other terms and conditions as A.I.D. may deem advisable.

Administrator

Date

ANNEX B

Description of the Fishery

Prior to 1959 the fishery of Lake Nokoue and the adjoining Porto-Novo lagoon was the most productive and important in Dahomey and provided income and subsistence for some 50,000 people. Before 1961, this area was producing about 15,000 metric tons of fish per year, but by 1967 the yearly production had decreased to about 9,000 tons, and in 1970 was estimated to be 5,600 tons (Fig. 1). This disastrous decrease in production has been a result of the changes in the ecology of the lake and the lagoon, due directly to the permanent opening of the Cotonou Channel, which in turn, was caused by the construction of the deep-water Port of Cotonou. Prior to the construction of the port, along-shore currents carried sand which was opened frequently by flood waters, usually during the fall of the year (October-December), but was soon re-closed by sands deposited at the mouth. Thus, the channel remained open for inflow of tide-waters into the lake and lagoon for only a short time. The present situation, where the sand-bearing coastal currents are diverted offshore by the breakwater of the Port, has prevented the re-formation of the sand bar since 1959. Tide waters from the Atlantic Ocean have had direct access to the lake whenever the marine tide level exceeded about +1.0 m.

The main fish-production in Lake Nokoue has been from the various types of "acadja" installations, which are artificial fish-culturing or fish-farming operations. The fishermen implant large numbers of branches of wood or brush close together in the shallow water. These are in a variety of forms--from small circles 5 to 7 meters in diameter (acadjavis) to very large rectangular shapes of up to seven hectares in area (avas and hanoumekadjas). These parks are attraction and refuge areas for fish which occur in low densities in the open water of the lake: the fish find the refuge of the acadjas and feed on organisms growing on and amongst the branches. Food and cover have been adequate in the past to support good fish growth, and the fish grow rapidly. Welcomme (1969) determined that the density of fish in the acadjas was approximately 100 times the density of the same species of fishes in the open water of the lake. It must be established,

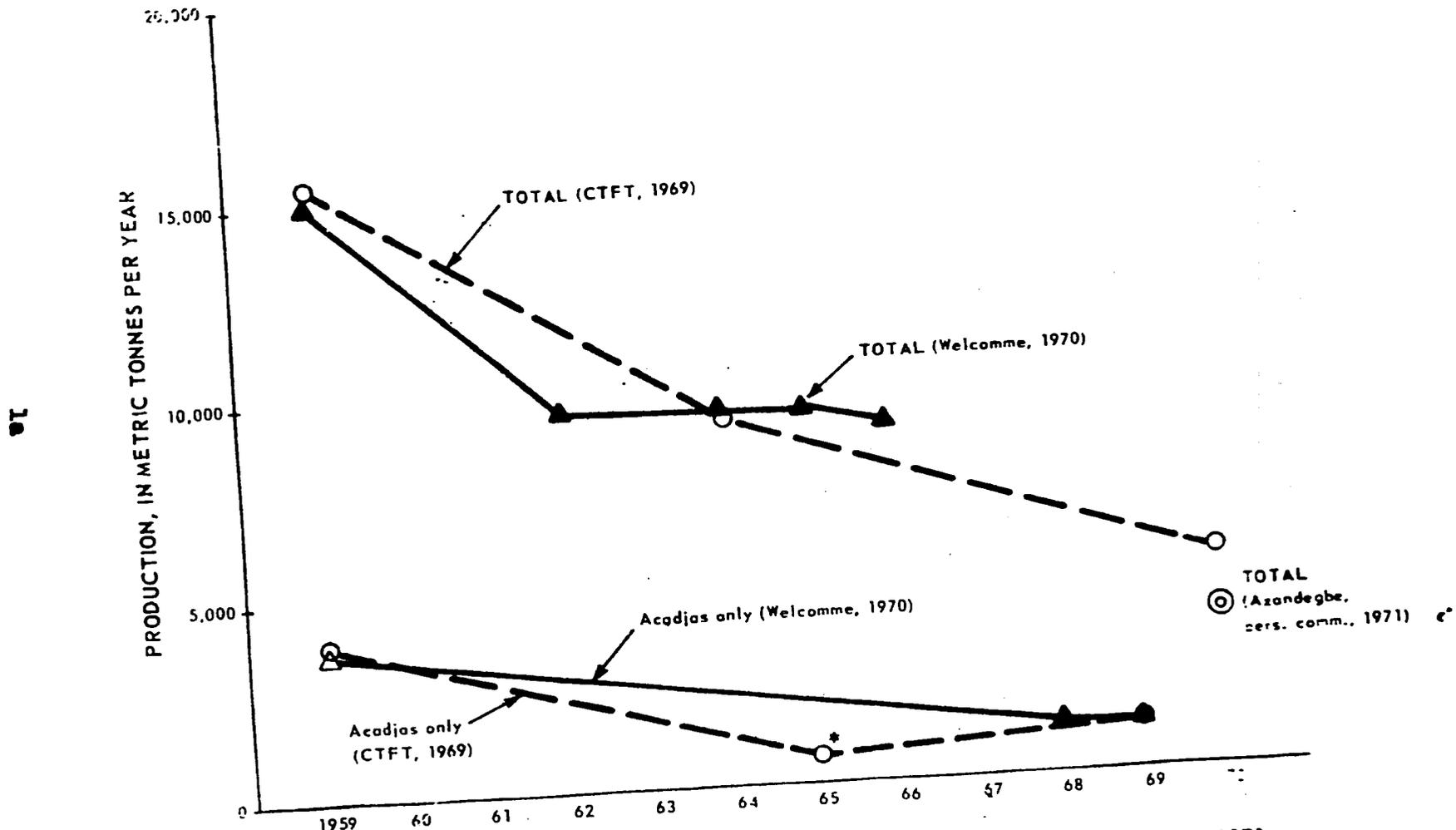


FIGURE 1. DECREASE IN PRODUCTION OF FISH IN LAKE NOKOUE, 1959 TO 1970
 * "PROBABLY UNDERESTIMATED"

FIG I

then, that the brush acadjas are necessary for the high production of fish that existed prior to 1959. The food and cover provided are necessary to entice and retain the fish in them, for there is no fish-tight fence around the acadjas and fish are not planted into them by the fishermen. If the brush is destroyed and the refuge and food sources no longer exist, then the fish move until they find another similar refuge.

The acadjas are also contributing to the harvesting of the cast-netters. Many of the cast-netters observed on the lake were fishing in the immediate vicinity of large acadjas--fishing for fish which had temporarily wandered out of the acadja into the nearby open water.

The main species of fish harvested from the acadjas are Tilapia heudelotii and Chrysichthys nigrodigitatus, which together comprise 90% of the yields by weight. These are basically freshwater forms which are especially tolerant to changes in salinity and are therefore found in estuarine and brackish waters. Tilapia is a rapidly-growing fish and attains sexual maturity in its first year. They are highly gregarious and live in dense aggregations where proper cover is available; in fact, they are seldom found outside of dense cover of branches or aquatic vegetation. The annual yield of Tilapia from the acadjas has approached nine metric tons per hectare (about 4 English tons per acre). The yield has been highest in those acadjas with the densest implantation of brush and branches.

Biological bases of productivity

Under the pre-1959 conditions, the mineral-rich silt delivered to the lake by the tributaries settled onto the lake bottom, providing a basis for excellent biological production, both within the lake bottom and in the waters of the lake. At the present situation the velocity of flood waters flowing through the lake and channel to the sea (at low tides) and the constant turbulence created by incoming and outgoing tides, have prevented the deposition of the silt and detritus on the lake bottom. There has thus been a considerable loss of basic biological productivity which has been a factor in reducing fish growth and yield from the lake.

The intrusion of tide water into the lake has, in addition to the physical scouring by turbulence, affected the ecology of the lake in many biological ways. The most serious biological change has been the introduction of and environmental enhancement for the marine borers, or shipworms, of Teredo and Bankia genera. These have been abundant enough and the damage created by them serious enough to jeopardize the acadja fishing operations in the lake and lagoon. They have bored into the wooden material of the acadjas and caused the rapid disintegration of these installations. The total area of acadja installations has been seriously reduced since 1959 (Fig. 2). In the less-saline areas of the lake, where the fishermen are still constructing and operating acadjas, the rapid rate of loss and the increase in cost of the branches has more than doubled the cost of their construction and maintenance. Information from fishermen on the lake indicated that prior to 1959 the brush in the acadjas was good for 1 year or more; after 1960 this durability began decreasing and the fishermen now report that the brush lasts only from 1 to 3 months. Because of this rapid destruction of the artificial environment required by the fish for optimum growth and reproduction, and to the need for more frequent addition of branches to the acadjas and to rising costs of the wood, the fishermen have been reluctant or financially unable to invest in the construction of new acadjas (cf. Fig. 2). The teredos are also damaging the houses constructed on stilts in the lake, and are attacking the small dugout canoes used by the fishermen and lake-dwellers. Houses which used to last for 12 to 14 years now collapse in 5 to 7 years; the pirogues previously had a life of 7 years and now last but two. Most lake residents have racks for raising the smaller canoes out of the water when they are not being used; the larger canoes cannot be lifted out of the water and are continuously at the mercy of the borers.

It is estimated that about one-half of the decrease in total fish production from the lake has been due to the too-rapid outflow of the nutritious flood water. The other half of the decrease can be attributed to the effects of changes in the amount and schedules of salinity intrusion which has brought in additional teredos or has provided a more suitable environment within the lake for their development.

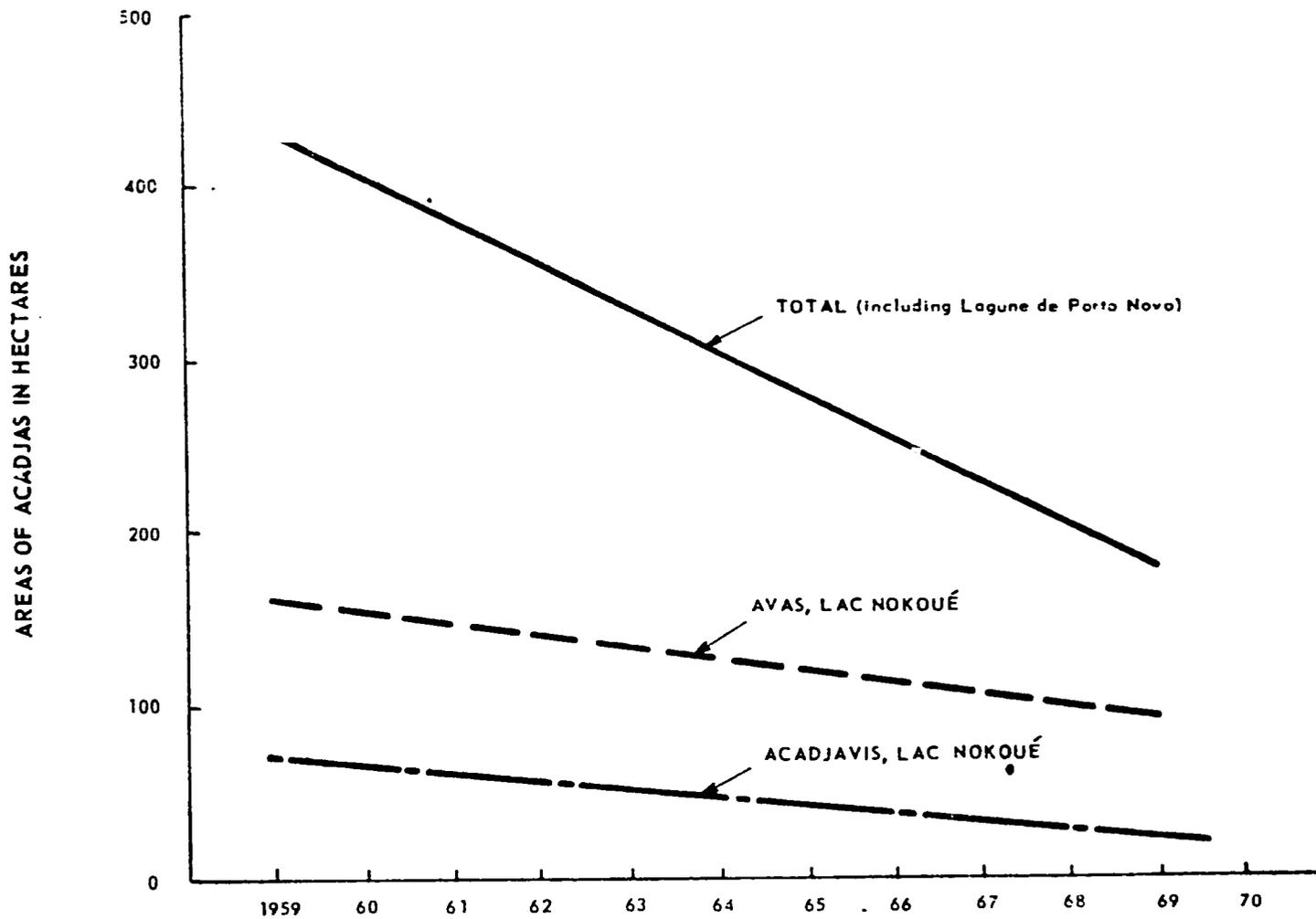


FIGURE 2. DECREASE IN AREA OF PREPARED ACADJAS IN LAKE NOKOUÉ AND ASSOCIATED AREAS, 1959 TO 1969 C.T.F.T., 1969

Evaluation of the Effects of the Proposed Dam

With the rock-fill weir type of dam with a crest of +1.1 meter as proposed by Sanders and Thomas, Inc., the initial benefit will be to reduce the rate of flow of water in both directions through the channel and in the outlet area of the lake. This reduction in velocity and total flow seaward during the flood season will permit the flood-borne silt and detritus to settle onto the lake bed. Reduction in current and turbulence in the outlet area of the lake (Agbato) will permit the silt to be deposited and to remain there. At present the current created by the in-rushing tides and the reverse outflows of tide water and lake water have scoured the lake bottom of all silt and detritus in the outlet area.

If no dam is built in the Cotonou Channel, it is obvious that, at best, the fish production of the lake will remain the same. It is more likely that the production of fish will continue to decline. Unless something is done to reduce the damaging effects of the teredos, the fishermen will not install the acadjas because of the financial constraints. Primary production within the lake will continue to decrease because of the loss of the biologically productive silt and other flood-borne nutritive material. Unless the salinity intrusion is reduced, the effects of the borers will continue to reduce the installation and maintenance of the acadjas and the production of fish from that type of fish culture. The effects of the borers on the stilt-houses and the dug-out canoes of the fishermen will continue to be a problem exclusive of the effects on fishery installations and productivity.

Any barrier to the flow of flood waters and tide waters in the channel can be expected to have beneficial effects on the fishery production of the lake. A barrier will reduce volume and rate of flows in both directions and reduce erosion and scouring. During flood periods the flow reduction will permit the settling of silt and detritus to the bottom of the lake and, to an unknown degree, restore some of the basic biological productivity that has been lost. The effects of reducing the salinity intrusion will depend upon the degree of reduction of the inflow of saline tidewaters. According to calculations by Sanders and Thomas, Inc. (Fig. 3), the +1.1 meter weir will reduce the amount of salt water flowing

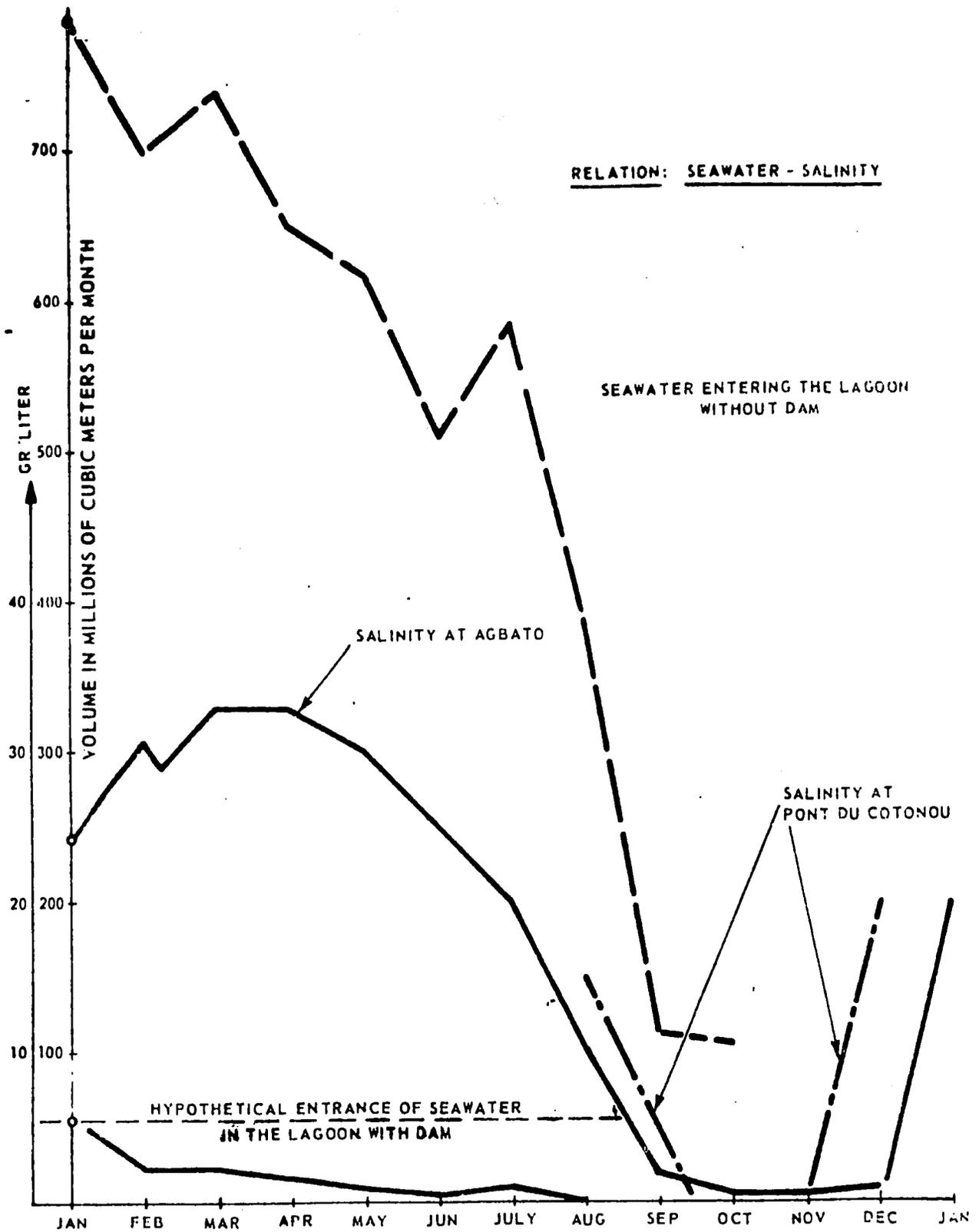


FIGURE 3. RELATION OF TIDAL FLOWS INTO THE COTONOU CHANNEL WITH SALINITY AT THE COTONOU BRIDGE AND THE CALCULATED FLOWS WITH THE 1.1 METER WEIR

FIG 3

into the lake to approximately 1% of the present amount. Although calculations to determine the resultant salinity in the lake have not been completed, it is estimated that this will reduce the salinity level to less than 6 grams/liter or parts per thousand. The tolerance of Teredos of related species to different levels of salinity is shown in Fig. 4. The target for maximum salinity for the lake should be at 4 g/l. If this level could be attained for a period of 7 days every 3 months, the existence of Teredos should be almost completely controlled. Larvae have been found to be able to exist at 10 g/l, but not to be able to burrow into wood at that level, hence they would soon die. The burrowing of adult Teredos is reduced below 10 g/l, and has been found to cease below 4 g/l (Kofoid, 1927). Salinities of 5 g/l and below have been found to be lethal to Teredos over a longer period of time. Thus, the primary target for maximum salinity of Lake Nokoue should be at 4 g/l for at least 7 days every 3 months. This level will, of course, eradicate the Bankia borers, which require salinities of greater than 12/g/l, and should also greatly reduce if not control the effects of the Teredo borers.

Accurate prediction and quantification of the effects of borer control cannot be made at the present time; the data needed for this type of analysis are not available from the Department of Fisheries or elsewhere. The financial constraints on the fishermen in maintaining the acadjas must also be considered. This involves the supply and demand for wood and the profit motives of the woodcutters. There will undoubtedly be better biological growth and production of fish in the lake but the effects of teredos have currently reduced the durability of the acadjas, forcing the fishermen to harvest at poorer productive schedules--due to the expected life of the acadja and not related to the prime biological harvesting time of the fish stock. The shorter life of the acadjas requires the fishermen to harvest more frequently, with resultant less production of fish on a per unit of time basis.

If the fishermen can be assured that salinities will be reduced and the effects of the borers eliminated, it should encourage them to invest in the

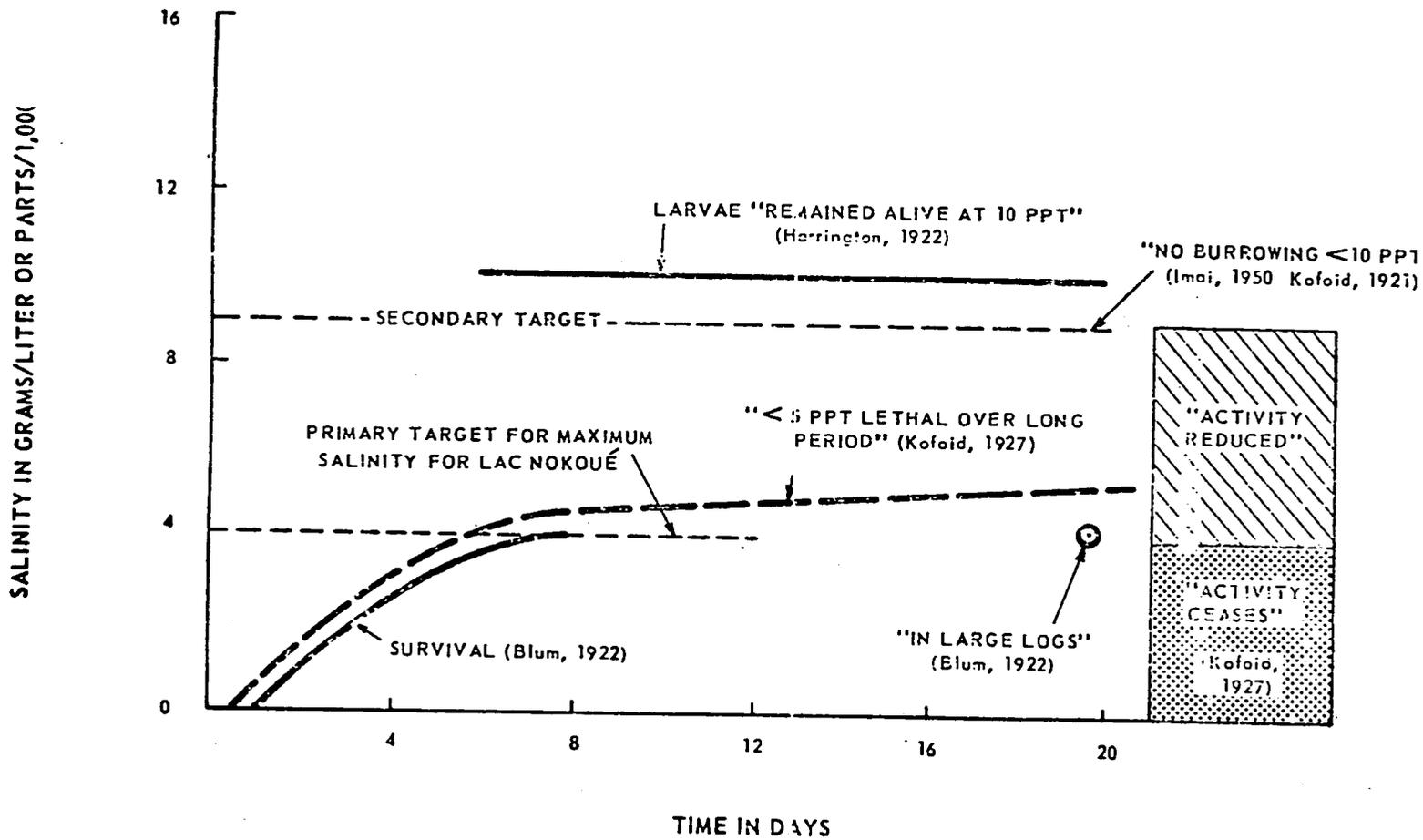


FIGURE 4. RELATIONSHIP OF SALINITY WITH ACTIVITY AND SURVIVAL OF TEREDO

construction of more and larger acadjas. With the restoration of the basic biological productivity to the level that existed in the lake prior to the permanent opening of the channel, there is no reason to believe that the fishery productivity of the lake would not be restored to its 1959 level. There is no indication available that the environmental changes have had an effect on anything but the quantitative aspects of the existing fish populations. No species of fish seems to have increased in numbers in response to the ecological changes of the lake. Restoration of original, or better, conditions by the construction of a barrier in the channel should provide for restoration of fish-cultural operations and the restoration of productivity levels to what they were before 1959. With the added information about the basic biology of the fish populations and the techniques of improving acadja installations and harvesting times and techniques (Welcomme, 1969 and 1970), there appears to be ample justification to support an hypothesis that fish productivity can be increased up to and perhaps beyond the 15,000 metric tons per year that existed prior to the permanent opening of the channel.

There should be no significant harmful effects to fishery enterprises or fish production if the dam is constructed as proposed. The only exception to this is the production of shrimp. These organisms come into the lake with the inflowing tides as pelagic larvae, grow in the lake for 1 to 3 years, and at the onset of sexual maturity migrate back out to sea for spawning. It is during the seaward migration that the fishermen harvest the shrimp with traps. With the installation of the +1.1 m weir, it can be expected that the shrimp fishery will be reduced greatly. If the calculations of the Sanders and Thomas engineers are accurate in predicting that the inflow of tidewater will be reduced to 1% of its current amount (Fig. 3), it seems reasonable to expect that the abundance of shrimp larvae entering the lake will be reduced in the same proportion. The effect of reduced salinity on the survival and growth of these shrimp that do gain access to the lake is not predictable at the present time.

The only recognizable environmental factor, other than shifts in the salinity patterns, that is now or likely in the future to affect the fishing yield for the

principal fish varieties as well as for shrimp is the expected restoration of biological productivity to be derived from the added desposition of flood-borne silts and detritus on the lake bottom by the reduction in flows and turbulence. It is roughly estimated that one-half of the decrease in fish yields from Lake Nokoue has been due to the loss of this silt; it is therefore reasonable to expect that a minimum of this amount would be restored by the construction of the dam and the subsequent reduction in turbulence.

No other controllable environmental factor than the effects of turbulence and the effects of salinity intrusion were evident. These are the two prime causes of decrease in fish yields, as indicated in all previous reports obtained and the situation as surveyed by this investigator.

Most evident factors controlling fishing yields, with the exception of the two mentioned above, are not environmental, but are associated with the material needs of the fishermen to engage in fishing, the harvesting of the fish crops and the marketing and distribution of the product. The cost and the transportation of wood branches for the construction of the acadjas are two important factors in the determination of future fishing yields. The supply of branches to the fishermen by woodcutters may be a limiting factor in increasing future productivity. The use of artificial materials for acadja installations is a future possibility and is being investigated at the present time. Marketing and distribution systems for the yields of fish from the lake are quite primitive and should be a target for improvement by the various fishery management and development agencies in Dahomey. These factors, however, are independent from the basic problem of evaluating the fishery benefits to be derived from the construction of a bridge and dam in the channel.

The totality of these effects requires that something be done to block the channel. The rapid out-flow of nutrition-bearing flood waters must be stopped; the turbulence created by the incoming tides must be reduced; and the intrusion of salinity into the lake system must be controlled before any improvement in the yield of fish from the lake can be expected.

Forecasting Considerations

As discussed above, it is not possible to forecast definitively the increase in fish yields due to ecological conditions that will be changed by the proposed dam. At present the following factors must be considered:

1. Reduce turbulence; allow deposition of silt, detritus and minerals in the lake.
2. Limit salinity intrusion: reduce salinities in the lake to below the minimum tolerated by Teredo petiti (less than 4 g/l.) and thus restore conditions that will ensure durability of the acadjas. With the assurance to the fishermen that the effects of the Teredos are indeed reduced, the construction of more and possibly larger acadjas should follow, until the area provided for such fish-culture operations equals if not exceeds that which existed prior to 1959.
3. There does not appear to be any evident biological restriction on the amount of fish production that can be achieved in Lake Nokoue--at least evident from available information. The major restriction on yields is the existence and durability of the acadjas; the more there are and the longer they last the greater the yield will be. Of course, there is an upper limit to yields, but on the basis of past cultivation efforts and productivity, it is estimated that this level is far above those achieved in the past.
4. The increase in population of the area surrounding Lake Nokoue in the past 10 years now provides a greater market for fish from the lake which should provide further incentive for more intensive fish-cultural operations.
5. To take advantage of this expected increase in yield, efforts should be initiated by the Department of Fisheries to provide for better preservation,, transportation and marketing facilities.

6. After the season of the floods, freshwater conditions were soon established in the lake. The local rainy season flushed the salt water from the lake, and it remained in essentially a freshwater condition through the late summer and early fall until the high fall tides (the highest of the year) flowed into the lake and made it saline again. Thus, if the intrusion of salt water during the high fall tides can be reduced or controlled, the lake should start toward a freshwater condition. Available records on the time of the opening of the channel, the height and frequency of the tides and the resultant salinity changes in the lake are not adequate to predict accurately future schedules and salinity changes. However, it is estimated that within three, or at most five, years after installation of the dam the lake should reach its post-dam stable condition, relative to salinity levels and to silt and detritus deposition.⁽¹⁾

The monetary evaluation of fishery benefits to be derived from the barrier dam is attached as Annex C.

(1) Source (1972) - Sanders and Thomas, Economic and Technical Feasibility Study for Bridge and Dam Across Cotonou Lagoon.

Appendix

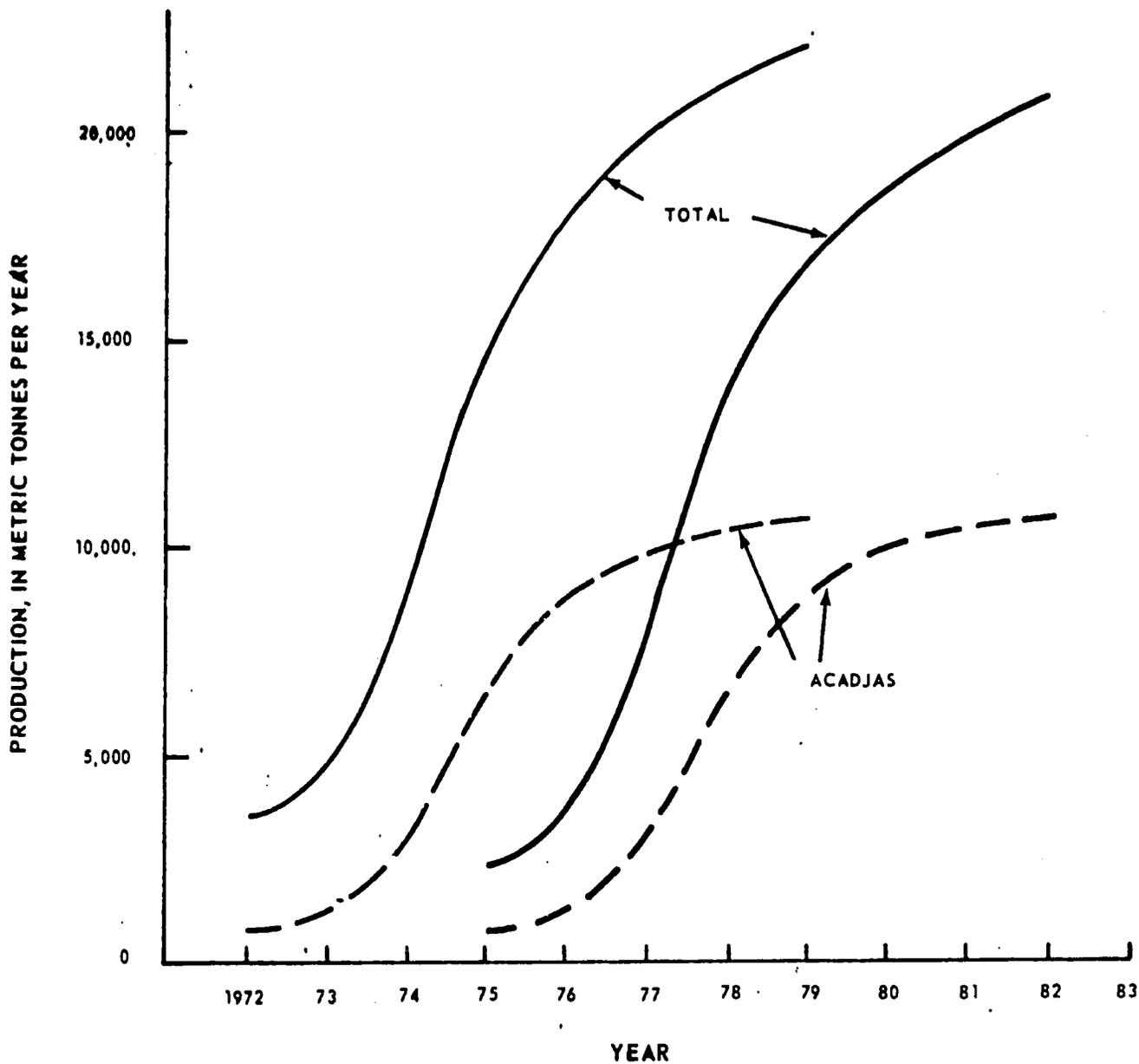
Fishery Benefits
Lake Nokoue, Dahomey

As a result of changes in the ecological characteristics of Lake Nokoue, fish production from the lake has dropped to 5,600 tons in 1970 from 15,000 tons in 1959 (see Text Figure 1). The social and economic well-being of approximately 50,000 people who depend directly on the fisheries of Lake Nokoue as a source of income and food are being threatened as are other sectors of the economy involved in fishery production and distribution. Consumers are also being affected by this decline in fishery production, as indicated by the doubling of fish prices at the harvesting level: Tilapia, 25 francs (CFA) per kg in 1959 and 50 francs per kg in 1971; mullet and shrimp, 70 francs per kg in 1959 and 150 francs per kg in 1971. Compounding these problems are the high unemployment in the fishery and region at this time and the need to import approximately 3,000 tons annually of fish products in recent years to offset the drastic decline in domestic production.

General benefits from the proposed dam:

The project (dam) is expected to result in the following general fishery benefits over time:

1. Increased production will contribute to food and higher nutritional needs of the region.
2. Increased employment and income in the harvesting and distribution sectors of the fishery.
3. Long-range stability that promotes maximum benefits from the fishery.
4. Stable and lower prices for these fish products.
5. Reduction in per unit production cost of fishing operations; especially material (wood) costs in the acadja fishery.
6. Permit alternative uses of national (Dahomey) monies (nearly U.S. \$1 million per year) currently expended on import of fish products.



APPENDIX FIGURE 1.

Estimated recovery of fish production from Lake Nokoue for acadjas (dashed lines) and total lake production (solid lines). The origins of the respective curves, at arbitrarily selected dates of 1972 and 1975, indicate the levels of fish production at those times and the curves the recovery estimated to occur if the dam is completed in those two years.

Fishery benefits from the proposed dam:

Economic benefits attributable to the fishery with the implementation of the project that will improve the fishery are reported here in terms of net economic benefits based on the following assumptions:

1. The low economic condition and high unemployment in the fishery specifically and in the region generally, permit evaluating benefits based on the assumption that net benefit can be represented by gross benefits less material costs only, due to lack of alternative employment for most resources currently employed in this fishery.
2. In the absence of adequate information on projected market prices at levels of increased productivity, an approximated decreasing price trend is used to value the increased fish production.
3. It will be assumed that the net value productivity of the fishery will return only to the 1959 level. This is considered a very conservative estimate as discussed elsewhere in this report.

Based on these assumptions, Appendix Table 1 summarizes the projected net economic benefits to the fishery from a dam constructed in 1972 or in 1975. In each case the planning period, or benefit stream, covers only seven years and is based on the production (or recovery) curves shown in Appendix Figure 1. These benefits are, however, expected to continue far beyond the planning period. Detailed analyses, by acadja and open lake fisheries, are given in Appendix Tables 2 and 3.

The total net economic benefit to the fishery during 1973-79 with the dam completed in 1972 is approximately U.S. \$10.7 million. With the dam completed in 1975, the total net economic benefit during 1976-82 is U.S. \$10.4 million. For informational purposes, discounted net benefits at four alternative interest rates are given in Appendix Tables 2 and 3. They show that the above stated net benefits when discounted to appropriate present values range from U.S. \$8.6 to \$4.8 million for the 1972 dam and U.S. \$8.3 to \$4.7 million for the 1975 dam.

... y benefits are expected beyond the planning period. As an example of net benefits that can be expected over a longer benefit stream, the total net economic benefit for a 20 year period (1973-92) discounted at the 20 percent rate would be U.S. \$7.7 million with the dam completed in 1972.

Appendix Table 1.--Projected increase in fishery production and net economic benefits from the proposed dam at Lake Nokoue, Dahomey.

Year	Fish production			Gross revenue	Fishing cost	Net benefit.
	Total	Annual increment	Cumulative			
	-----metric tons-----			-----U.S. \$1,000-----		
(Dam completed in 1972)						
1972	3,700	-	-	-	-	-
1973	5,100	1,400	1,400	564	150	414
1974	9,300	4,200	5,600	1,574	418	1,156
1975	15,000	5,700	6,170	1,941	465	1,476
1976	18,200	3,200	9,370	2,383	787	1,596
1977	20,000	1,800	11,170	2,679	884	1,795
1978	21,400	1,400	12,570	2,956	975	1,981
1979	23,300	1,900	14,470	3,394	1,120	2,274
						Total = <u>\$10,692</u>
(Dam completed in 1975)						
1975	2,200	-	-	-	-	-
1976	3,600	1,400	1,400	468	103	365
1977	8,000	4,400	5,800	1,586	411	1,175
1978	13,800	5,800	11,600	1,977	470	1,507
1979	16,700	2,900	14,500	2,359	779	1,580
1980	18,500	1,800	16,300	2,621	865	1,756
1981	19,800	1,300	17,600	2,873	949	1,924
1982	20,700	900	18,500	3,054	1,008	2,046
						Total = \$10,353

Appendix Table 2.--Projected benefits with enhancement project (dam) completed in 1972, Lake Nokoue fishery, Dahomey (1973-1979). 1/

Year	Fish production 2/		Estimated price for fish 3/ (CFA/kg)	Gross benefits 4/		Fishing cost 5/ (U.S.\$)	Net benefit 6/ (U.S.\$)	Net benefit (U.S.\$) discounted at 7/			
	Total	Annual increment		CFA	U.S.\$			4%	6%	12%	20%
(Acadja Fishery)											
1972	500	-	-	-	-	-	-	-	-	-	-
1973	1,500	600	600	50	30,000	110	0	110	105	104	99
1974	3,300	1,800	2,400	35	84,000	308	0	308	280	274	244
1975	6,700	3,400	5,800	25	145,000	531	0	531	460	446	378
1976	9,000	2,300	8,100	25	202,500	742	245	487	411	394	314
1977	10,000	1,000	9,100	25	227,500	838	275	558	440	417	317
1978	10,500	500	9,500	25	240,000	870	200	580	443	415	298
1979	10,600	300	9,000	25	247,500	907	200	608	436	404	275
Total							= \$3,201	2,575	2,454	1,928	1,444
(Open Lake Fishery)											
1972	2,800	-	-	-	-	-	-	-	-	-	-
1973	3,600	800	800	155	124,000	454	150	304	290	287	272
1974	6,000	2,400	3,200	108	345,600	1,266	418	848	771	755	676
1975	8,300	2,300	5,500	70	385,000	1,410	465	945	819	793	673
1976	9,200	900	6,400	70	448,000	1,641	542	1,099	908	870	693
1977	10,000	800	7,200	70	504,000	1,846	600	1,237	975	921	707
1978	10,900	900	8,100	70	567,000	2,077	685	1,392	1,045	981	735
1979	12,500	1,600	9,700	70	679,000	2,487	821	1,666	1,104	1,108	804
Total							= \$7,401	6,003	5,718	4,600	3,307
(Total Fishery)											
1972	3,700	-	-	-	-	-	-	-	-	-	-
1973	5,100	1,400	1,400	-	154,400	564	150	\$ 414	395	391	370
1974	9,300	4,200	5,600	-	429,600	1,574	418	1,156	1,051	1,020	922
1975	15,000	5,700	5,170	-	530,000	1,941	465	1,476	1,280	1,239	1,051
1976	18,200	3,200	9,370	-	650,500	2,383	787	1,596	1,319	1,264	1,014
1977	20,000	1,800	11,170	-	731,500	2,679	884	1,795	1,415	1,341	1,018
1978	21,400	1,400	12,570	-	807,000	2,956	975	1,981	1,489	1,396	1,004
1979	23,300	1,900	14,470	-	926,500	3,394	1,120	2,274	1,630	1,512	1,020
Total							= \$10,692	8,578	8,172	6,408	4,761

1/ The planning period is 1973 through 1979 (7 years). The 1979 total net benefit of U.S. \$2,274,000 may be extrapolated or kept as a constant estimate for each year beyond the planning period of 1979.

2/ Represents the projected recovery in fish production following the completion of the dam in 1972. The 1959 level of 15,000 tons is expected to be reached in 1975. The increased production (but at a declining rate of increase) thereafter is based on projected changes in fishery practices which will further enhance production.

3/ Reports indicate the following prices received by fishermen: Acadja fishery: 1959 = 25 francs per kg.
1960 = 35 francs per kg.
1971 = 50 francs per kg.
Open lake fishery: 1959 = 70 francs
1960 = 70 francs
1971 = 150 francs per kg.
and up to 500 francs per kg. for large fish

In the absence of supply and demand relations, it will be assumed that market price will decline with increased production (supply) as approximated in the table. The use of a constant 25 francs for the Acadja fishery and 70 francs for the open lake fishery is considered to be extremely conservative.

4/ Gross benefit is the cumulative increase in production times price. Monetary conversion is 277 francs (CFA) = U.S. \$1.

5/ In determining net benefits associated costs are limited to material costs of the fishery based on the rationale that labor and capital costs are omitted in view of the high unemployment and lack of alternative employment opportunities in the fishery region. All material costs, except for the Acadja fishery during 1973-75, are based on the 33 percent of gross revenues suggested in Welcomme (1968). The exception noted above is based on the fact that cost savings will be realized because less wood will need to be replaced with the reduction in the effects of marine borers on wood; i.e. the replacement rate of wood had increased over the 1959 normal by 75 to 100 percent by 1969 with an attending 100 percent increase also in wood prices.

6/ Net benefit is gross benefit (revenue) less the fishing cost, and represents the benefit to the fishery from the enhancement project.

7/ For informational purposes, net benefits are discounted at four alternative interest rates using 1973 as year 1.

Appendix Table 3.--Projected benefits with enhancement project (dam) completed in 1975, Lake Nokoue fishery, Dahomey (1976-1982). 1/

Year	Fish production ^{2/}		Estimated price for fish ^{3/} (CFA/kg)	Gross benefits ^{4/}		Fishing cost ^{5/} U.S.\$	Net benefit ^{6/} U.S.\$	Net benefit (U.S.\$) discounted at: ^{7/}				
	Total	Annual increment		Cumulative increase	CFA			U.S.\$	7%	6%	12%	20%
-----metric tons-----												
(Acadja Fishery)												
1975	750	-	-	-	-	-	-	-	-	-	-	
1976	1,600	850	850	50	42,500	156	0	156	149	147	130	130
1977	3,400	1,800	2,650	35	92,750	340	0	340	309	303	271	236
1978	6,800	3,400	6,050	25	151,250	554	0	554	480	465	394	321
1979	9,000	2,200	8,250	25	206,250	756	250	506	418	401	322	244
1980	10,200	1,200	9,450	25	236,250	865	285	580	457	433	353	233
1981	10,700	500	9,950	25	248,750	911	301	610	458	430	309	204
1982	11,000	300	10,250	25	256,250	939	310	629	451	418	284	175
Total							= \$3,375	2,722	2,597	2,048	1,544	
(Open Lake Fishery)												
1975	1,450	-	-	-	-	-	-	-	-	-	-	-
1976	2,000	550	550	155	85,250	312	103	209	199	197	187	174
1977	4,600	2,600	3,150	108	350,200	1,246	411	835	759	743	666	580
1978	7,000	2,400	5,550	70	388,500	1,423	470	953	826	800	679	551
1979	7,700	700	6,250	70	437,500	1,603	529	1,074	868	851	682	518
1980	8,300	600	6,850	70	479,500	1,756	580	1,176	927	879	667	473
1981	9,100	800	7,650	70	535,500	1,962	648	1,314	988	926	666	440
1982	9,700	600	8,250	70	577,500	2,115	698	1,417	1,015	943	642	395
Total							= \$6,978	5,602	5,339	4,189	3,131	
Total Fishery)												
1975	2,200	-	-	-	-	-	-	-	-	-	-	-
1976	3,600	1,400	1,400	-	127,750	468	103	365	348	344	326	304
1977	8,000	4,400	5,800	-	432,950	1,586	411	1,175	1,068	1,046	937	816
1978	13,800	5,800	11,600	-	539,750	1,977	470	1,507	1,306	1,265	1,073	872
1979	16,700	2,900	14,500	-	643,750	2,359	779	1,580	1,306	1,252	1,004	752
1980	18,500	1,800	16,300	-	715,750	2,621	865	1,756	1,384	1,312	996	706
1981	19,800	1,300	17,600	-	784,250	2,873	949	1,924	1,446	1,356	975	644
1982	20,700	900	18,500	-	833,750	3,054	1,008	2,046	1,466	1,361	926	571
Total							= \$10,353	8,324	7,936	6,237	4,675	

1/ The planning period is 1976 through 1982 (7 years). The 1982 total net benefit of U.S. \$2,046,000 may be extrapolated or kept as a constant estimate for each year beyond the planning period of 1982.

2/ Represents the projected recovery in fish production following the completion of the dam in 1975. The 1959 level of 15,000 tons is expected to be reached around 1979. The increased production (but at a declining rate of increase) thereafter is based on projected changes in fishery practices which will further enhance production.

3/ See same footnote in Appendix Table 2.

4/ See same footnote in Appendix Table 2.

5/ See same footnote in Appendix Table 2.

6/ See same footnote in Appendix Table 2.

7/ For informational purposes, net benefits are discounted at four alternative interest rates using 1976 as year 1.

1. Q.: Will a dam at the mouth of the Lagune de Cotonou, together with continued sewage discharge, cause Lake Nokoue to become polluted to an extent that it would affect fishing in the lake or constitute a potential health problem?

A.: In general, the dam will be an artificial replacement of the naturally-formed sand bar that closed the lagoon outlets prior to 1959; therefore pollution from sewage, other conditions being equal, should be approximately the same as in pre-1959 years. I have no information on sewage or pollution conditions in those years. However, the bi-annual floods would probably flush out much of the accumulated sewage materials in the lagoon area. It is unlikely that domestic sewage, unless extremely heavy, -heavy enough to create de-oxygenated conditions in the lagoon, but not in the lake, would create conditions that would be deleterious to fish production, and these effects would probably be restricted to the lagoon area. The element of this question pertaining to a potential health problem is out of my area of knowledge and I cannot answer it.

2. Q.: What effects might the dam have on salinity, pollution, fishing, etc. in the Porto Novo area?

A.: The first two elements of this question are essentially sanitary engineering questions that I am unable to answer. If the Cotonou lagoon is blocked by the dam, as it was blocked before 1959 by the sand bar, the river waters flowing into the lake will have to exit the watershed through the Porto-Novo lagoon. These flows of fresh water, as opposed to salt, should restore aquatic conditions in the Porto Novo lagoon area to their pre-1959 levels. The incursion of salt water has apparently been the single most effective deterrent to fish production. Control of the inflow of saltwater, followed by reduction in abundance and effects of the marine borers, should restore the durability of the existing acadjas and encourage the fishermen to invest in the construction of additional ones. From these efforts fish production should increase to the 1959 level, if not exceed it.

3. Q.: Would incorporation of a culvert or a by-pass permit the ingress-egress of the shrimp?

A.: At the time the larval shrimp move into coastal estuaries, they are being passively transported by currents and are not large enough to swim volitionally. Pink shrimp (Penaeus duorarum) life history investigations have shown that the greater the volume flow the more larvae and post-larval shrimp are transported into the coastal estuaries and lagoons. Thus, in the specific shrimp/tides/lagoon situation at Cotonou, it can be assumed that, other biotic factors being equal, the abundance of larval shrimp entering the lagoon-lake system is a lineal function of the volume of water entering. If this volume is reduced by the dam to 1% of the current amount, it follows that only 1% of the current amount of larval shrimp will be transported. Since the main achievement to increase total fishery production is to reduce the inflow of saltwater, a culvert or by-pass would not significantly enhance shrimp abundance in the lake, and would perhaps jeopardize much potential fishery production because of the saltwater intrusion. Further studies on timing and abundance of incoming larval shrimp, (as I suggested to Fisheries Director Azandegbe during my visit to Dahomey) might better define certain seasonal periods - e.g. certain nocturnal flood tides during spring half-moons - when it would be worthwhile to allow a little saltwater - bearing a significant density of larval shrimp - thru a culvert into the lagoon. If a

closeable culvert, or culverts, can be included in initial construction without additional costs, it may be worthwhile to include them. However, much additional life history information on the pink shrimp needs gathering before it would be advantageous to undertake additional costs to provide for their movement into the lagoon. As stated elsewhere in the report, Dr. Azandegbe said that the shrimp fishery would be expendable if the acadja fisheries in Lake Nokoue could be restored.

It may be fruitful to consider installation of controllable-flow culverts in the dam for permitting seaward flows during low tides to help alleviate sewage concentrations in the lagoon, if such occurs. Then, on the basis of knowledge on the timing/density of larval shrimp movement with the tides, to permit a small amount of saltwater to flow inward at high tide levels. It may be that the peak abundance of larval shrimp coincides with the high tides that would flow over the +1.1 m. weir. Adequate information on shrimp larvae availability and transport by tidal flows is not available.

4. Q.: Alternate erosion control measures: effect on fisheries?

A.: No information at present on what, exactly, these control measures will be. If the inflow of the saltwater tides through the lagoon into the lake is not reduced by at least 95%, the resulting saline conditions in the lake will permit survival of marine borers, which will reduce the durability of acadjas and rate of construction of acadjas - hence, fishery production will remain at its present low level or be reduced even further.. To enhance the Lac Nokoue fishery production, the incursion of saltwater must be greatly reduced. If alternate measures do not include a weir or dam to halt tidal inflows, no improvement in fishery production can be expected.

5. Q.: Reasons for price differential

A.: In June, 1971, the Department of Fisheries of the Republic of Dahomey, through the American Embassy in Cotonou, gave the prices of fish received by the fishermen for Lake Nokoue fish as: Tilapia, 50 CFAF per kilo; mullet, 150 CFAF per kilo. Tilapia is the main species harvested from acadjas; mullet are not taken in great abundance in the acadja fisheries, but are taken mostly by the castnetters in open waters. A few large catfish, with a reported price to the fishermen of 500 CFAF per kilo, are taken both in acadjas and open waters, but estimates of numbers taken were very low and catfish production figures were not included in the economic evaluation. (1)

(1) Source (1972). Sanders and Thomas, Economic and Technical Feasibility Study for Bridge and Dam Across Cotonou Lagoon.

ENVIRONMENTAL CONSIDERATIONS

1. Summary Impact Statement

Hydrographic studies and measurements of water flow were made by the consultant, Sanders and Thomas, to develop a mathematical model for stimulating the hydrographic conditions and define the boundary conditions in the Cotonou Lagoon and Lake Nokoue. The mathematical model developed by the consultant was used to study the effects on flow and water level due to the presence of the proposed dam located near the mouth of the Lagoon. These and other studies which are listed below also consider the beneficial and detrimental effects resulting from the construction of the dam. Results of the studies indicate that the dam, by controlling average water elevations and velocities in the Lagoons, will serve to eliminate shore erosions and scour. In addition, the dam will block a large amount of the tidal inflows into the Cotonou Lagoon which should reduce salinity in the Lake. This lower level of salinity in the Lake coupled with the stabilized Lake water elevation and outflow water velocities during floods will help restore the ecological conditions which existed before the construction of the port west of the mouth of the Lagoon. Restoration of these ecological conditions in Lake Nokoue should improve fish production in the Lake. Further, a high rate of salinity in the Lagoon is required for the raising of shrimp which has reached about 900 tons per year. The proposed dam will be designed to give MRGD's Fisheries Department some measure of flexibility in controlling the tidal inflows into the Lagoon. The crest of the dam will include a weir which will be covered by removable massive concrete blocks. Therefore, by controlling the amount of salt water admitted into the Lagoon, a certain balance can be achieved between the low level of salinity in the Lake required to increase fishing yields and the high level of salinity in the Lagoon needed to maintain the current rate of shrimp production. Alternative erosion control measures were considered. However, results of investigations show that these measures would still need to include a weir or dam structure to halt tidal inflow for any meaningful effect on the ecology of Lake Nokoue.

Detrimental effects due to the presence of the proposed dam have also been considered. Problem areas, such as silt deposits, loss of shrimp and accumulations of sanitary effluents in the Lagoon, were studied. The problem of silting in the Cotonou Lagoon is difficult to evaluate. In the past, when the Lagoon was closed for several years at a time, no serious silting occurred. The

dam at the mouth of the Lagoon will act as a permanent barrier and silt accumulations that do occur could easily be removed during the dry season. This can be done by a dragline using the dam itself as a convenient access platform. The cost of such periodic work would be minimal. Construction of the pervious dam as originally designed could have possibly totally eliminated shrimp fishing in the Cotonou Lagoon. However, the alternative design indicated above includes a 30-meter long sill, 2-meters deep, closed by removable concrete blocks. This will permit the Fisheries Department to exercise some extra flexibility in directly controlling the quantity of salt water in the Lagoon which is needed for shrimp raising. The additional construction cost of this alternative design has been estimated at about \$200,000. Currently, all sanitary effluent in Cotonou is discharged into the ground where it mixes with the rain storm effluent and eventually seeps into the Lagoon. Cotonou's industrial zone is located east of the Lagoon, and extends toward Porto Novo. All industrial waste from this zone is discharged into the ocean. Concerns have been expressed that the proposed dam will create stagnant conditions in the Lagoon and therefore aggravate pollution from the sanitary effluent. The dam will be a very pervious dam and there will always be some water movement towards the ocean, even in the dry season. During the flood season, the entire Lagoon will continue to be flushed clean not only of any sanitary effluent accumulations, but also of salinity built up in the Lagoon. Therefore, no adverse conditions are anticipated from the construction of the proposed dam with respect to the accumulation of sanitary effluent in the Lagoon. This should not preclude the fact that there will be a pressing need to construct a sanitary sewer system in Cotonou as the city continues to grow. This has been reported to appropriate authorities in Dahomey. Recent developments indicate that Cotonou's managers are planning the construction of a sewage treatment plant which will be located in the industrial zone.

Environmental Analysis of Dam

a. The major modification of the landscape and waterway which will result from the construction of the dam at the mouth of the Lagoon is the fact that the pervious dam will be an artificial replacement of the naturally formed sand bar that closed the Lagoon outlet prior to 1959.

- b. Biohydraulic studies, performed by Richard B. Thompson of the National Marine Fisheries Service Biological Laboratory of Seattle, Washington, indicate that the presence of the dam near the mouth of the Lagoon will have a beneficial effect on the fish in Lake Nokoue. (See Annexes B and C of this paper.)
- c. Impact of the effluents of waste disposal system was discussed in the summary statement. Periodic floods will flush out to the ocean any accumulations of sanitary effluents.
- d. Stagnant pools to trap pollutants will not develop.
- e. The Lagoon's discharge patterns will not be adversely affected.
- f. The project is an important part of a coherent plan for the orderly expansion and development of the city of Cotonou.
- g. The pre-development waterway sedimentation patterns are the following:

Sediments are brought into Lake Nokoue, mostly by the Oueme River. The flow of the river in its northern reaches is relatively fast and thus it is able to carry silt and sediments downstream towards Lake Nokoue and Porto Novo Lagoon. As soon as it reaches the Lake, however, the speed of flow is drastically reduced. Thus, any silt or sediment kept in suspension in the river water will mostly be deposited in the Lake.

- h. The dam will to some extent block sediment and silt movements from the Lagoon toward the ocean and adjacent beach areas.
- i. It is anticipated that any possible induced tidal wash and currents will not be of a magnitude sufficient to cause channel bank, beach and coastal erosion.
- j. The source of sand for the core of the dam will be the beaches along the coast near Cotonou. The source of rock for the apron, crest and side slopes cover will be the Paouignan Quarry, located approximately 200 km north of Cotonou. Sources are existing commercial operations. No changes nor adverse effects to the environment are anticipated.
- k. Accident contingency plans will be formulated by the construction firms prior to start of construction operations. Other types of accident considerations are not applicable here.

1. Construction firms will take measures to handle emergencies or accidents.

m. Dredging sand will be used to fill deep holes in the vicinity of the dam.

n. The construction of the dam will not adversely affect local cultural or economic values, such as scenic beauty, local fishing and other economic enterprises.

o. This project will have no effect on historical, religious, archaeological and geological artifacts.

p. The possibility of water pollution in the Lagoon as a result of the construction of the dam has been investigated. Adverse effects on local workers or on the adjacent population are not expected.

q. Dredging operations will be required to level the Lagoon bed to the correct elevation of the base of the dam.

r. Since no new water impoundment will result from the construction of the dam there is not concern about evaluating resource trade-offs such as value of water impounded as land flooded and optional uses lost, mineral deposits lost, forest resources diminished, etc. Likewise, there is no incompatibility with regional resource planning.

s. The dam is not expected to effect aquatic vegetation growth patterns in the channel.

t. The dam will not result in relocation of population; no resettlement areas and ancillary community services will need to be provided; consequently no socio-cultural effects will occur.

3. Environmental Analysis of Bridge and Approaches -- A.I.D. Environmental Analysis Guidelines Manual

a. No inaccessible or barely accessible areas will be opened by the construction of the new bridge. Boulevard St. Michel, the western approach to the bridge is fully accessible and well developed; the eastern approach road will pass through an existing, though not developed, right of way in an already partially developed area.

b. Desirable future development along the Boulevard St. Michel will occur. Further housing, commercial and industrial development can also be expected to occur along the eastern approach road. Development will be controlled by Cotonou's master development plan.

c. No adverse effects are expected from the construction of the bridge on wildlife, rangelands (which do not exist in the area) or migration routes.

d. The bridge will not disturb the flow of water in the channel connecting Lake Nokoue and the sea. No timberlands or mineral deposits will be effected. Construction of the bridge will restrict navigation. There is only small boat traffic in the channel.

e. A fetish-house currently sitting on the west bank of the channel within the right of way will need to be moved. Dahomean Government Agencies are arranging for its removal to a suitable site nearby. The Government is also building a new modern reinforced concrete market building to the north of the western approach to replace the old crowded market consisting of wooden ramshackle buildings now used and within the western right of way. A storm sewer outfall will also have to be relocated to a point just north of the western approach. Other than the above, no historic, religious, spiritually holy ground or building, natural landmarks or archaeological site will be disturbed by the bridge and its approaches.

f. No barrow pits or waste areas will result from construction of the bridge. Sand will be brought in from the beach area and gravel will come from the existing Paouignan quarry operation.

g. Average air pollution can be expected from fuel consumption by vehicles moving across the bridge but then this will have little effect on the present level of air pollution in Cotonou. Since this is a bridge, no dust pollution will result.

h. Effect on the cultural patterns of the people will be minimal. No primitive peoples will be affected as this is presently an accessible area.

i. No population will be dislocated by the bridge.

j. The aesthetic qualities of the bridge design are acceptable.

k. The noise level on the bridge will not be any worse than on the present bridge.

1. The purpose of the bridge is to relieve traffic congestion across the existing bridge. It will be some years before the traffic increases to the point where congestion results.

m. The design provides for safety walks for pedestrians.

n. No new pathways will be developed for vector diseases either human, animal or plant, as this is already a developed area.

4. Summary of Environmental Aspects

a. The environmental consequences of future area projects have been considered by the consultant in the design of the dam. Findings were reported to the Government of Dahomey.

b. The entire project, which includes the new bridge across the Lagoon, the dam near the mouth of the Lagoon, the link-up to route no. 11 and the renovation of the existing bridge as its elements, complements land-use patterns developed for Cotonou's 1962 Master Plan. This Plan, which was developed by A. Arsac and K. Mestoudjian, architects and urban planners of Paris, France under the sponsorship of SCET International, analyzes various urban problems and outlines an integrated course of action for Cotonou's future development. The elements of this project are an integral and vital part of the city's development plan.

c. The elements of this project will improve facilities available to monitor circulation and the impact of traffic and new access upon important elements of ecosystems -- population settlements, migration patterns, diseases, surface water and erosion. As the cornerstone of Cotonou's Master Development Plan, this project will encourage:

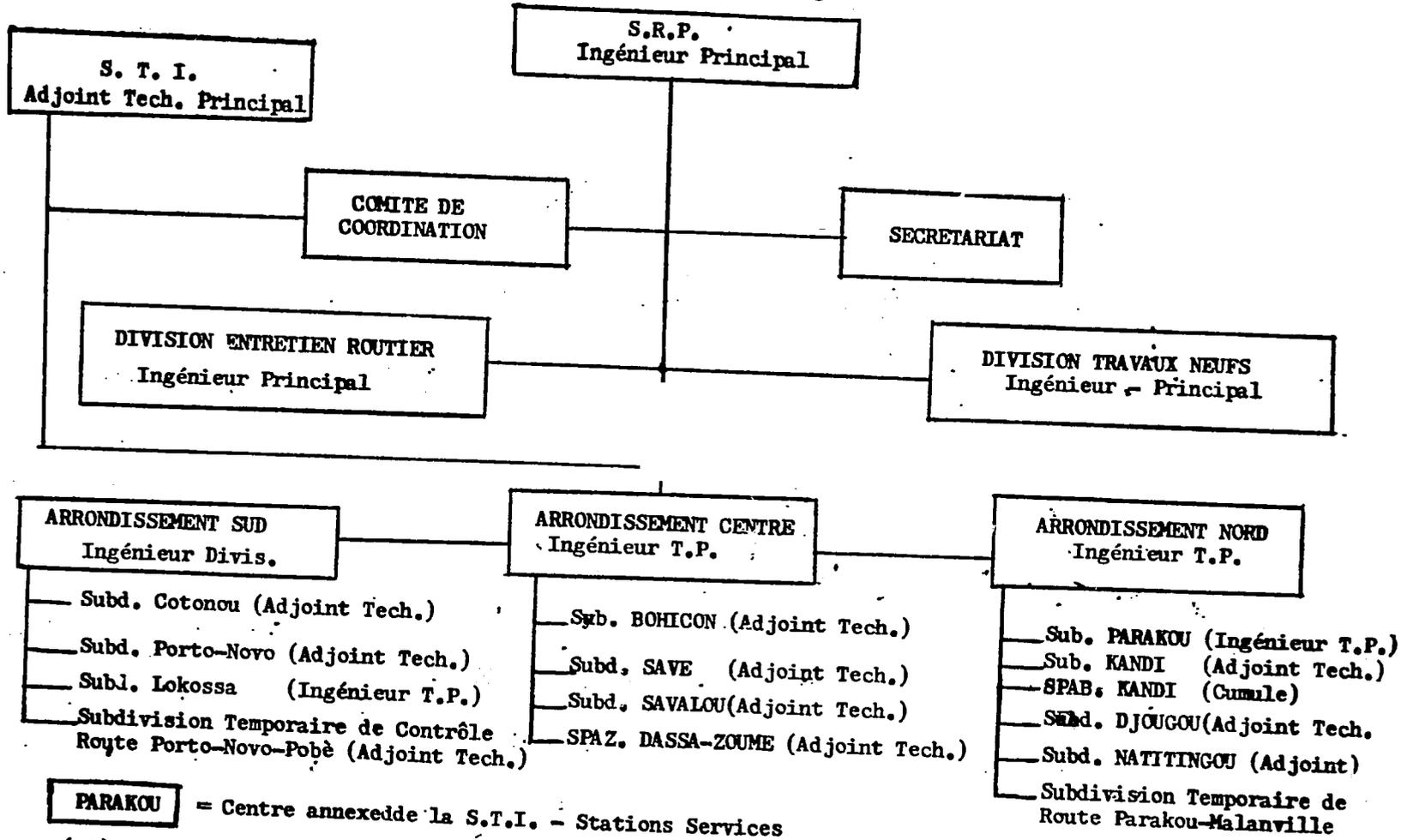
(1) The move to the north of the city's center of the gravity, towards its geographical center;

(2) Provide access to areas of the city suitable for future development;

(3) Facilitate and improve the operations of the city's municipal services;

(4) Develop easier communications and access between the eastern and western halves of Cotonou, thus allowing for better use of its eco-cultural and recreational resources.

ORGANIGRAMME DU SERVICE
DES ROUTES ET PONTS



PARAKOU = Centre annexé de la S.T.I. - Stations Services

(.A) = Atelier de réparations et entretiens courants du matériel dans chaque unité.

DIRECTION DE LA COOPERATION
INTERNATIONALE

2197h1

CI /RSC.-

Le Ministère des Affaires Etrangères de la République du Dahomey présente ses compliments à l'Ambassade de la République des Etats-Unis d'Amérique et se référant aux dispositions définies, de commun accord, à la réunion Multipartite des Experts MAD-USAID, WANDERS et THOMAS et Techniciens Dahoméens les 7, 8 et 10 Novembre 1973 à Cotonou, relative à l'Etude définitive du Nouveau Pont de Cotonou, du Barrage et de la Réfection du Pont actuel, a l'honneur de lui demander de bien vouloir porter à la connaissance des Autorités compétentes de l'USAID que le Gouvernement Militaire Révolutionnaire de la République du Dahomey voudrait solliciter auprès d'eux un prêt de 8,5 Millions de Dollars US soit environ 12,040 Milliards CFA pour le financement de la construction du nouveau pont et les routes d'accès. Ci-après les conditions du prêt :

Durée : 40 ans avec un différé de 10 ans

Taux d'intérêts : 2 % les 10 premières années

3 % les 30 dernières années.

Par ailleurs, le Gouvernement dahoméen s'engage à prendre à sa charge 10 % du coût des dépenses locales dans la réalisation du projet, conformément aux entretiens qu'a eus Monsieur DAVID JISAR, Directeur Régional de l'USAID (REDSO/WA) avec Monsieur GNAGUIDI, Directeur des Travaux Publics.

Le Ministère des Affaires Etrangères de la République du Dahomey remercie l'Ambassade de la République des Etats-Unis d'Amérique de son obligeante entremise et saisit cette occasion pour lui renouveler les assurances de sa haute considération./-

AMBASSADE DE LA REPUBLIQUE
DES ETATS UNIS D'AMERIQUE

COTONOU, Le 25 AVRIL 1974

COTONOU



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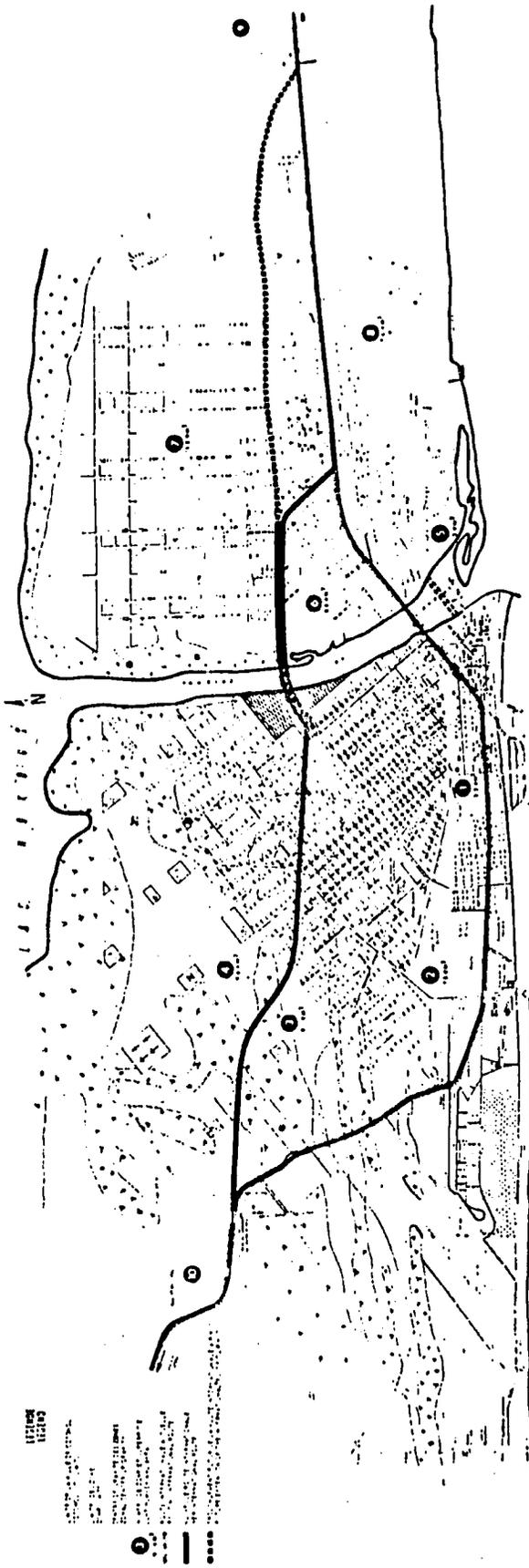
PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Dahomey - Cotonou Bridge and Dam

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>A1- To promote and support West African regional cooperation and economic development, and improve the economy of Dahomey, through improvement of a major link in the areas road transportation sector.</p>	<p>A2- 1985 Unemployment. - Improvement in the GNP of Dahomey and each of the countries in the area. - Increase in intra-country trade. - Greater tax base for government.</p>	<p>A3 Review of official national and regional economic statistics.</p>	<p>A4- Cotonou will continue to be part of East/West axis. - The region will continue to experience economic growth. - Road links will continue as important means of moving goods and people. - Countries on East/West axis will maintain increased trade with one another.</p>
<p>B1- Facilitate movements of local and international traffic flows through Cotonou. - Reconstitution of the fishing industry in the Cotonou area.</p>	<p>B2- Absolute increase in the number and speed of traffic over both bridges. - Increased foreign exchanges from export of fish and shrimps. - New industrial and commercial enterprises located in the Cotonou area. - Return to fishing productivity before new port was constructed, i.e. 15,000 metric tons a year.</p>	<p>B3- Traffic counts measuring number and waiting time for vehicles crossing the bridges. - Lagoon producing sufficient fish and shrimps to support about 50,000 people dependent on the industry. - Increase employment in Cotonou. - Government records on fishing industry</p>	<p>B4 - Traffic levels are increasing on East/West axis. - Private investment funds available for Cotonou's development. - Lagoon salinity will be controlled by dam.</p>
<p>C1- A new four lane bridge and approaches across the Cotonou lagoon at Bld. St. Michel. - A dam located near the mouth of the lagoon. - Repairs to the existing 45 year old railroad bridge. - Improved 9.0 Kms of access roads.</p>	<p>C2- New bridge in place with moving traffic on it. - Reconstructed bridge open with moving vehicle and train traffic on it. - Dam in place. - Approach and access roads in place. - More sophisticated Public Works Department.</p>	<p>C3 - Physical examination, - Traffic counts, - Hydrological and scientific water flow and salinity examinations.</p>	<p>C4 Facilities to be constructed on schedule. Growth of East/West traffic will continue to grow at projected rates.</p>
<p>D1- AID Loan for construction of the bridge, approaches and supervision. - AFDB loan for construction of dam and repairs to lagoon. - FED Grant for reconstruction of access roads. - MRCD - Local currency</p>	<p>D2- Signed AID loan for \$10.9 million. - Signed AFDB loan for \$2.9 million. - Signed FED grant for \$0.8 million. - MRGD budget laws total</p>	<p>D3- Contractors work completed and all bills paid. - Certificates of work completed issued on all projects.</p>	<p>D4 - Ability of Dahomey to find sufficient resources to make its contribution. - Ability of Dahomey to meet AID, AFDB conditions precedent.</p>

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ANNEX - M

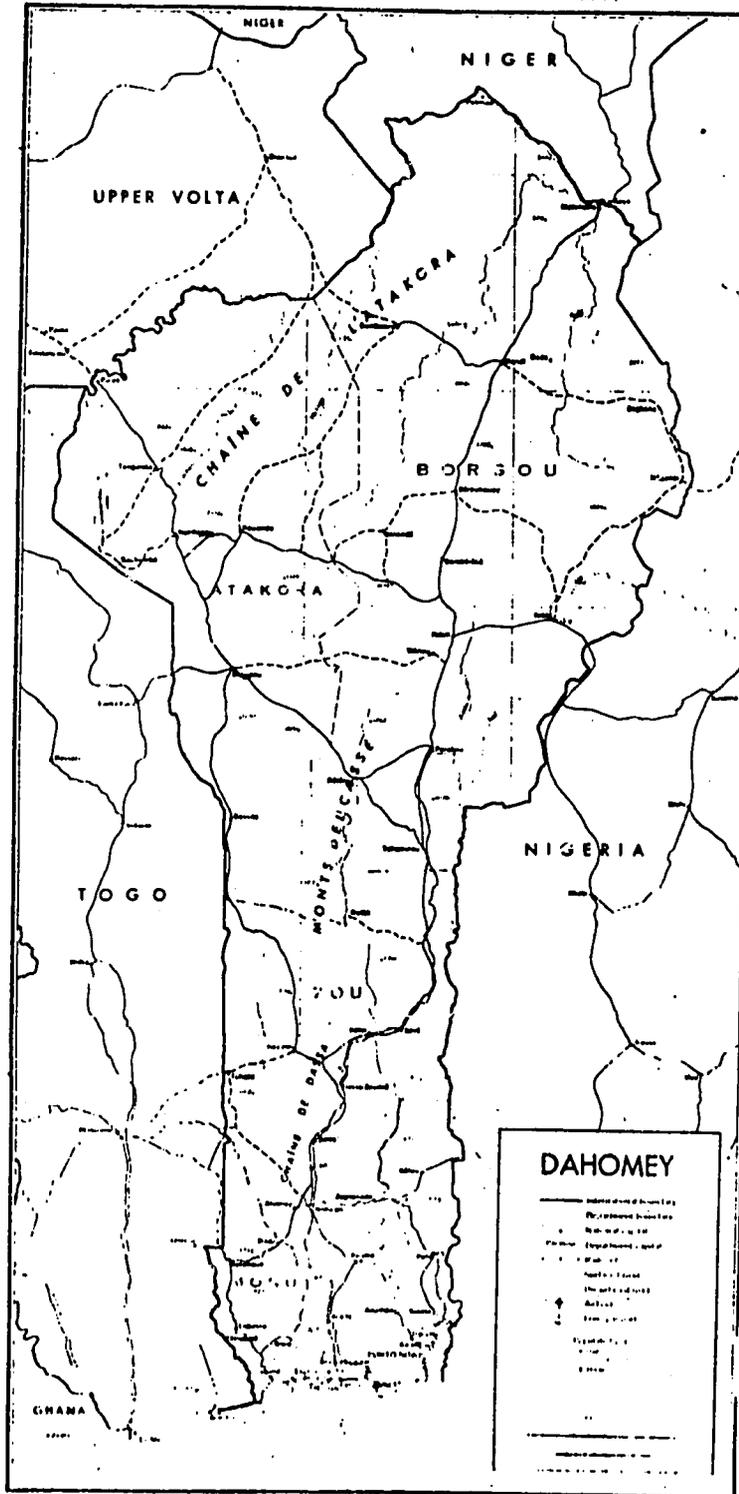


PLAN DE VILLE AVEC LIMITES DES ZOI
CITY PLAN WITH ZONE BOUNDARIES

A-1

VILLE OF COTONOU
CITY OF COTONOU

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Cotonou, Dahomey

April 22, 1974

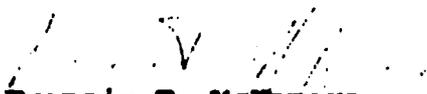
**Dr. Samuel Adams
Assistant Administrator
Africa Bureau
Agency for International Development
Washington, D.C.**

Dear Dr. Adams:

The question of U.S. participation in the financing of the Cotonou Bridge-Dam project has been discussed within the Country Team. We unanimously recommend that steps be taken to secure promptly U.S. AID development loan funds for construction financing of this project.

The project, which ranks highest on the priority list of the Government of Dahomey, will contribute substantially to regional commerce and trade, further development of Dahomey's fishing industry, and promote economic development of the nation. The interests of the United States will be served

Sincerely,


**Francis T. McManara
Charge d'Affaires, a.i.**



Department of State

TELEGRAM

AFR

UNCLASSIFIED 5404

INFO PARE 01 NIAMEY 01364 060930Z

62 R3 ACTION AID-31

CCLE INFO OCT-01 AF-05 EB-05 IGA-02 /044 W

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INFO AMEMBASSY ABIDJAN

54 SEC UNCLAS NIAMEY 1364

7-3-74 IDAC

ABIDJAN FOR REDSO

E.O. 116521 N/A

TAGS:

SUBJECT: COTONOU BRIDGE/DAM 611E CERTIFICATION

REF: ABIDJAN 3235

FOLLOWING IS TEXT OF 611E CERTIFICATION SIGNED BY HILL FOR BARON ON MAY 3, 1974, BEING POUCHED AID/W ON 7 MAY: "I, ALBERT R. BARON, PRINCIPAL OFFICER OF AID FOR ENTENTE STATES (DAHOMY, IVORY COAST, NIGER, TOGO AND UPPER VOLTA), HAVING TAKEN INTO ACCOUNT, AMONG OTHER THINGS, MAINTENANCE AND UTILIZATION OF PROJECTS IN DAHOMEY PREVIOUSLY FINANCED OR ASSISTED BY U.S., THE MINISTRY OF WORKS AND COMMUNICATIONS; RESPONSIBILITY FOR MAINTAINING ROADS THROUGHOUT DAHOMEY, THE PREVIOUS ASSISTANCE FROM OTHER DONORS SPECIFICALLY DIRECTED TO ROAD CONSTRUCTION AND MAINTENANCE, AND THE UNDERTAKINGS OF THE MGRD WITH RESPECT TO MAINTENANCE, REPAIR AND OPERATION OF THE ROAD, DO HEREBY CERTIFY THAT IN MY JUDGMENT THE MGRD HAS BOTH FINANCIAL CAPABILITY AND HUMAN RESOURCE CAPABILITY TO EFFECTIVELY MAINTAIN AND UTILIZE THE CAPITAL ASSISTANCE PROJECT: THE COTONOU BRIDGE AND DAM."BUCHE

ROADWAY APPROACHES
TO THE NEW BRIDGE

<u>Principal Items</u>	<u>Approximate Quantities</u>	<u>Item Cost (\$ Mil.)</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>
Mobilization (1)	L.S.	0.60	0.05	0.01
Construction Yard (2)	L.S.	0.40	0.03	0.01
Clearing & Demolition	L.S.	0.02	-	0.02
Roadway Excavation	23,400 M ³	0.13	0.08	0.05
Roadway Embankment	160,000 M ³	0.99	0.37	0.62
Subbase (15 cm)	89,100 M ²	0.17	0.11	0.06
Base Course (15 cm)	60,200 M ²	0.22	0.07	0.15
Bituminous Surface Course (5 cm)	58,900 M ²	0.60	-	0.60
Concrete Curbing	6,400 M	0.02	-	0.02
Concrete Paving (10 cm)	2,100 M ²	0.02	0.01	0.01
Shoulders	7,950 M	0.12	0.06	0.06
Guard Rail	1,370 M	0.05	0.04	0.01
Roadway Lighting	-	0.13	0.11	0.02
Drainage and Miscellaneous Items	-	0.20	0.09	0.11
Seeding and Mulching	73,500 M ²	0.02	-	0.02
Relocated Railroad Tracks (3)	520 M	<u>0.14</u>	<u>0.04</u>	<u>0.10</u>
		2.93	1.06	1.87
15% cost escalation during construction		<u>0.44</u>	<u>0.16</u>	<u>0.28</u>
		3.37	1.22	2.15
		100%	36%	64%

(1) includes demobilization

(2) includes removal

(3) includes removal and salvage of existing tracks, new rails, ties and ballast for new tracks

NEW BRIDGE

<u>Principal Items</u>	<u>Approximate Quantities</u>	<u>Item Cost (\$ Mil.)</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>
Mobilization (1)	L.S.	0.42	0.38	0.04
Construction Yard (2)	L.S.	0.27	0.23	0.04
Precast Prestressed Piles (Piers)	4400 M	0.95	0.81	0.14
Steel Piles (Abut.S)	400 M	0.06	0.05	0.01
Prestressed Pile Load Test	1 ea	0.05	0.03	0.02
Structural Excavation	220 M ³	0.02	0.01	0.01
Reinforced Concrete (substructure)	2546 M ³	0.78	0.62	0.16
(superstructure)	1854 M ³	0.29	0.21	0.08
Reinforcing Bars	443 tons	0.29	0.26	0.03
Precast Prestressed	240 ea	1.58	1.15	0.43
Steel Bridge Railing	710 M	0.06	0.05	0.01
Bridge Lighting	-	<u>0.07</u>	<u>0.06</u>	<u>0.01</u>
		4.84	3.86	0.98
15% cost escalation during construction		<u>0.73</u>	<u>0.58</u>	<u>0.15</u>
		5.57	4.44	1.13
		100%	80%	20%

(1) includes demobilization

(2) includes removal

**RENOVATION OF
EXISTING BRIDGE**

<u>Principal Items</u>	<u>Approximate Quantities</u>	<u>Item Cost (\$ Mil.)</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>
Mobilization (1)	L.S.	0.15	0.13	0.02
Construction Yard (2)	L.S.	0.06	0.04	0.02
Remove Existing Concrete Deck		0.03	0.02	0.01
Remove Existing Steel Brackets and Railing	50 Tons	0.05	0.04	0.02
Remove & Replace Railroad Tracks (3)	348 M	0.15	0.07	0.08
Reinforce Concrete Deck & Sidewalks	725 M ³	0.16	0.07	0.09
New Steel Brackets	162 Tons	0.22	0.20	0.02
Reinforce Concrete (Abut.S)	60 M ³	0.03	0.01	0.02
Reinforcing Bars	47 Tons	0.05	0.04	0.01
Steel Bridge Railing	734 M	0.06	0.05	0.01
Bridge Lighting	-	0.14	0.12	0.02
Clean & Paint Existing Steel Girders	4,200 M ²	0.07	0.03	0.04
Relocate Fuel Line	356 M	0.04	0.02	0.02
Miscellaneous	-	<u>0.02</u>	<u>0.01</u>	<u>0.01</u>
		1.24	0.85	0.39
10% cost escalation during construction		<u>0.12</u>	<u>0.08</u>	<u>0.04</u>
		1.36	0.93	0.43
		100%	68%	32%

(1) includes demobilization

(2) includes removal

(3) includes maintaining rail traffic during construction and removal of portion of existing deck

DAM

<u>Principal Items</u>	<u>Approximate Quantities</u>	<u>Item Cost (\$ Mil.)</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>
Mobilization (1)	L.S.	0.22	0.19	0.03
Construction Yard (2)	L.S.	0.08	0.05	0.03
Dredging	24,100 M ³	0.09	0.08	0.01
Sand (Dam Core)	9,200 M ³	0.08	0.01	0.07
Rock Filter (Dam & Banks)	7,100 M ³	0.32	0.09	0.23
Rock Rip-Rap (Dam & Banks)	23,800 M ³	0.68	0.27	0.41
Sand Fill (Banks)	8,200 M ³	0.02	-	0.02
Precast Concrete (WEIR)	330 M ³	0.18	0.16	0.02
Grouting Under Weir	L.S.	0.12	0.12	-
Crane for Removable Blocks (3)	L.S.	0.06	0.06	-
Reinforcing Bars	28 Tons	0.03	0.02	0.01
Miscellaneous	-	<u>0.03</u>	<u>0.01</u>	<u>0.02</u>
		1.91	1.06	0.85
10% cost escalation during construction		<u>0.19</u>	<u>0.11</u>	<u>0.08</u>
		2.10	1.17	0.93
		<u>100%</u>	<u>56%</u>	<u>44%</u>

(1) includes demobilization

(2) includes removal

(3) includes training Dahomean personnel to operate crane and remove and place concrete blocks