

AFRICAN DEVELOPMENT FUND

PROJECT COMPLETION REPORT

**REGIONAL SOLAR ENERGY CENTRE OF THE WEST
AFRICAN ECONOMIC COMMUNITY
(CEAO)**

REPUBLIC OF MALI

**DEPARTMENT OF AGRICULTURE AND
RURAL DEVELOPMENT, NORTH REGION**

MARCH 1995

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BASIC PROJECT DATA

1. Name of Project : Establishment of the Regional Solar Energy Centre
2. Loan Number : CS/MAL/ED/84/15
3. Borrower : The Republic of Mali acting on behalf of the CEAO and CILSS Member States
4. Guarantor : The Republic of Mali
5. Beneficiary : CEAO and CILSS Member States
6. Executing Agency : CEAO in Bamako

A. LOAN

ESTIMATE AT APPRAISAL

ACTUAL

1. Amount (million UAs) : 10.36
2. Interest Rate : 0.00
3. Service Charge : 0.75 % per year
4. Repayment Period : 40 years
5. Grace Period : 10 years
6. Loan Negotiation Date : September 1983
7. Loan Approval Date : 24 November 1983
8. Loan Signature Date : 18 January 1984
9. Loan Effectiveness Date : 07 June 1984

B. PROJECT DATA

1. Total Cost (in million UAs) Estimate at Appraisal Actual

	<u>F.E.</u>	<u>L.C.</u>	<u>F.E.</u>	<u>L.C.</u>	<u>Total</u>
	18.34	2.96	21.3	0.17	15.39

2. Financing Plan (in million UAs)

CEAO and OPEC financing: exchange rate used: UA 1 = CFA.F 370.482 (1st Quarter 1992).

<u>Sources</u>	<u>ESTIMATE AT APPRAISAL</u>			<u>ACTUAL</u>		
	<u>F.E.</u>	<u>L.C.</u>	<u>Total</u>	<u>F.E.</u>	<u>L.C.</u>	<u>Total</u>
ADF	8.25	2.11	10.36	10.358	0	10.358
CEAO	0.88	0.85	1.73	0	0.173	0.173
OPEC	4.61	0	4.61	4.866	0	4.866
FRANCE	2.04	0	2.04	0	0	0
GERMANY	2.15	0	2.15	0	0	0
EDF	0.41	0	0.41	0	0	0
TOTAL	18.34	2.96	21.30	15.224	0.173	15.397

3.	Effective Date of First Disbursement	:	17/04/85
4.	Effective Date of Final Disbursement	:	21/12/92
5.	Start-up of Project Implementation Activities	:	1984
6.	Completion Date of Project Implementation Activities	:	1992

C. PERFORMANCE INDICATORS

1.	Unused Balance %	:	0.035 %
2.	Slippage on Schedule	:	6 years
	- slippage on effectiveness	:	1 year
	- slippage on completion date	:	6 years
	- slippage on final disbursement	:	6 years
	- number of extensions of the deadline for the final disbursement	:	6
3.	Project Implementation Status	:	completed
4.	List of Verifiable Indicators	:	(construction work : 100 % general equipment/ furniture : 100 % ; scientific equipment: partially completed)
5.	Institutional Performance	:	Unsatisfactory
6.	Borrower's Performance	:	Satisfactory
7.	Suppliers' Performance	:	Fair
8.	Consultant's Performance	:	Satisfactory

D. MISSIONS

	<u>Number of Persons</u>	<u>Composition</u>	<u>S/W</u>	<u>Date</u>
- Identification		carried out by UNESCO		
- Preparation		carried out by UNESCO		
- Appraisal	4	NARD-NCPR/BEICIP	16	1983
- Monitoring	2	NCPR	2	1987/1988
- Supervision	2	NARD	4	1987
- PCR	2	NARD	4	1994

E. DISBURSEMENTS (in UAs)

- Total Disbursed	:	10,358,150.48
- Amount Cancelled	:	None
- Unused Balance	:	3, 683.52

ANNUAL DISBURSEMENTS (in million UAs)

YEAR	ESTIMATE AT APPRAISAL	ACTUAL	PERCENTAGE DISBURSED
1983	0	0	0
1984	1 842	0	0
1985	5 259	2 395	23.12
1986	3 260	4 051	39.11
1987	0	1 548	14.95
1988	0	226	2.18
1989	0	970	9.36
1990	0	490	4.73
1991	0	595	5.75
1992	0	83	0.80
TOTAL	10 361	10 358	100

F. CONTRACTORS/SUPPLIERS**CONSTRUCTION WORK**

Name	:	GERC consortium : SODETEG, SATOM and SNED
Responsibility	:	Civil Works – Site Development
Contract Signature Date	:	18/10/84
Contract Expiry Date	:	October 1986
Contract Duration	:	24 instead of 21 months
Original Amount	:	CFA.F 3 331 953 331
Amount of 1 st amendment signed in October 1985	:	CFA.F 71 894 513
Amount of 2 nd Amendment signed in January 1988	:	CFA.F 170 989 808
Total Amount	:	CFA.F 3 574 837 652
Financing	:	ADF/OPEC/CEAO
Name	:	SATOM
Responsibility	:	Supplementary Civil Works
Contract Signature Date	:	03/05/198
Original Amount	:	CFA.F 32 610 762
Financing	:	ADF/OPEC/CEAO
Name	:	Office des Posts et Telecommunications-Mali
Responsibility	:	Telephony Works
Contract Signature Date	:	17/04/86
Contract Expiry Date	:	July 86
Contract Duration	:	3 months
Original Amount	:	CFA.F 9 300 703

Name : Energie du Mali
 Responsibility : Drinking Water Supply
 Contract Signature Date : 03/12/85
 Contract Expiry Date : August 1986
 Contract Duration : 8 months
 Original Amount : CFA.F 6, 488, 401

Name : Energie du Mali
 Responsibility : Drinking Water Supply
 Contract Signature Date : 03/12/85
 Contract Expiry Date : August 1986
 Contract Duration : 8 months
 Original Amount : CFA.F 37, 490, 292

GENERAL EQUIPMENT/FURNITURE

Name : DEBAMAS (France)
 Responsibility : Audio-visual
 Contract Signature Date : 25/07/1986
 Contract Expiry Date : December 1986
 Contraction Duration : 5 months
 Original Amount : FF 401, 240.20
 1st Amendment (telephone) signed on 13/11/86 : FF 409, 629.00
 2nd Amendment (vehicle) signed on 6/02/88 : FF 110, 998.00
 Total Amount : FF 921, 867.20 (UA118, 091.54)
 Financing : ADF

Name : DEBAMAS (France)
 Responsibility : Office Machines
 Contract Signature Date : 26/11/1986
 Contract Expiry Date : January 1988
 Contract Duration : 14 months
 Amount : FF 422,023 (UA 53,838.39)
 Financing : ADF

Name : SFI/SOCIMPEX (France)
 Responsibility : Furniture/other items
 Contract Signature Date : 14/07/1986
 Contract Expiry Date : November 1986
 Contract Duration : 4 months
 Original Amount : FF 2, 985, 236.60
 1st Amendment (rods) signed in October 86 : FF 29,793.00
 Total Amount : FF 3, 015, 029.60
 (UA 393, 216.47)
 Financing : ADF

Name : ORPO (France)
 Responsibility : Printing equipment/photo-copiers
 Contract Signature Date : 14/07/86
 Contract Expiry Date : September 1986
 Contract Duration : 2 months
 Original Amount : FF 600, 000 (UA 77, 079.51)

Financing	:	ADF
Name	:	SATEC DEVELOPPEMENT (France)
Responsibility	:	Audio-Visual Equipment
Contract Signature Date	:	03/06/91
Contract Expiry Date	:	July 1992
Duration	:	13 months
Amount	:	CFA.F 24, 765, 000 (UA 65, 508.57)
Financing	:	ADF
Name	:	RECOMA
Responsibility	:	Batteries and Condensers
Contract Signature Date	:	13/05/1988
Contract Expiry Date	:	February 1989
Contract Duration	:	9 months
Original Amount	:	CFA.F 5,727,650 (UA 14,036.329 UC)
Financing	:	ADF
Name	:	SOMACOF (Mali)
Responsibility	:	Vehicles
Contract Signature Date	:	11/08/1986
Contract Expiry Date	:	February 1987
Contract Duration	:	6 months
Original Amount	:	CFA.F 55, 872, 000(UA140 068)
Financing	:	ADF
Name	:	SOMAFREC
Responsibility	:	Vehicles
Amount	:	CFAF 7,074,684(UA 17, 321.45)
Financing	:	ADF
Name	:	DIAMA
Responsibility	:	Vehicles
Amount	:	CFAF 7,247,000 (UA17, 981.25)
Financing	:	ADF

SCIENTIFIC EQUIPMENT

Name : DEBAMAS (France)
 Responsibility : Lab. Equipment : data collection
 and processing
 Contract Signature Date : 14/10/1987
 Contract Expiry Date : February 1988
 Actual Contract Duration : 11 months
 Original Amount : CFA.F 57,383,475
 1st Amendment : CFAF 24,251,384
 Total Amount : CFA.F 81, 634, 859
 Financing : CEAO/FCD
 Bidding : January 1987

Name : EXTENTIA (Italy)
 Responsibility : Computer Equipment Phase I
 Data Centre
 Contract Signature Date : 14/02/1988
 Contract Expiry Date : June 1988
 Contract Duration : 4 months
 Amount : CFA.F 25,109,812
 Financing : CEAO/FCD
 Bidding : January 1987
 Limited Shopping : August 1987

Name : OPEN TECHNOLOGIE
 (France)
 Responsibility : Computer Equipment
 Phase II
 Contract Signature Date : 09/08/89
 Contract Expiry Date : November 1989
 Contract Duration : 5 months
 Amount : CFAF 39,905,961
 Financing : CEAO/FCD
 Limited Shopping : January 1989

Name : SOGEXPORT (France)
 Responsibility : Thermal and Thermo-dynamic
 Lab. Equipment
 Contract Signature Date : 21/11/88
 Contract Expiry Date : July 1989
 Contract Duration : 10 months
 Amount : CFA.F 161,112,315
 (UA 393,854.41)
 Financing : ADF
 Bidding : June 1987

Name : SOGEXPORT (France)

Responsibility : Equipment for General
Maintenance Workshop
Contract Signature Date : 22/11/88
Contract Expiry Date : April 1989
Contract Duration : 10 months
Amount : CFA.F 36,813,685
(UA 94, 273.82)
Financing : ADF
Bidding : June 1987

Name : SOGEXPORT (France)
Responsibility : Photovoltaic Lab. Equipment
Contract Signature Date : 18/12/89
Contract Expiry Date : April 1990
Contract Duration : 9 months
Amount : CFA.F 181, 990, 000
(UA 502, 707.37)
Financing : ADF
Bidding : June 1987

Name : SATEC-DEVELOPPEMENT (France)
Responsibility : Lab. Equipment, Materials and Tech.
Support
Contract Signature Date : 5/07/90
Contract Expiry Date : December 1990
Contract Duration : 8 months
Amount : FF 1,997,066 (UA 267,531.85)
Financing : ADF
Bidding : May 1989

G. CONSULTANTS

Name : BLE YANGRA Architects
Responsibility : Supervision of Civil Works
Contract Signature Date : 02/09/85
Contract Expiry Date : October 1986
Contract Duration : 24 months
Amount : CFA.F 96,033,000
Financing : ADF

Name : CEP (Contrôle et Prévention)
Responsibility : Technical Inspection of Works
Contract Signature Date : 01/01/85
Contract Expiry Date : October 1986
Contract Duration : 24 months
Amount : CFAF 41,250,000
Financing : ADF

Name : Bureau VERITAS
 Responsibility : Technical Supervision of Supplementary works
 Contract Signature Date : 28/06/88
 Contract Expiry Date : December 1988
 Amount : CFAF 7,720,000
 Financing : CEAO

Name : Bureau d'Etudes Industrielles et de Coopération de l'Institut français du pétrole (BEICIP)
 Type of Contract : Designs for Equipment-Furniture/ Assistance to Project Owner/ General Coordination of Implementation
 Contract Signature Date : 29/09/1984
 Contract Expiry Date : December 1986 / March 1992
 Actual Contract Duration : 91 months
 Original Amount : CFA.F 400,000,000
 1st Amendment signed on 31/01/87 : CFA.F 44,665,000
 2nd Amendment signed on 14/7 88 : CFAF 22,060,000
 Total Amount : CFAF 466,725,000
 Financing : ADF

TRAINING

Name : (BEICIP) Bureau d'études Industrielles et de Coopération de l'Institut français du pétrole (BEICIP)
 Type of Contract : Assistance for training & start-up activities
 Contract Signature Date : 21/11/88
 Amount : FF 300,000 (CFAF 15,000,000)
 Financing : ADF

Name : GESTION INFORMATIQUE DEVELOPPEMENT (GID) (France)
 Responsibility : Training in Computer Science and Management Software
 Contract Number : CRES/INFO-BAD/07/90
 Amount : CFA.F 4,907,500 (UA12,680,71)
 Financing : ADF
 Limited Shopping : March 90

Name : TIME INFORMATIQUE (RCI)
 Responsibility : Computer Training (Phase II)
 Amount : CFA.F 4,576,800 (UA 11,818.20)
 Financing : ADF
 Limited Shopping : March 90

CURRENCY EQUIVALENTS**AT APPRAISAL**

FUA 1	=	UA 0.921052
FUA 1	=	CFAF 361.117
FUA 1	=	US\$ 40.93511

**AT PROJECT COMPLETION
(1994 PCR)**

UA1	=	CFAF 774.997
UA1	=	US\$ 1.46738

WEIGHTS AND MEASURES

1 metre	=	3.28 feet
1 square metre (M ²)	=	10.76 square feet
1 hectare (ha)	=	2.47 acres
1 kilometre (km)	=	0.62 mile

FINANCIAL YEAR**January – December****ABBREVIATIONS**

ADB	:	African Development Bank
ADF	:	African Development Fund
BEICIP	:	Bureau d'Etudes Industrielles et de Coopération de l'Institut français du Pétrole (Industrial Designs and Cooperation Agency of the French Petroleum Institute)
BER	:	Bureau d'Etudes et de Réalisation (Studies and Implementation Unit)
CDF	:	Community Development Fund
CEAO	:	West African Economic Community
CILSS	:	Permanent Inter-State Committee on Drought Control in the Sahel
CRES	:	Regional Solar Energy Centre
ECOWAS	:	Economic Community of West African States
EDF	:	European Development Fund
GFR	:	German Federal Republic
IDRC	:	International Development Research Centre
ITB	:	Institut Technique des Banques
OPEC	:	Organization of the Petroleum Exporting Countries
PREFAS	:	Regional Solar Energy Training and Support Programme
UNDP	:	United Nations Development Programme
UNESCO	:	United Nations Educational, Scientific and Cultural Organization

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1. INTRODUCTION

1.1 The Project for the Establishment of a Regional Solar Energy Centre (CRES) was initiated as a result of the awareness by the Heads of State of the West African Economic Community (CEAO) of the consequences of their countries' total dependency on traditional sources of energy such as oil and electricity, while the sub-region had vast solar energy potential. In October 1978, the CEAO Heads of State decided to establish a Regional Solar Energy Centre in Bamako, in Mali, in order to make suitable use of the sun as a source of natural energy in abundant supply in Africa. The Member States of the Permanent Inter-State Committee on Drought Control in the Sahel (CILSS), which approved the initiative, joined the project. The CRES thus became a regional project involving eleven countries, i.e. Benin, Burkina Faso, Côte d'Ivoire, the Gambia, Guinea Bissau, Cape Verde, Mali, Mauritania, Niger, Senegal and Chad.

1.2 Different donors, including France, Germany, Canada, OPEC, UNDP, EDF and UNESCO initially supported the project. The Bank also responded favourably to the subsequent invitation to it to participate in the financing of the operation. Thus, in May 1983, it fielded a mission to Mali to appraise the project, and to define the practical modalities of its implementation with other technicians already in the field.

1.3 This Project Completion Report (PCR) contains a critical analysis of the project cycle. It highlights the positive and negative aspects of the project's implementation and draws appropriate lessons for improving the likelihood of success of future projects. The PCR is based on the Bank's appraisal report and supervision missions, various documents and studies prepared by CRES on the project, or commissioned by the other partners, as well as the conclusions of the November/December 1994 project completion mission.

2. SECTOR GOALS AND SPECIFIC OBJECTIVES OF THE PROJECT

2.1 The concept of the CRES as a project, stemmed both from a theoretical premise and an empirical assessment. Indeed, in the late 1970s, the Heads of State of CEAO and CILSS considered that one of the essential criteria for assessing a country's level of development lay in its management of energy resources, since energy was pivotal for any development process. But, in most West African countries, traditional energy, from wood, was consumed wantonly, whereas the region enjoyed over 2,000 hours of sunlight per year representing 5 kWh/m²/day.

2.2 This disquieting situation prompted the CEAO and CILSS countries to seek alternative solutions to the region's energy requirements. Following consideration of the available technologies, resources, the most pressing needs, constraints, the likely costs and financing capacity, it was decided to promote the development of renewable energies and save traditional energies as much as possible. Those objectives could only be attained through the intervention of a specialist centre for the harnessing of renewable energies (sun, wind, bioenergy), the production, promotion and dissemination of production systems, research and development, training, and the dissemination and centralization of information, all of which culminated in the idea of establishing the CRES.

2.3 The sector goals pursued through the project consisted in the mastery of renewable energy technologies, active participation in the development of the related techniques and the creation of solar energy production capacity in West Africa.

2.4 The specific objectives assigned to CRES by the Heads of State of CEAO and CILSS, as part of the general objectives mentioned above, consisted in making a significant contribution to meeting the energy requirements of the sub-regions, particularly in rural areas, especially for water, health and education purposes.

3. PROJECT FORMULATION

3.1 Identification

3.1.1 The detailed preparation of this ambitious and complex project was essentially based on the following: the project was identified by UNESCO in a study conducted in 1979, and prepared on the basis of a detailed feasibility study financed by CEAO/CILSS in 1981. The purpose of the feasibility study was primarily to update the UNESCO study on the basis of guidelines defined by the CEAO Ad Hoc Committee of personalities from the region, with experience in renewable energies, and also taking into consideration the evolution of technologies and costs, which is necessary in such a rapidly developing area. The study also made it possible to clarify a number of points in order to permit the very rapid establishment of the CRES. It was immediately followed by a detailed engineering design that complemented the feasibility study and made it possible to issue invitations to bid for the construction of the Centre.

3.1.2 Following completion of the feasibility studies and other engineering designs, the Bank was invited by CEAO to participate in the financing of the project. It responded favourably and fielded an appraisal mission to Bamako from 2 to 15 May 1983 to discuss all aspects of the project with the CEAO authorities and the consultants who had prepared the engineering designs.

3.1.3 The appraisal mission defined the final components of the project, determined the expenditure categories, and prepared the estimated costs. In so doing, the Bank appraisal mission downsized the project from the original engineering designs, by, for example, removing some of the originally planned items of scientific and technical equipment for the different laboratories and technical units, and by cutting back staff from 207, as initially estimated in the engineering design, to 83 during the initial years of operation.

3.1.4 No particular difficulties were encountered during the project negotiations, and the CEAO and Bank authorities were all satisfied by the nature, quality and scope of the activities planned under the project. Furthermore, the conditions of effectiveness, as defined by the Bank, presented no special problems. They were the usual ADF conditions, which CEAO undertook to fulfill without any special discussions. The Board approved the loan without difficulty and the Executive Directors expressed their satisfaction with the project, not only because of its relevance in terms of the development of the sub-region concerned, but also because of the quality of its technical preparation.

3.1.5 The overall project design and preparation appear to have been satisfactory. The rationale behind it was clearly explained from the outset to the satisfaction of the countries concerned. Subsequently, the project was meticulously prepared through a series of feasibility studies and preliminary designs, which considered all aspects of the implementation of the components. An implementation schedule, with clearly defined time periods, was prepared, and permitted the identification of three principal project implementation phases, i.e. the Regional Solar Energy Training and Support Programme (PREFAS), the programme for the start-up of CRES activities and the actual CRES activities. Those phases served, to some extent, as indicators for the implementation of the project.

3.1.6 Although the Bank was not directly involved in the preparatory activities, it did not experience any particular difficulties in mastering all aspects of the operation, precisely because of the technical information provided when it was invited to participate. This information, drawn mainly from the feasibility studies conducted, provided the Bank with an opportunity to define the project components with full knowledge of the facts, and determine both its scope and costs. Taking advantage of this situation, the Bank appraisal mission defined the CRES project, which

other donors joined, namely EDF, France, the German Federal Republic (GFR) and OPEC. The Bank, therefore, played a determining role in formulating the project.

3.2 **Project Description**

3.2.1 The project was designed around two principal components:

The CRES Component

- a) The preparation of bidding documents for general and scientific equipment, the issuing of invitations to bid, and supervision of construction work, and the procurement of equipment and furniture;
- b) The construction of 19 buildings jointly financed by ADF, OPEC and CEAO. The buildings comprised;
 - **training and research building**: 1 library, records and data processing building; 1 training building; 1 lecture hall; 2 solar energy laboratories; 1 water and wind energy laboratory; 1 biomass laboratory; 1 improved stove testing laboratory; 1 cattle shed and testing and measurement areas;
 - **workshops**: 1 machine shop; 1 wood and plastics workshop and 1 general warehouse;
 - **service areas** : 1 administrative building; 1 entrance guard post and 1 equipment room;
 - **campus**: 2x30-room halls of residence; 1 restaurant and recreational building and 2 staff houses. and
 - **site development**: sports ground; access roads, telephone, electricity and water supply; 2 transformers; 2 generators; 1 treatment plant; tarred and compacted roads; external lighting; planting and fencing;
- c) The procurement of scientific equipment for laboratories, workshops and measuring and testing areas to be financed by the EDF, France and the German Federal Republic; and
- d) The procurement of general equipment and furniture for all the buildings, as well as vehicles to be fully financed by ADF.

BER Component

3.2.2 Following the CRES feasibility study, CEAO established in Bamako, from October 1982, a Studies and Implementation Unit (BER) to apply its solar energy policy throughout the 1982/1984 programme. As the project manager, the BER was responsible for: 1) carrying out the different training activities and preparing the regional programme; 2) providing support to the strengthening of the national centres, the establishment of national engineering units and the complete establishment of the CRES. The BER was financed from the following bilateral sources: EDF, UNDP, USAID, France and the German Federal Republic.

3.2.3 Under the project, the Bank fully financed a) the procurement of general equipment and b) technical assistance for the general coordination of the implementation of its project. The BER operating and training costs were borne by the Bank and CEAO.

3.2.4 The BER was also responsible for coordinating training, in the form of specialized courses and seminars, for 30 CRES lecturers, 15 of whom were engineers and 15 technicians. The

average training period for engineers was to be 6 months, of which 3 in Europe or the USA and 3 in Africa, while for technicians it was to be 4 months, of which 2 in Europe and 2 in Africa.

3.3 Project Cost

The total estimated project cost at appraisal was UA 21.30 million. UA 4.61 million of the construction work was to be financed by OPEC, UA 5.73 million by ADF and UA 0.47 million by CEAO. The procurement of scientific equipment was to be fully financed by Germany, France and the EDF for a total amount of UA 4.60 million, as well as by CEAO to the tune of UA 0.37 million. The other expenditure was to be borne jointly by ADF (UA 4.63 million) and CEAO (UA1.34 million). The following tables indicate the project costs by expenditure category and source of financing.

Table 3.1
Project Cost by Expenditure Category
(in UA millions)

Categories	CURRENCIES		Total	%
	F.E.	L.C.		
A. Studies/Supervision	1.43	0	1.43	8.89
B Construction	6.58	1.66	8.23	51.22
C. Scientific Equip.	3.64	0.00	3.64	22.66
D. Furn. & Gen. Equip.	1.05	0.06	1.11	6.91
E. Technical Assistance	0.38	0.00	0.38	2.37
F. BER Operation	0.00	0.52	0.52	3.19
G. Training	0.71	0.05	0.76	4.73
Base Cost	13.78	2.29	16.07	100.00
Physical Contingencies	0.79	0.10	0.89	
Price Contingency	3.77	0.56	4.33	
PROJECT TOTAL	18.34	2.96	21.30	
% participation	85.7	14.3	100	

Table 3.2
Cost by Source of Financing
(in million UAs)

SOURCES	F.E	L.C.	TOTAL	%
ADF	8.25	2.11	10.36	48.64
CEAO	0.88	0.85	1.73	8.12
OPEC	4.61	0.00	4.61	21.64
FRANCE	2.04	0.00	2.04	9.58
GERMANY	2.15	0.00	2.15	10.09
EDF	0.41	0.00	0.41	1.93
TOTAL	18.34	2.96	21.30	100.00

4. PROJECT IMPLEMENTATION

4.1 Conditions of Effectiveness and Start-Up

4.1.1 Loan effectiveness was subject to the usual Fund, and other, special conditions. More specifically, regarding the conditions precedent to the first disbursement, the Fund was to receive from the Borrower, prior to each disbursement:

- i) an undertaking to make regular appropriations in its annual budgets to cover its share of the project costs, as set out in the financing plan;
- ii) an undertaking to secure supplementary financing in the event of overruns of the project's estimated cost;
- iii) written evidence that the 30 hectares of land had been allocated by the Malian Government to the Regional Solar Energy Centre, as well as an undertaking that they would be reserved solely for the purposes of the latter;
- iv) evidence of the opening of a special account with a banking institution in Bamako for the payment of the proceeds of the ADF/OPEC loans. The said account was to be managed by the BER;
- v) evidence that financing agreements with the other donors had been signed or that the latter had given written undertakings that they would participate in the financing of the project or, at any rate, that the project financing package had been finalized;
- vi) the decree financing the objectives, statutes and mode of operation of CRES; and
- vii) an undertaking to secure the necessary funds required for the running of the CRES.

4.1.2 In addition, the Borrower was to:

- i) submit to the Fund for comment and approval the list and CVs of the technical assistants provided for under the project and the 30 candidates selected for scholarship awards by the BER;
- ii) give the assurance that the scholarship holders sign a five-year bond to work for the CRES in Bamako; and
- iii) give the assurance that it would help the trainees leaving the CRES to secure jobs.

4.1.3 The analysis reveals that the conditions precedent to loan effectiveness, whether related to the first disbursement or the others, were fulfilled by the Borrower without any real difficulty. Most of them were the usual Bank conditions, which CEAO was able to fulfill without any problems. The Borrower did, in fact, give the required undertakings and provided evidence that the financing agreements with the other donors had been signed, or that the latter had provided written undertakings to participate in the project financing. This condition was all the easier to fulfil, since, even before the Bank was invited to participate in the project financing, the other donors, i.e. EDF, France, the GFR and OPEC, had confirmed to CEAO their intention to contribute to the project. There was no serious slippage on loan effectiveness.

4.1.4 Nor was there any slippage on project start up, since, even prior to the official launching of the project, the Regional Solar Energy Training and Support Programme (PREFAS), intended to get the CRES project off the ground, was implemented. One of the principal activities under the PREFAS was to prepare the establishment of CRES by:

- completing the preliminary designs of the centre (engineering, architectural);
- overseeing the construction of buildings and the installation of equipment;
- training the staff of the future CRES; and by
- preparing the organization of the different CRES units.

4.1.5 CEAO was officially notified of the withdrawal of the European donors in May 1988 at the 25th Meeting of the Council of Ministers of the organization, held in Ouagadougou. The reasons given to justify this unexpected withdrawal, were, inter alia, the oversizing of CRES, the overlapping of activities planned at regional level with those of other countrywide activities and the lack of support provided by CEAO States to the Institution.

4.1.6 On examination, the reasons given appear to be pretexts rather than sound explanations. Indeed, since the reproaches made against CRES were essentially technical, technical solutions could easily have been provided. Such technical solutions were, moreover, suggested to the European donors who showed no inclination to reverse their decision, because in reality the real reasons for the withdrawal of the European donors lay elsewhere, especially in the difference of opinion between them and CEAO regarding the orientations of CRES.

4.1.7 Indeed, CEAO, in keeping with the initial project objectives, saw in CRES an instrument for the subregion's economic development. Thus, in 1987, the project managers conducted strategy and feasibility studies defining the modalities for creating a production function within CRES. Mainly, those studies concluded on the need to establish in Bamako a production unit for photovoltaic panels, the development plan for which provided for the transition from the assembly of systems to encapsulation. The production unit would be of the limited liability type, supplemented by a joint venture, and its capital would be opened up to third parties.

4.1.8 The European donors in no way shared this view. As far as they were concerned, although they had approved the original project objectives and signed all the financing agreements concerning the programmes to be implemented, CRES should only be an instrument for stimulating the potential market for equipment using renewable energies, and not an instrument for the production or the development of such equipment. The economic stakes were: CRES, as perceived by CEAO, could be a formidable competitor for European enterprises specialized in solar energy, which was quite unacceptable to the European donors.

4.1.9 Thus, despite their clearly stated undertaking to contribute specific amounts to the project, the European partners (EDF, France and GFR) quite unexpectedly terminated their participation in the project, whereas the operation, already underway, needed their support as planned. Since no mechanism for exerting pressure had been envisaged, the European partners were able to withdraw with complete impunity. CEAO was unable to secure the necessary funds to fill the vacuum created by the withdrawal of the European cofinanciers and ensure the operation of CRES despite its undertaking to do so. Once again, no means of exerting pressure had been considered, and CEAO simply withdrew from the project in the late 1980s.

4.2 Outputs/Changes

Construction Work

4.2.1 All the construction work planned and described in paragraph 3.3.1 was completed, with the exception of the cattle shed, which was suspended right from the start. No major changes occurred in the civil works, or in the procurement of general equipment and furniture. Only the official residence of the Director-General was modified, which made it possible to increase the surface areas of the rooms and to add a room. Rolling shutters were added to the catering services building to ensure better protection of the bar of the self-service restaurant from wind and rain.

4.2.2 In order to improve project performance, additional work was carried out after the commissioning of the buildings. This concerned the turfing and metalling of slopes and the installation of batteries and condensers. VERITAS was responsible for the technical inspection of the additional work.

4.2.3 The premises are not always used for their intended purpose. There have been some slight modifications. In the administrative building, the switchboard was moved from the ground to the second floor, near the Director's office to ensure direct supervision of the use of the telephone. On the other hand, in the research and training centre, some rooms and laboratories (water, biomass, wind energy, testing of improved stoves, solar energy) are not used because of insufficient equipment or staff shortages. The machine, wood and plastics workshops and the general warehouse are not utilized because they are not equipped or are underequipped.

4.2.4 The campus, which has been without students and trainees from CEAO member States for some years because of the sluggishness of CRES, is temporarily available to the general public for seminars and the accommodation of different types of clients. This management of the campus facilities (meeting rooms, dormitories, and kitchens) enables the management of CRES to generate income, which helps to finance some of the institution's operating expenses.

Scientific Equipment

4.2.5 Not all of the scientific equipment intended for the laboratories and workshops was acquired, since the donors who were to finance its procurement withdrew in 1987 when the project was being implemented. At the request of CRES, ADF agreed for part of the funds earmarked for other categories of expenditure to be used to acquire some equipment for three laboratories (photovoltaic, thermal and thermodynamic, materials and technical support), as well as for the general maintenance workshop. Since this budget could not cover requirements, a new list of priority equipment, and the corresponding bidding documents, were prepared to comply with the new budget.

4.2.6 Moreover, it had not been possible to recruit all the engineers and technicians responsible for ensuring the functioning of the laboratories in time, owing to the withdrawal of the cofinanciers. The consequences are: i) some buildings constructed at great expense are no longer used and cost efficient because of a lack of equipment and trainers; and ii) CRES's specialized training objectives have not yet been attained.

Training

4.2.7 With regard to CRES staff training, the appraisal report made provision for the retraining of 30 people, namely 15 engineers and 15 technicians following the publication of vacant positions in the principal newspapers of CEAO and CILSS member States. The average length of training for engineers was to be 6 months, of which 3 in Europe or in USA, and 3 in Africa. For

technicians it would be 4 months, of which 2 in Europe and 2 in Africa. For various reasons including cuts in the original training budget in favour of equipment following withdrawal of the other donors, the delay in the procurement of scientific equipment and the slowness in the recruitment and mobilization of the initial staffing of CRES, the original training programme could not be fully carried out.

4.2.8 Training activities finally consisted of supplementary training and the retraining of 22 engineers, technicians, specialized staff and directors' secretaries in international or subregional institutions for periods of between 15 to 30 days. Exceptionally, 5 people received long-term training over one to three academic years. Furthermore, the loan was used to finance support (travel) to staff of specialist national centres in renewable energies, to participate in UNESCO course on Solar Electricity in France. The list of beneficiaries of training courses financed by the ADF loan is given in Annex 2.

4.3 Implementation Schedule

4.3.1 The estimated project implementation schedule was for a three-year period from June 1983 to August 1986, the final date for the delivery of all the equipment. The following table sets out the estimated and actual implementation schedule, as is also set out in Annex 3.

Table 4.1
Estimated and Actual Schedule of Activities

ACTIVITIES	ESTIMATED	ACTUAL	SLIPPAGE IN MONTHS
A. <u>Studies/Supervision</u> Recruitment of Consultants. Period of Activities	June 83 to Jan 84 Feb. 84 to Aug 86	1984 Sept.84 to March 92	67 mths
B. <u>Construction</u> Selection of Enterprises Works Implementation	June 83 to May 84 June 84 to May 86	1984 Oct. 84 to Oct. 86	5 mths
C. <u>Scient. Equipment</u> BDs for Equipment Selection of Suppliers Deliveries/Acceptance	May 84 to Aug. 84 Sept. 84 to Feb. 85 March 85 to July 86	1987/1988 Sept. 88 to Nov. 1991	64 mths
D. <u>General Equipment</u> <u>And Furniture</u> BDs for General Equipment Selection of Suppliers Deliveries/Acceptance	July 84 to Nov. 84 Dec. 84 to July 85 Aug. 85 to June 86	1986 Sept. 86 to Feb. 87	8 mths
E. <u>Training</u> 15 engineers 15 technicians		1987 to 1992	

4.3.2 The project was appraised in May 1983 and it was unrealistic to anticipate the start up of activities in June of that year. Such optimism may have been due to the fact that the BER (project executing agency) had already been established.

4.3.3 On the whole, the project was completed five and a half years behind schedule owing to three major factors: i) withdrawal of the European donors from the financing of scientific equipment, (ii) the non-existence of a real executing agency as from 1986, and administrative delays at CEAO level. This situation resulted in the continuation of the activities of the technical assistance agency (BEICIP), responsible for the general coordination of the implementation until the delivery of all the equipment, i.e. March 1992. On the other hand, the other consultants who had supervised the construction works continued their activities until the different acceptance dates without any excessive delays.

4.3.4 The works, including the special equipment and site development, which were due to begin in June 1984, and to be completed in May 1986, effectively started up in October 1984 only 4 months behind schedule, and were completed in October 1986. The 5 months slippage on works implementation is slight in light of the volume of work to be done.

4.3.5 The general equipment and furniture were provisionally accepted from September 1986, i.e. three months slippage on the appraisal report estimate. The final deliveries were 8 months behind schedule. Since all the suppliers were outside the country, monitoring and control of compliance with deadlines were not easy. Moreover, at that time, BER had been dissolved and the new CRES structure, in addition to its usual functions, was responsible for project management. However, it should be mentioned that one consignment was only delivered in January 1988 owing to the fact that since, up to October 1986, the first successful bidder had not executed the contract, the latter was terminated and awarded to the second lowest bidder in November 1986.

4.3.6 Scientific equipment was procured very slowly for several reasons, namely: i) withdrawal of the European partners in 1986, ii) search for new financiers, iii) distance of suppliers who sometimes defaulted, iv) the simultaneous application of CEAO and ADF procurement procedures. Bids were analyzed by the CEAO Commission comprising two representatives of each member State, then approved by the CEAO General Secretariat before being forwarded to ADF for approval. The contracts were subject to the same formalities.

4.4 Reporting

The Bank did not regularly receive project status reports from CRES, although the Loan Agreement required the Borrower to submit its reports to ADF. However, under its obligations, as a specialized CEAO institution, CRES often submitted activity reports to it.

4.5 Procurement of Goods and Services

4.5.1 In conformity with the appraisal report, goods and services for the project financed by ADF, CEAO and OPEC were procured according to ADF rules of procedure, namely by international competitive bidding for: i) construction work, ii) general equipment and furniture, iii) technical assistance responsible for supervising the procurement of equipment and the general technical coordination within BER. The inspection firm was effectively selected from among those with experience of the region. Supervision of the civil works was awarded by amendment to the architect Blé YANGRA, who had prepared the project designs, and his engineering consulting firm, because of their in-depth knowledge of the project. This architect had been retained following international competitive bidding for the conduct of the architectural and engineering designs. No major difficulties were encountered in the procurement of those goods and services.

4.5.2 The appropriate procedures of the donor concerned were to be applied for the scientific equipment to be initially financed by France, Germany and the EDF. Since such scientific

equipment was finally acquired from ADF and CEAO resources, ADF rules and procedures should have been applied. However, CEAO and ADF approval channels were followed for bidding and the award of contracts. This contributed to the delays. Indeed, following ADF's approval, in May 1987, of the procurement of scientific equipment from the unused balance for certain activities, contracts were only prepared in October/November 1988, i.e. over a year later. Furthermore, since only one bid was submitted, a further round of international competitive bidding was required.

4.6 Sources of Financing and Disbursements

4.6.1 Under the original financing plan, ADF was to contribute UA 10.36 million (i.e. 48.64%), CEAO, UA 1.73 million (8.12%), OPEC, UA 4.61 million (21.64%), France, UA 2.04 million (9.58%), Germany, UA 2.15 million (10.09%) and EDF, UA 0.41 million (1.93%). This financing plan could not be realized. Indeed, in 1987, the European donors, namely France, Germany and the EDF, withdrew from the project against all expectations, especially as only three years earlier they had officially undertaken to contribute the above-mentioned amounts to the financing of the operation.

4.6.2 The withdrawal of France, Germany and the EDF changed the original financing plan in such a way that only ADF, OPEC and CEAO were responsible for financing the project. ADF contributed UA 10.36 million towards the financing of all expenditure categories. The following table shows the participation, by expenditure category, of the donors which effectively contributed to the financing of the project.

Table 4.2
Actual Sources of Financing by Expenditure Category
(in thousand CFA.Fs)

Categories	ADF	% ADF	OPEC	%OPEC	CEAO	%CEAO	TOTAL
A.Sup.Studies.	179,084	92.67	0	0	14,161	7.33	193,245
B.Constr.	2,327,912	55.50	1,802,783	42.98	64,081	1.52	4,184,776
C.Scient. Equipment	479,769	76.59	0	0	146,651	23.41	626,420
D. Furn./Gen. Equipment	348,632	100	0	0	0	0	348,632
E.Tech Asst.	444,178	100	0	0	*	*	
F.Operation/ BER/CRES	257,230		0	0	*	*	
G. Training	113,635		0	0	*	*	
TOTAL	4,170,440		1,802,783				

Source table 4.2: BEICIP Archives (Bamako)
*: insufficient information

4.6.3 OPEC's participation in the financing of the construction work represented approximately 43% of the total cost of that category, in conformity with the appraisal report. CEAO's participation was below the estimate for the same expenditure category, i.e. 1.5% instead of 4.3%; the difference being absorbed by the ADF loan. CEAO also participated in the operating costs of the BER and CRES, from its establishment. However, BER, as well as CRES, in addition to their official duties, carried out periodic project management activities. It is, therefore, difficult to determine exactly the specific recurrent costs of the project.

Table 4.3.
Estimated and Actual Financing by ADF by Expenditure Category
(in thousand UAs)

Categories	Estimated Amount	%	Actual Amount	%	Difference
A. Studies/Sup.	1,234	71.28	454		+780
B Construction.	5,729	53	5,892	55.50	-163
C.Scientific Equip.	0	0	1,258	77.20	-1,258
DFurn/Gen.Equip	1,593	100	887	100	+706
E.Tech. Assistance	461	100	925	100	-464
F. Oper.BER/CRES	313	51	868		-555
G.Training	1,032	75	74		+958
Total	10,362		10,358		+4

Source: ADB (FDIS)

4.6.4 The significant overruns in respect of technical assistance and the operation of the BER/CRES are due to the extension of the project implementation period. An explanation regarding ADF's participation in the financing of scientific equipment has already been given above in paragraph 4.2.5.

4.6.5 The changes to the implementation schedule led to modifications in the expenditure schedule. The following table indicates estimated and actual disbursements released by ADF.

Table 4.4
Estimated and Actual Loan Expenditure by Category

Year	Appraisal Estimate	Actual (UA 000)	Percentage Disbursed
1983	0	0	0
1984	1,842	0	0
1985	5,259	2,395	23.12
1986	3,260	4,051	39.11
1987	0	1,548	14.95
1988	0	226	2.18
1989	0	970	9.36
1990	0	490	4.73
1991	0	595	5.75
1992	0	83	0.80
Total	10,361	10,358	100.00

4.6.6 Disbursements began in 1985, one year behind the estimated schedule. Since technical assistance and construction activities started up in the last quarter of 1994, the first invoices were submitted to BER in late October, and forwarded to the Bank in December of that year. On completion of the project in 1986, only 39% of the loan had been disbursed.

5. PROJECT OPERATING PERFORMANCE

5.1 Overall Assessment

5.1.1 The goods and services procured under the project correspond to the requirements and objectives defined at appraisal. However, some goods such as scientific equipment and staff training defined at appraisal were not fully procured and prevented CRES from attaining all its set objectives. The Borrower should have been more diligent in seeking financing for the remainder of the goods to be procured.

5.1.2 A training and research institution of CRES's size has high operating costs. However, insufficient consideration was given to recurrent costs at appraisal; for, at present, the centre's activities have come to a standstill owing to a shortage of funds.

5.2 Performance of Consultants, Contractors, Suppliers and the Borrower

The Consultant

5.2.1 Blé Yangra, the firm of architects responsible for the designs and works supervision, performed satisfactorily. The designs of the centre and campus are highly satisfactory. The buildings are well positioned and ventilated. The materials used are adapted to the environment and the climate. Furthermore, the construction work was supervised properly until completion. The inspection firms CEP and VERITAS, recruited to verify the standards and guarantee the stability and sustainability of the structures, also performed satisfactorily. The services of BEICIP, which was responsible for the equipment/furniture designs, assistance to the project management, the overall coordination of implementation, as well as assistance with the start up of training activities, were deemed to have been satisfactory.

The Contractor

5.2.2 GERC, the contractor for the civil works, was a consortium of three enterprises: SATOM, SNED and SODETEG. All the work was completed in conformity with the estimates of the implementation schedule. The quality of the materials used and their correct usage have ensured the uniqueness and undoubted sustainability of CRES. It should, however, be mentioned that some cracks have appeared in the walls and on the floor of the photovoltaic laboratory. Furthermore, since some buildings have remained unoccupied since the termination of the work, they have been subject to acts of vandalism and have deteriorated. Nor have all the buildings and installations been regularly maintained, which could cause their rapid deterioration.

Suppliers

5.2.3 The suppliers of general equipment and furniture satisfactorily performed their contracts by supplying products of high quality, and, on the whole, adhering to the schedule. Scientific equipment was procured slowly, and not all the suppliers provided training for staff in its utilization. The users do not use it properly, either from lack of knowledge or because the equipment is incomplete or obsolete.

5.2.4 It is unfortunate that local, or even regional, suppliers did not participate much more actively in the implementation of the project, especially with the current problem of maintenance of the equipment procured. The principal donor (ADF) should have required the grouping of external suppliers with local and /or regional suppliers, as well as the training of competent staff to ensure the maintenance and sustainability of scientific and special equipment.

5.2.5 In the case of this project, the Borrower was the Republic of Mali acting on behalf of the CEAO States. CEAO was, therefore, responsible for assessing the performance of the Borrower in the implementation of the project. BER, the executing agency, responsible for the management of the project, did, in fact, operate normally until March 1986, when CRES was established, resulting in the suspension of its activities before the project had been completed. Thereafter, there was no executing agency to permit proper monitoring and the resolution of the problems encountered. CRES took over although this was not provided for in the appraisal report. CRES could not work efficiently because of its own organizational problems. Moreover, the financial difficulties of the CEAO States prevented it from carrying out its activity programme and regularly releasing the necessary funds for the smooth operation of CRES to enable it to operate at maximum output.

6. INSTITUTIONAL PERFORMANCE

6.1 Overall Assessment of the Operation of CRES

6.1.1 To objectively assess the level of institutional performance attained by the project, the role and functions vested in CRES at the design stage should be recalled. According to the project promoters, CRES was, in keeping with the renewable energies development strategy, to:

- i) develop applied research and support the national centres;
- ii) develop national, African and international cooperation in new energy;
- iii) participate in the preparation of a global energy strategy for CEAO and CILSS countries;
- iv) promote renewable energy projects through engineering designs and oversee their implementation; and
- v) plan and create large-scale production capacity for equipment, which would meet the demand of CEAO and CILSS member countries.

CRES was to play this role through the activities of the technology, design and engineering, information, documentation and training departments.

The Technology Department

6.1.2 The role assigned to the Technology Department consisted in support to local structures, support for the large-scale production of solar energy equipment, research and development, and the promotion of pilot projects.

6.1.3 CRES implemented various measures to achieve those objectives. Thus, as from October 1983, it signed several agreements with the member States of CEAO/CILSS. These agreements enabled CRES, through its Technology Department, to carry out solar energy-related technical assistance activities in favour of the countries of the sub-region such as Mali, the Gambia, Mauritania, Niger, etc. Apart from technical assistance, several engineers of the national centres received travel or study scholarships as part of the agreements.

6.1.4 CRES industrial promotion activities involved several initiatives. A strategy study was conducted to define an industrial strategy for the production of solar equipment. The conclusions of the study, approved by CEAO experts and adopted by the Heads of State Conference in March 1986, proposed the establishment of a production unit for photovoltaic modules at the CRES in

Bamako, called UPS-Régionale. This central unit was to be accompanied by corresponding national units responsible for the marketing, installation and maintenance of equipment. Despite its endeavours to implement the UPS-Régionale project, CRES was unable to find a serious partner for a joint venture. In light of the failure to implement the UPS-Régionale project as a joint venture, CRES adopted another approach involving the establishment of a system assembly unit on CEAO financing in the hope of attracting a technical partner. A project in this vein submitted to CEAO was unable to secure the necessary funds (CFA.F 215,000,000). To address this latest difficulty, CRES proposed the assembly of portable solar lamps in its photovoltaic laboratory. Twenty such lamps were procured with a view to conducting on site trials. Because of insufficient financing (CFA.F 10,000,000), this new approach was not followed up either.

6.1.5 Research and development (R&D) activities involved the preparation of scientific and technical documents, and R&D activities as such. These activities were impeded by the delay in recruiting technical and scientific staff and the lack of funding. Despite such constraints, CRES was able to carry out data collection and processing activities, as well as research in the thermal or thermodynamic laboratories, the results of which were made available to CEAO and CILSS member countries.

6.1.6 CRES also promoted different pilot projects, the most important of which were the solar energy drying project, the experimental solar energy-powered village project, the project aimed at providing CRES with a field site at Banankoro (Bamako), and the integrated solar energy-powered village project. All attempts to obtain financing for the implementation of the different projects failed, with the exception of the integrated solar energy-powered village project, for which financing was obtained from the ACCT, and under which a solar energy-powered village was established at KONI-BERI in Niger.

Design and Engineering Department

6.1.7 The Department, which was established in 1986, has carried out several activities, of which the launching and monitoring of programming in Benin, the partial implementation of the regional programme and the study of two preliminary designs for solar-powered lighting. These activities had tangible results, namely (a) the preparation of Benin's infrastructure plan, (b) the equipping of two lecture halls and cultural centres with photovoltaic solar systems: lighting, power supply for audio-visual equipment, and (c) the conduct of 14 studies on projects in the water, health and educational/cultural sectors.

6.1.8 Apart from the above-mentioned activities, the Department has had to prepare, in cooperation with the other departments concerned, finance request documents with a view to the partial implementation of the regional infrastructure programme and the establishment of the Solar Energy Production Unit. Unfortunately, none of those activities was successful, since no donor agreed to finance the CRES programme.

Information and Documentation Department

6.1.9 The Department has carried out a number of activities related to the dissemination of scientific, technical and promotional information, or information aimed at extending the systems and informing decision-makers or economic operators. Documentation-related activities comprise, in particular, (a) the establishment of a documentation centre (library, database and bank), (b) the establishment of national information units in member States, and (c) the establishment of a mechanism for cooperation with regard to exchanges of documents, and technical and financial support.

6.1.10 At present, the Documentation Centre comprises a stock of almost 4,000 works, principally from abroad, and almost 8,000 references in the computerized database and bank. This stock, mainly acquired from USAID, UNDP and IDRC subsidies, also comprises the CRES archives. The national documents constitute a minute portion of the stock of documents because of collection difficulties.

The Training Department

6.1.11 This Department has only very partially performed the duties assigned to it. Indeed, it has succeeded in establishing contacts with training structures in the subregion regarding renewable energies, and has even carried out periodic training activities in collaboration with some institutions in Mali, Niger, Burkina Faso, Benin and Senegal. The Department has also made contact with different foreign training and research institutes, especially in France and Germany, and has even worked with many of them, some of which have received CRES trainees.

6.1.12 The Department has also initiated and organized many courses and seminars for management staff and technicians of CEAO/CILSS member countries and carried out concrete actions with a view to introducing renewable energies in the general education programmes of the countries concerned. Thus, in October 1983, CRES was able to recommend to the Conference of CEAO Heads of State the introduction of renewable energies in general education. Furthermore, in 1983, CRES distributed a book called "les jeux du soleil" for primary school pupils. Aside from those periodic activities, CRES has not really been able to achieve its main goal, namely the training of engineers/ management staff and technicians needed by the subregion to ensure the management of renewable energies.

6.2 Dysfunctional and Organizational Weaknesses of CRES

6.2.1 On the one hand, CRES wanted to be the only centre with regional responsibility for the development of new and renewable energies (solar and wind energy, biomass, improved stoves, micro-irrigation) and the rational use of energy, and, on the other, the promoter of a regional policy based on the requirements of its member countries. CRES is a long way from achieving this ambition, and even worse, does not have the proper organizational and operating structure to achieve it. There are several reasons for this situation, foremost among which are institutional and organizational weaknesses, as well as difficulties of a financial nature.

6.2.2 The institutional framework has not been conducive to the optimal utilization of CRES's human and technical resources for various reasons. First, the agreement for the establishment of CRES created positions and decision-making bodies without really taking into account the relevance of the objectives set, and especially the environment in which CRES would evolve. Thus, under the impact, among others, of dwindling financial resources, the production company was never established, the position of Director of the Centre never filled, and the Education and Research Committee never established.

6.2.3 These institutional weaknesses are exacerbated by the lack of organization of CRES and the poor management of its human resources. In fact, there is no organization chart of the Institution, and there never has been one, not even for internal purposes. This has resulted in insufficient definition of the structural and functional relationships between the different departments, inadequate definition of evaluation criteria, and vagueness regarding the scope of responsibilities, missions and objectives of the different positions. At present, there are only descriptions of the functions of the positions for which applications have been invited, which can, in no way, replace a real organization chart.

6.2.4 The withdrawal of the European donors also considerably affected the smooth operation of CRES. For example, this withdrawal led to considerable delay in installing scientific equipment and, consequently, in the conduct of training, and research and development activities. To correct the situation, the list of goods and services was revised downwards and the Bank's contribution reallocated. However, there are at least two other reasons for the financial difficulties now facing CRES. On the one hand, the search for financial partners was not cohesive, reflected in a total absence of strategy, and financing requests submitted to donors without solid arguments, and on the other, slipshod financial management illustrated in many cases by wide-ranging expenditure, without prioritization. It should be mentioned that, although the President of the Bank has officially expressed its desire to step up its assistance to CRES if necessary, the management of the Institution has never submitted such a request.

7. SOCIAL IMPACT

7.1 The social impact of CRES is indicated by the very objectives assigned to the Institution. Indeed, the primary objectives of CRES consist in the management of renewable energies (especially solar), the production, promotion and dissemination of the systems for producing such energies, training, and the sensitization of the populations of CEAO and CILSS countries to the use of renewable energies. These objectives are most vital for the rural areas. In fact, the solar energy sought by CRES is very useful for cooking food, pumping water, electric power supply to health facilities, general lighting, food preservation, etc. It is, therefore, a major asset for the well being of the rural population in general, and especially women, who are responsible for performing household duties.

7.2 These social impacts unfortunately remain unrealized, in so far as CRES has not really been able to operate as anticipated. Since solar energy has never been produced, rural and semi-urban populations have not yet had the opportunity of improving their living conditions on the basis of this alternative source of energy.

8. ENVIRONMENTAL IMPACT

8.1 The project's environmental impact was assessed in relation to the geophysical background. Indeed, most countries in West Africa consume modern energy, in the form of oil and electricity, in small quantities, limited in most cases to urban areas, compared with a very high consumption of traditional energy, in the form of wood, which represents 70% to 95% of total energy consumption. This situation is not only dangerous for the stability of the ecosystem, in the light of the irreversible deterioration of the environment (deforestation, desert encroachment, atmospheric pollution), but is, moreover, absurd, for the countries of the region concerned have an average of over 2,000 hours of sunlight per year representing 5 kWh/m²/day in many cases, sources of energy which they do not use.

8.2 CRES was, therefore, established to resolve the predicaments which might arise for the CEAO/CILSS member countries as a result of their excessive use of traditional (in the form of wood) or modern (in the form of oil) energies alone, whereas there was vast solar potential in the sub-region. Unfortunately, CRES's inability to effectively produce solar energy and popularize it has prevented the realization of the positive environmental impacts of the project.

9. SUSTAINABILITY OF THE CRES

9.1 CRES's objectives remain valid (coordination of research and development in the sub-region, training and information, design and engineering, energy savings, the environment, the production of systems using new and renewable energies). They should not, therefore, be called into question. On the contrary, the evolution of the energy situation in CRES member countries,

consideration of the problems of the environment at international level and the increasing sophistication of products using renewable energies argue in favour of the maintenance of the original objectives. CRES's objectives could be redefined to take into consideration the problem of the rational use of all energies (CRES could thus play a key role in the energy policy of the subsector), and that of the environment, since the major cause of environmental deterioration in the Sahel remains deforestation. Furthermore, CRES's partners could be expanded to include other West African States, not members of CRES, with the same energy situation as the CEAO States.

9.2 The future of CRES, like that of the other sub-regional centres, obviously depends on its financial resources. The situation is the same in all similar institutions south of the Sahara, and is related not only to the above-mentioned difficulties, but also to the economic and financial situations of the member States. Financing should, therefore, be sought, at least partially, outside the subregion. This assumes the integration of CRES in the network of centres of excellence of international organizations. CRES has undoubted assets (laboratories, infrastructure) which are sure to facilitate such integration.

9.3 Finally, at the level of all the member States, political, economic, administrative and regulatory incentives should be introduced to encourage the production, promotion and utilization of new and renewable energies. In the range of CRES functions, production appears essential and should, therefore, occupy centre stage. It is indeed important, for the viability of such a project, for the activities of the Centre to be organized around production. In addition, such production should be carried out under technically competitive and financially rewarding conditions. Thus CRES could, through productive activities, generate substantial income which could be used to finance its own operation, for it is difficult to accept that an institution such as CRES, which has undoubted economic interest, must be subsidized by external financial assistance. The feasibility studies conducted showed that an economically viable project was possible. Because of its importance, the objective of promoting production remains valid and is justified. It is quite legitimate for the subregion to have a solar energy systems production unit drawing on the existing or future industrial bases in the countries concerned.

10. PERFORMANCE OF THE BANK AND OTHER COFINANCIERS

10.1 The Bank

10.1.1 The limited institutional results of the project, as analyzed above, indicate that the development objectives of the energy sector in general in West Africa, and especially of the solar energy subsector, pursued by the Bank through the CRES project, were not attained. While solar energy remains a priority need for Africa, CRES, because of its structural weaknesses and financing constraints, has been unable to provide a viable solution.

10.1.2 However, the Bank's operating performance was satisfactory. It often reacted promptly to the different requests arising from the implementation of the project. The opinions and approvals relating to bidding documents and contract award proposals were communicated to the project officers within a reasonable time. In addition, the Bank displayed flexibility where the interests of the project were at stake. Thus, when the European donors, the project cofinanciers, suddenly withdrew, the Bank approved the downward revision of the list of goods and services and the utilization of part of its loan made available by the downsizing of the project, for the procurement of goods and services which were to be provided by them.

10.1.3 The Bank's flexibility in this respect benefited the project. However, there are still some gray areas with regard to the Bank's participation in the project. These weaknesses are illustrated by the fact that the Bank did not monitor the project regularly, since it only carried out a few

monitoring and supervision missions throughout the project, whereas the scale of the work to be carried out required at least one supervision mission per year. Another of the Bank's weaknesses was its lack of initiative when France, Germany, and the EDF suddenly decided to withdraw from the project. The Bank should have opened negotiations with its partners to encourage them to reconsider their decision or, if necessary, to take joint measures to fill the financial vacuum created by their withdrawal.

10.2 The Cofinanciers

10.2.1 The European partners in the project, namely EDF, France and Germany, did not fulfill their commitments. Without really justifying their actions, they unilaterally cancelled their financial commitments against all expectations at a time when CRES needed them for its operation. Following our enquiries, it appears that the European donors decided to withdraw from the project following a difference of opinion concerning the functions of CRES. Indeed, for CEAO and the Bank, it was accepted that CRES, in addition to its research and training activities, was to carry out solar energy production activities in the short term to meet the demands of the subregion, through national solar energy units established in CEAO and CILSS member countries.

10.2.2 This opinion does not appear to have been shared by the European partners, who only saw in CRES a centre for solar energy research and sensitization in the sub-region concerned. This difference of opinion was perhaps due to the fact that CRES's initial objectives were defined in over general terms, making them liable to different interpretations. Also, as soon as CRES's management took the first steps towards the construction of a solar production unit, the European partners opposed it and, faced with CRES's determination to carry out the programme, finally withdrew from it. CRES was unable to achieve its objectives largely as a result of those partners. Unlike the European financiers, the other partner, OPEC, honoured all its commitments.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

11.1.1 Technically, the CRES project was successfully implemented, from its identification to its implementation, through the preparation and appraisal stages. Indeed, carefully analyzed on the basis of the energy constraints of the CEAO/CILSS member countries, the idea of establishing CRES was thoroughly explored through several engineering designs. Such a detailed preparation made it possible to objectively appraise the project, since all the relevant information had been made available.

11.1.2 The project was implemented satisfactorily, although considerable changes were made to some components in relation to the initial appraisal. Thus, the construction work was correctly implemented in conformity with the estimates of the appraisal report. However, not all the equipment planned could be procured, following the unilateral cancellation by the European donors, partners in the project, of their initial financial commitments. Training activities could not be carried out either as planned because of insufficient equipment, and delays in recruiting technical staff. These constraints led to the downsizing of the project. For all those reasons, the project operating performance, while not excellent, is considered to be satisfactory.

11.1.3 The situation regarding the institutional performance is less satisfactory. Indeed, seven (7) years after its commissioning, CRES has not attained its objectives. The many projects initiated have not been completed, and the solar energy production activities have been unable to start up owing to a lack of financing. In fact, the premature withdrawal of the European partners from the project has almost paralyzed CRES, which has been at a virtual standstill since 1990.

11.1.4 Analysis of the implementation of the project and operation of CRES shows that the principal weakness of the operation lay in the fact that there were no safeguards to correct the type of financial constraints which the project is now facing following the withdrawal of the European partners. On the other hand, the project designers did not provide for a policy which would have made CRES profitable, and consequently self-financing, thus creating the conditions for its sustainability.

11.2 Recommendations

11.2.1 Two types of recommendations are proposed in the light of the foregoing, namely (a) urgent recommendations, which could revitalize CRES, and (b) general recommendations aimed at ensuring the viability and sustainability of regional projects financed by the Bank.

Revitalization of CRES

11.2.2 CRES constitutes an extremely important investment both in terms of the resources allocated to it, as in terms of prospects for development. It would, therefore, be tragic if it were to become a white elephant, a costly investment, which, in the end, serves no purpose. The Bank was the project's principal investor, and, consequently, the most concerned by its profitability. Economic logic, therefore, requires the Bank to revive the activities of CRES.

11.2.3 Several scenarios have been envisaged to ensure this. The most effective and realistic, under present circumstances, would require the Bank, either alone, or in association with other donors which it might identify, to grant a significant supplementary loan. This would be used to finance the fulfilment of the conditions for carrying out the income-generating research, training and production activities assigned to CRES. Such financial assistance should be provided along with the implementation of a policy, which would gradually make CRES self-financing on the basis of income earned from its activities. Thus, the Bank's supplementary loan would be used to create the conditions for CRES to be self-financing.

11.2.4 The major study on energy in Africa entitled: 'The Energy Programme for Africa', financed by the Bank since 1992, could provide an ideal opportunity to deepen the reflection on the practical modalities of reviving CRES's activities on the basis of the principle of the Institution's financial autonomy. In this perspective, meetings should be organized without delay with those in charge of the study to ensure that special attention is paid to the CRES issue.

The Sustainability of Regional Projects

11.2.5 CRES is not the only regional project financed by the Bank whose sustainability is not guaranteed. Projects such as the EMIG and the Regional Maritime Science Academy have the same problems. These projects were financed without a specific analysis of the conditions of sustainability. It is not sufficient to create a regional research and/or training institution, with a modern architectural design and sophisticated equipment without ensuring its survival, and even its long-term development. In the studies on the institution, it is vital, not merely to provide for the financial resources to ensure the sustainability of its operations, but also to define a realistic and effective strategy to cover those medium and long-term requirements. The Bank should finance no regional project unless the conditions for its sustainability, on completion of the Bank's operation, have been fulfilled.

Cofinancing

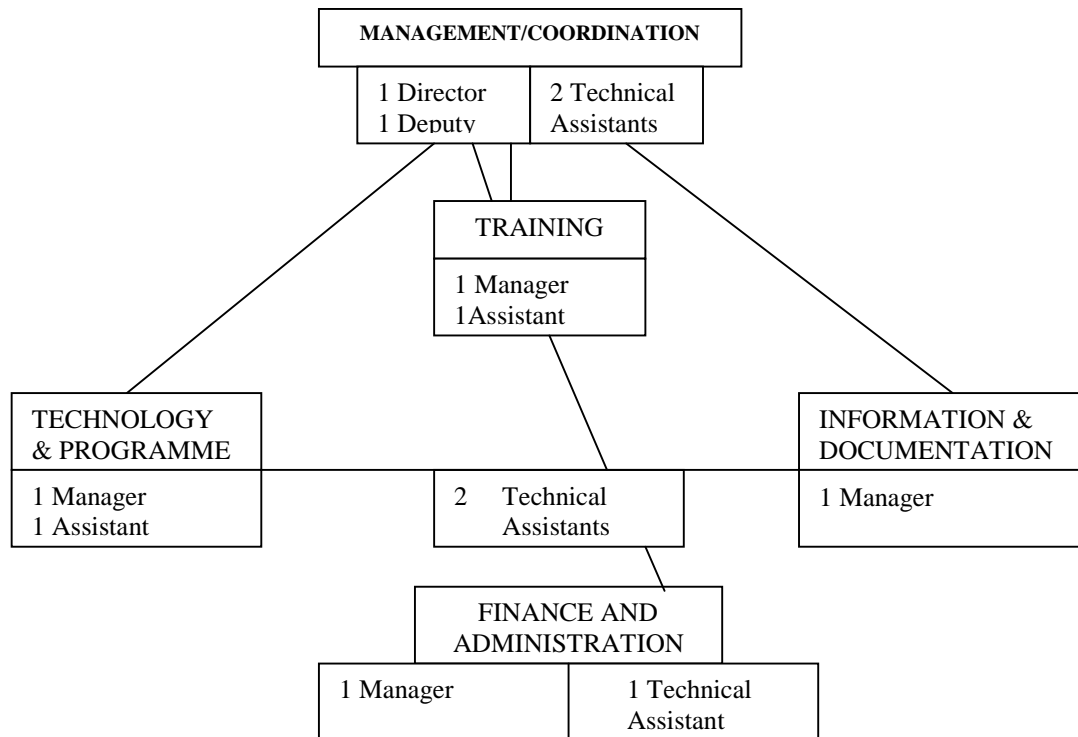
11.2.6 Project cofinancing is only of interest if the different partners effectively agree to honour their commitments. Unfortunately, this basic principle was not complied with in the case of

CRES. The project's European partners, in particular EDF, France and Germany, unilaterally decided to withdraw from the financing of the project, for no specific reason, while it was being implemented. The Bank did not react to this withdrawal and its far-reaching consequences. To avoid a repetition of such a situation, it is recommended that the appraisal report contain provisions, requiring the cofinanciers to honour their commitments, and consider compensatory measures in the event of default by a cofinancier.

Supervision

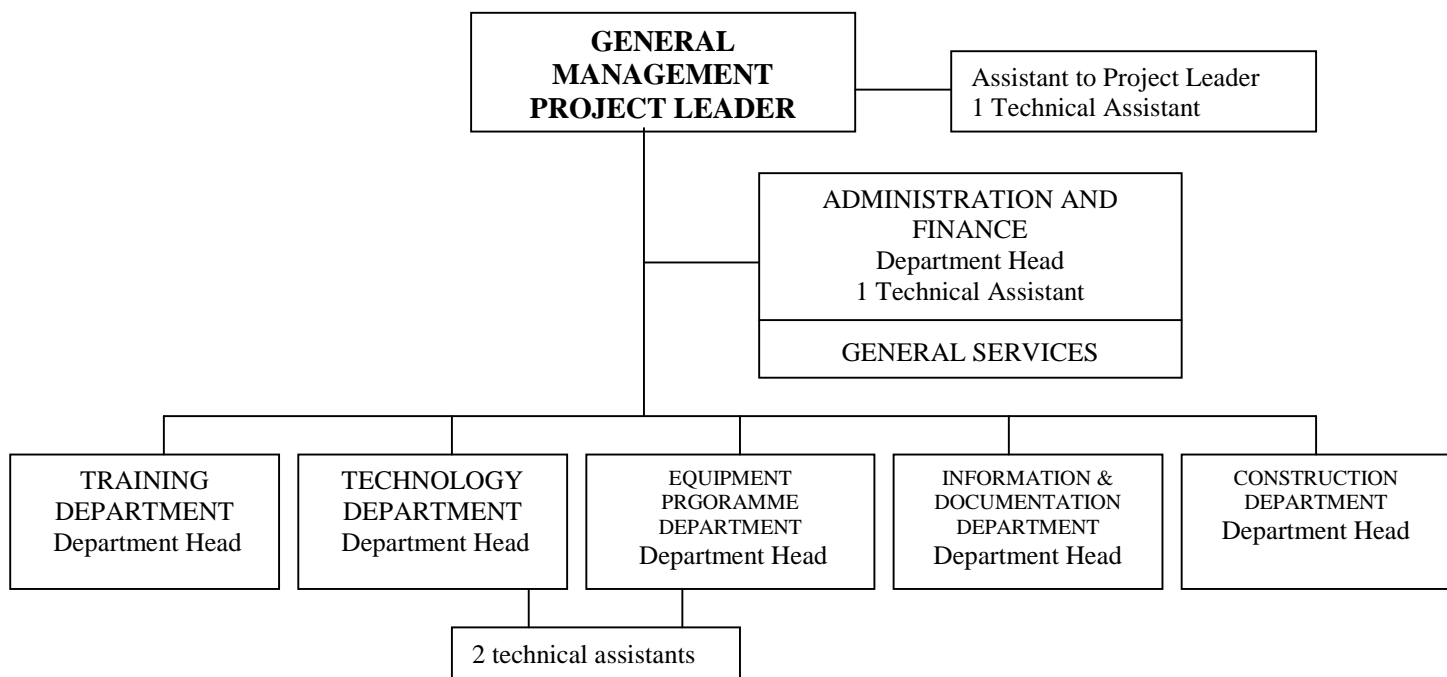
11.2.7 In future, the Bank shall increase its monitoring and supervision missions in order to provide timely solutions to the problems facing projects.

REPUBLIC OF MALI
REGIONAL SOLAR ENERGY PROJECT
B.E.R. ORGANIZATION CHART AT APPRAISAL
 (December 1981)



Average Staffing: - 8 managerial staff and 8 technical assistants

ACTUAL B.E.R. ORGANIZATION CHART (January 1985)



**MALI - PROJECT FOR THE ESTABLISHMENT IN BAMAKO OF THE
REGIONAL SOLAR ENERGY PROJECT**

LOAN N°. CS/MAL/ED/84/15

LIST OF CRES STAFF TRAINED UNDER THE PROJECT

Beneficiaries	Position	Type of Training	Dates	Duration	Venue
Mamadou L. Touré	Head of Thermal Lab.	-fact-finding visits on the latest technological developments to specialized centres	1991	50 d..	Paris Perpignan Cadarache
Mactar Sall	Head of Data Collection and Processing Lab.	- Training with suppliers of lab. equipment. - Seminar on « Radiometric Measurement»	1991	44 d.	Carpentras Avignon Paris
Yves M. Traoré	Head of Photovoltaic Lab.	- Course on the use of photovoltaic systems. - Visits to specialized centres.	1991	30 d.	Marseille Cadarache Lyons Hamburg
Vincent Hessou	Head of Studies/Eng. Dept.	- General training in renewable energies and energy management. - Course at the Institut Technique Banques.	1987 89-90, 90-91 and 91-92	21 d. 3 acad. years.	France Bamako Ouaga.
Abderhamane Sotbar	Head of Training Department	- Training in solar electric power	1991	21 d.	Paris
Hamounet Coulibaly	Engineer Depart. Studies/ Eng.	- Economics and Energy Planning.	1992	36 d.	Grenoble
Joseph Bathiébo	Training Officer	- Familiarization with the opportunités of a National Centre. - General Training in renewable energy and energy management	1991 1991	15 d. 21 d.	Dakar Nice
Jean-Marie Inéka	Computer Engineer	- Further training in PC-ATS. - Computer Security. - Training on software and Lotus 123.	1988 1990 1989	25 d. 10 d. 10 d.	Paris Abidjan Paris
Mamadou Seck	Thermal Lab. Technician	- Training with suppliers of lab. equipment.	1991	50 d.	Aubagne Digne Perpignan

**MALI – PROJECT FOR THE ESTABLISHMENT IN BAMAKO OF THE
REGIONAL SOLAR ENERGY CENTRE**

LOAN N°. CS/MAL/ED/84/15

LIST OF CRES STAFF TRAINED UNDER THE PROJECT

Beneficiaries	Position	Type of Training	Dates	Duration	Venue
- Issouphou Salemberé	Lab. Technician Data Collection and Processing	- Utiliz. /maintenance data recording units - Retraining on utiliz./maintenance of data recording units. - calibrators, radiometers and hygrometers. - Computer Training.	1998	60 d..	Paris Frankfurt
			1990	18 d..	Paris Frankfurt
			1991	14 d..	Paris Avignon
			90-91	1 acad. yr.	Bamako
- Norbert Bothini	Photovoltaic Lab. Technician	- Familiarization with the potential of a National Centre. - Training on Photovoltaic Lab. Equipment - Computer Training	1989	21 d.	Ouaga
			1990	45 d.	Marseilles
			90-91	1 acad. yr.	Bamako
- Ibrahima Maïga	General Maintenance Engineer	- Training in Maintenance of Technical Equipment - Retraining on CRES technical equipment. - English Proficiency Course.	1987	21d.	Nantes. Paris
			1990	27d.	Nantes Paris
			90-91	1 acad. yr.	IPN Bamako
- Mady Debra	Workshop Technician	- Training on the operation and maintenance of workshop equipment - Computer Training.	1990	45 d.	Marseilles
			90-91	1 acad. yr.	Bamako
- Jérôme Yerbanga	Documentalist	- Computer Training.	89-90 90-91	2 acad. yr.	Bamako
- Francis B. Coulibaly	Assistant documentalist	- Technical information seminars. - Computer Training	1990	40 d.	Bordeaux
			90-91	1 acad. yr.	Bamako
- Faria Bassakoye	Printer	- Photoetching Training	1991	21 d.	Paris
Labasse Haidara	Chief Accountant	- COMGID and PROGID software training	1991	15 d.	(CRES) Bamako

**MALI - PROJECT FOR THE ESTABLISHMENT IN BAMAKO OF THE
REGIONAL SOLAR ENERGY CENTRE
LOAN N°. CS/MAL/ED/84/15**

LIST OF CRES STAFF TRAINED UNDER THE PROJECT

Beneficiaries	Position	Type of Training	Dates	Duration	Venue
- Béchir Sylla	Accountant	- Computer Training. - Accounting Course	1 Acad. yr. 90/91	1 Acad. yr.	(ESET) Bamako Paris
- Silamakan Dicko	Financial Officer	- Computer Training	90/91 Acad. yr.	1 Acad. yr.	(ESET) Bamako
- C. O. Guisse	Head of Admin. Service	- Seminar on retraining of archivists	1 to 26/07/91	27 days	Bordeaux
- Mamadou Dembélé	External Relations Officer	- Training at EIB	September to October 91	2 months	Bordeaux
- Assata Coulibaly	Executive Secretary	- English Language Proficiency	89/90-90/91 Acad. yrs.	2 Academic years	(IPN) Bamako

