

**GLOBAL
ENVIRONMENT
FACILITY**

Regional

**Control of Greenhouse Gas Emissions through
Energy-Efficient Building Technology in West Africa**

Project Document

*This Project Document has been edited to facilitate public dissemination.
The original is on file in the GEF Office at UNDP Headquarters in New York.*



ABBREVIATIONS

ADEME	Agence Française pour la défense de l'environnement et la maîtrise de l'énergie
AfDB	African Development Bank
AFME	Agence Française pour la maîtrise de l'énergie (now ADEME)
AIDHE	Association Ivoirienne d'étude et de développement de l'habitat économique
ALBTP	Association Africaine des laboratoires du bâtiment et des travaux publics
BCI	Budget consolidé d'investissements (Consolidated Investment Budget - SN)
BEE	Bureau des économies d'énergie (Energy Savings Bureau - CI or SN)
CEBTP	Centre expérimental de recherche et d'études du bâtiment et des travaux publics (F)
CEREEQ	Centre expérimental de recherche et d'études de l'équipement (SN)
CFC	Chlorofluorocarbons
CI	Côte d'Ivoire
CIDA	Canadian International Development Agency
CIE	Compagnie Ivoirienne d'électricité (Private Ivorian Electricity Management Company)
CLEP	Comité local d'examen de projet (Local Project Review Committee)
CODINORM	Association Ivoirienne de normalisation
CONSERE	Conseil supérieur de l'environnement et des ressources naturelles (SN)
COPED	Cooperative Program on Energy and Development
DCA	Direction de la construction et de l'assainissement (CI)
DCH	Direction de la construction et de l'habitat (SN)
DCU	Direction de la construction et de l'urbanisme (CI ou SN)
DE/MEM	Direction de l'environnement (Ministère de l'environnement - SN)
DE/MEMI	Direction de l'énergie (Ministère de l'énergie, des mines et de l'industrie - SN)
DSM	Demand-side management
EDF	European Development Fund
EECI	Energie électrique de la Côte d'Ivoire (National Electric Power Company - CI)
ENSTP	Ecole nationale supérieure des travaux publics de Yamoussoukro
ENSUT	Ecole nationale supérieure universitaire de technologie de Dakar
EPT	Ecole polytechnique de Thiès
ESMAP	Energy Sector Management Assistance Program (see PAGE)
FAC	Fonds d'aide et de coopération de la République Française
GEF	Global Environment Facility
GHG	Greenhouse gas
ISN	Institut Sénégalais de normalisation
LBTP	Laboratoire du bâtiment et des travaux publics (CI)
LCP	(Integrated) least-cost planning
NEAP	National Environmental Action Plan
NGO	Non-governmental organization
OPS	Office for Project Services
PAGE	Programme d'assistance à la gestion de l'énergie
PRISME	Programme international de soutien à la maîtrise de l'énergie
REXCOOP	Réalisations expérimentales en coopération (French Cooperation Programme)
SENELEC	Compagnie Sénégalaise d'électricité
SN	Senegal
tCO ₂ e	ton of carbon dioxide equivalent
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

CONTENTS

Project Information	1
A. Context	2
1. Description of subsector	2
2. Host country strategy	3
3. Prior and ongoing assistance	7
4. Institutional framework for subsector	9
B. Project Justification	12
1. Problem to be addressed and the present situation	15
2. Expected end-of-project situation	16
3. Target beneficiaries	17
4. Project strategy and institutional arrangements	20
5. Reasons for GEF assistance	24
6. Special considerations	24
7. Coordination arrangements	24
8. Counterpart support capacity	25
C. Development Objectives	25
D. Immediate Objectives, Outputs and Activities	26
E. Inputs	46
1. Host country governments	46
2. Global Environment Facility	47
F. Risks	50
G. Prior Obligations and Prerequisites	51
H. Project Review, Reporting and Evaluation	52
I. Legal Context	52
J. Budget	53
1. Project budget covering Government of Côte d'Ivoire contribution	54
2. Project budget covering Government of Senegal contribution	55
3. Project budget covering UNDP contribution	56
Annexes	
1. Project organization chart	57
2. Greenhouse gas emissions due to energy production in Côte d'Ivoire and Senegal	58

UNITED NATIONS DEVELOPMENT PROGRAMME

GLOBAL ENVIRONMENT FACILITY

Project of the Governments of Côte d'Ivoire and Senegal

Title: Control of Greenhouse Gas Emissions through Energy-Efficient Building Technology in West Africa

Number: RAF/93/G32/B/1G/31

Duration: Three years

Project Site: Côte d'Ivoire and Senegal

UNDP Sector: Environment

Subsector: Global warming

Government Counterpart Agencies: Ministry of Environment and Tourism, Côte d'Ivoire
Environment Department, Ministry of Environment, Senegal

Executing Agency: Office of Project Services (OPS) of the United Nations Development Programme (UNDP)

UNDP Approval: October 1994

Estimated Starting Date: March 1994

Government Inputs: Côte d'Ivoire: CFAF 265 million¹ (in kind) (US\$ 509,038)
Senegal: CFAF 390 million (in kind) (US\$ 749,150)
Parallel financing recommended by GEF: US\$ 1 million

GEF/UNDP Inputs: US\$ 3.5 million

Brief Description:

In West Africa, 25 to 30 percent of the total consumption of electricity goes towards the operation of large buildings. Since most of this electricity is generated by thermal power plants which emit greenhouse gases, the building sector contributes to emissions from other local or global sources. Although investment in energy efficiency in buildings can be both cost-effective and environmentally beneficial, such investment on a large scale in the region would require both

¹ According to the official exchange rate in 1994, US\$ 1 = CFAF 520.59.

technical capacity and the right institutional framework (including regulations, standards, appropriate taxes and tariffs, fiscal incentives, and pricing policies for electricity). This project aims to strengthen or create the required capacities, introduce and disseminate energy-efficient building technologies in the region, and prove their cost-effectiveness in order to create conditions that would allow the retrofitting of existing buildings, as well as the design, building, and operation of more efficient new buildings.

GEF will provide core funding for the project which will be managed by UNDP and executed by OPS. The GEF recommends approaching other donors to obtain parallel cofinancing for dissemination of the project's results to other French-speaking countries in West Africa.

A. CONTEXT

1. Description of subsector

International context

The 1980s were the hottest years in a century. Since the recording of climate data, six of the ten hottest years occurred in this decade.² Several different studies suggest that these temperatures could be part of a global warming trend caused by the accumulation of gases from human sources in the atmosphere, which enhance the natural greenhouse effect. These greenhouse gases (GHGs) are carbon dioxide (CO₂), methane (CH₄), nitrogen oxides (NO_x), and chlorofluorocarbons (CFCs). More than two thirds of global GHG emissions are related to energy production from fossil fuels, with the balance being due to deforestation, bioenergy, and secondary sources.

In the past, energy savings were a concern mainly on financial, political and strategic grounds. The threat of global warming, however, fuelled this concern, especially in some industrialized countries. Starting in 1973, many industrialized countries initiated energy-saving policies which relied on technological innovations and regulations, resulting in significant improvements. Energy efficiency in buildings improved by some 50 percent over time, making it possible to stabilize electric power consumption in this sector despite an increase in the number of buildings. Further progress can still be made in these countries, but as the most obvious measures have already been adopted, the cost of additional kilowatt hours (kWh) saved has now risen considerably.

Regional context

The same cost calculation does not hold for Africa, where concerns about energy in the building sector have been relatively recent. Considerable potential remains for cost-effective energy savings, and for a reduction of GHG emissions at a cost lower than that in developed countries.

Non-residential buildings account for 20 to 30 percent of electric power consumption in the major West African urban centres such as Abidjan and Dakar. Increasing urbanization, the

² All data used in this document are drawn from a bibliography which is available upon request from UNDP.

development of the service sector, and the construction of new buildings are the main factors responsible for the increase in electric power demand.

Power generation and distribution companies in West Africa are faced with two types of difficulties:

- The relatively high cost of construction or retrofitting of electric power production facilities, especially in view of the limited availability of capital
- The particularly high consumption of public agencies, resulting in large arrears in government payments to power companies.

The dissemination of energy-saving technologies designed to improve the performance of existing buildings and promote more efficient new ones can significantly cut electric power demand, and improve the economies of countries along with their power generation and distribution facilities.

The reduction or stabilization of power production from thermal sources translates to reduced or stabilized GHG emissions. In Côte d'Ivoire and Senegal, the share of thermal power production is 40 to 50 percent, and 100 percent respectively.

Most of the buildings in the subregion were constructed in the 1960s and 1970s. The original installations are nearing the end of their economic life, and it would be advisable to initiate appropriate energy-saving policies for buildings at the same time that equipment is replaced.

These conclusions of the Bamako workshop on GHGs from energy sources at the regional level (French cooperation and environnement et développement Afrique (ENDA)—Energie, April 1992), and the national experience in Côte d'Ivoire, prompted the government to elaborate a project for submission to the GEF. The Ivorian authorities suggested from the start that the project be undertaken at the regional level, and consulted with Senegal to obtain its approval. This project is therefore an initiative coming from the region, and not from external sources. Project ownership by the host countries, and subsequently by the other beneficiary countries, provides a guarantee for success.

2. Host country strategy

Côte d'Ivoire

Environment

Environmental issues are examined in the "National Report on the State of the Environment in Côte d'Ivoire," which was approved by the government in October 1991 and submitted to the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992.

The formulation of the National Environment Action Plan of Côte d'Ivoire (NEAP-CI) was initiated in May 1992. It is financed by two grants—US\$ 1 million from the Japanese government, administered by the World Bank, and a supplementary grant of FF 1 million (US\$ 192,090) from

the French government. NEAP-CI has adopted a regional approach in conjunction with a conventional thematic approach. The main objectives of the plan are to:

- Ensure consistency between economic and social development policies, and any actions taken to enhance and protect the environment
- Call on the population to identify appropriate strategies which would ensure their involvement in the application of policies
- Identify and prepare effective environment management tools
- Identify relevant actions that need to be strengthened or undertaken.

The plan will lead to the drafting of a white paper to be submitted to the National Assembly, after which a list of programmes and projects with cost estimates and implementation schedules will be submitted to a round table of donors.

At present, the government considers the local environment an area of priority, with special emphasis on:

- Upgrading living conditions in rural areas (especially by settling the populations and so preventing rural emigration); improving conditions in urban centres through sanitation projects by organizing the collection, treatment, and disposal of household refuse; and enhancing the communal environment (public facilities, markets, health stations, and so on). All the projects are part of a decentralized system. The Communal Environment Programme is supported by the European Development Fund (EDF) and the French Aid and Cooperation Fund (FAC).
- Pollution and nuisance control through the monitoring of industrial establishments, and the optimization of energy consumption in the industrial, tertiary, household and transportation sectors. This project will help to attain this objective through indirect effects such as the improvement of air quality around power plants. The improvements will be in proportion to the sulfur content of the fossil fuels currently used for power generation.
- Restoration of the degraded natural environment, deforestation control, marine and inland water pollution control, and control of aquatic weeds in water bodies. Two related GEF projects are now under preparation: a regional project, Pollution Control and Preservation of Biodiversity in the Gulf of Guinea Large Marine Ecosystem, and a national project, Control of Aquatic Weeds in Water Bodies in Order to Enhance/Restore Biodiversity.

Energy

Following a programme conducted by the World Bank and UNDP on the Control of Energy Choices in Côte d'Ivoire (which was the subject of a mission deployed in January-February 1984),

the government instituted, as early as 1986, the National Energy Saving Programme with assistance from FAC and the United States Agency for International Development (USAID). The building sector component of the programme includes:

- Reducing electricity expenses for public buildings
- Raising awareness among economic operators and the general public
- Standardizing construction and ambient conditions in air-conditioned buildings
- Standardizing equipment testing and operating procedures
- Improving the use of energy in buildings.

The programme to revise electricity billing in the public sector undertaken by the Construction and Public Works Laboratory (Laboratoire du bâtiment et des travaux publics (LBTP)) and the pilot programme (UNDP/World Bank/CIDA) of the Energy Sector Management Assistance Programme (ESMAP) to improve energy management, conducted by the Hydrocarbons and Energies Department of the Ministry of Mines and Energy, are both included in the National Energy Saving Programme.

The government is also committed to a vast reorganization of the electric energy sector, with the support of a World Bank sectoral adjustment loan. The programme, designed to enhance the efficiency of the sector, led to the establishment in late 1990 of a national electric utilities company (Energie électrique de la Côte d'Ivoire (EECI)), a private management company (Compagnie Ivoirienne d'électricité (CIE)), and a production facilities retrofitting plan.

The National Energy Plan, adopted in 1992, provides guidelines for the development of the production infrastructure. It also includes provisions for the development of national natural gas reserves in the medium term, and for harnessing additional hydroelectric resources in the longer term. The National Energy Plan is consistent with the guidelines of the National Energy Saving Programme.

Recognizing the interrelation between the energy sector and the environment, the Ivorian government drew up an inventory of measures that might help lower or stabilize GHG emissions. A list of project concepts covering various sectors (such as industry, households and transportation) was submitted to the GEF, via UNDP, in May 1992. An intervention on the energy consumption of buildings was found to offer the best cost-efficiency ratio, both at the national and regional levels. This project, accepted for financing by the GEF in October 1994, is supported by the UNDP Regional Bureau for Africa.

Senegal

Environment

In February 1991, a committee was set up by the Ministry of Tourism and Environment to prepare the National Report of Senegal for UNCED. This report defined Senegal's philosophy and assessment of the role of the environment in providing a better future for its population. The following priorities were identified:

- Coastal protection and rehabilitation
- Water resources management
- An agricultural sector adjustment programme
- Tropical forestry action plan
- Development of the green belt in northern Senegal
- Development and management of the southern forests
- Conservation of biodiversity and development/promotion of biotechnologies
- Development and promotion of renewable energies in rural areas
- National Environment Action Plan (NEAP)
- Soil conservation and restoration
- Developing and reinforcing research capacity in the country
- Implementation of the Senegal River Left Bank Action Plan
- Energy-saving programme in the industrial and tertiary sectors (programme d'économies d'énergie dans l'industrie et le tertiaire (PEEI)).

Energy

The Energy Redeployment Programme of Senegal (Redéploiement énergétique du Sénégal (RENES)) has been the basis of energy policy in the country since 1980. In view of the considerable expenses incurred by the country for oil imports and the high cost of energy, the primary objectives of the programme were to:

- Promote the substitution of other fuels for imported oil
- Reduce consumption by fostering energy savings, and streamline energy production, transport and distribution.

The 1985-89 four-year programme reintroduced the RENES programme, and yielded concrete results by improving planning for the energy sector, tapping oil deposits for thermal electricity production, increasing substitution of biomass with butane gas, improving energy use in industry, and developing national capacities.

Despite these improvements, however, the situation remains critical. The ESMAP/Programme d'assistance à la gestion de l'énergie (PAGE) identified as critical the need to mobilize sufficient financial resources for restructuring the sector. Such financing would come mainly from external sources, and its availability would depend on meeting the following conditions in the country:

- Revision of the institutional framework for energy management and development, especially in the area of electric power
- Making coherent choices in domestic energy policies in view of the scope of the economic, social and environmental stakes
- Practicality of the rural electrification strategy
- Continuation and expansion of programmes that enhance energy efficiency.

As regards buildings, the ESMAP/PAGE programme explicitly advocated that the well-tryed methods used in Côte d'Ivoire to control public expenditure on electricity and improve energy use be applied in Senegal. Initial findings suggest that there are areas for major energy savings, particularly in the public sector.

3. Prior and ongoing assistance

Côte d'Ivoire

The Ivorian government became concerned about energy control after the first oil crisis of 1973. (These concerns were later heightened when the low rainfall of 1983 caused disruptions in the distribution of electricity over the power grid, negatively affecting the economy.) As a result, several initiatives were launched between 1973 and 1980, such as the EPERON programme undertaken by DHE and EECI, and the research on solar energy by the Institut de recherche sur les énergies nouvelles (IREN).

As early as 1981, the Laboratoire du bâtiment et des travaux publics (LBTP), assisted by French private technical organizations—Association des propriétaires d'appareils à vapeur et électriques (APAVE) and the Centre expérimental de recherche et d'études du bâtiment et travaux publics (CEBTP)—began to focus on improved energy use in buildings and the upgrading of alternative sources. Ongoing collaboration in the form of doctoral theses and academic project papers was set in motion between the LBTP and national engineering schools such as the Ecole nationale supérieure des travaux publics (ENSTP) in Yamoussoukro, and the Ecole nationale des ponts et chaussées and the Ecole centrale in Paris.

External assistance was provided through several programmes including, most recently:

- The French interministerial programme for cooperative experimental activities—Réalizations expérimentales en coopération (REXCOOP) (Construction Plan—AFME 1983–85)
- The assessment of national energy-savings potential (USAID 1986)
- Strengthening and providing support to the Energy Savings Bureau (FAC 1987)
- Awareness raising campaign (USAID 1987)
- Preparation of a national energy plan (World Bank, FAC, CIDA 1989)
- Implementation of an energy management pilot project, consisting primarily of monitoring energy use in seven representative buildings, and preparing an Energy Efficiency Code for new constructions or buildings under renovation (ESMAP 1990, involving UNDP, the World Bank, and CIDA).

This assistance has been invaluable for conducting the following locally-financed activities:

- Establishment of power consumption monitoring procedures for the main public sector buildings (BEE, LBTP 1986)
- Installation of condenser sets in the main public sector buildings (BEE, LBTP 1987)
- A pre-diagnosis campaign in buildings and industrial premises (Fonds national de régulation (FNR) 1987)
- A staff training programme for energy-equipment operators (FNR 1987)
- Extension of the power consumption monitoring procedures to the low-voltage public sector (LBTP 1991).

Senegal

An initial evaluation of the energy sector was conducted by ESMAP/PAGE in 1980. A national energy-savings programme was initiated in 1982, financed by the National Energy Fund (funded by revenues from a tax on petroleum products), and supplemented by Italian bilateral resources. The main features of the programme are:

- The creation of a Bureau of Energy Savings within the Department of Energy, Mines and Geology, with staff members trained by a Canadian cooperation agency that specializes in energy audits.
- Audits of forty-seven industrial facilities consuming large quantities of energy, and the identification of 245 energy-saving projects, with investments of CFAF 2 billion within an ESMAP/UNDP/CIDA project.
- Two workshops on efficient energy management for industry technicians and public building managers.
- Awareness-raising campaign on energy conservation targeting the general public, financed by the National Energy Fund.
- Implementation of the PRISME programme (International Programme to Support Energy Control), with financing from the Institut de l'énergie des pays ayant en commun l'usage du Français (Energy Institute of the Countries with French as a Common Language (IEPF)), and Agence Française pour la défense de l'environnement et la maîtrise de l'énergie (ADEME), coordinated by Senegal in West Africa. This programme helped to establish a local capacity in thermal diagnosis, the conduct of a few energy audits, and the institution of a National Committee for Energy Control (Department of Environment, Compagnie Sénégalaise d'électricité (SENELEC), Centre expérimental de recherche et d'études de l'équipement (CEREEQ), and the Department of Urban Development).

- Drawing up national inventories of GHG sources and sequestration within the framework of a GEF/UNDP project on GHG emissions, using the method recommended by the Intergovernmental Panel on Climate Change (IPCC) and the Organization for Economic Cooperation and Development (OECD).

Regional programmes

From the earliest stages, this project was designed as a regional project. Starting with the preparatory assistance phase, contacts were established between this and other regional projects. Several regional or subregional programmes can contribute to the success of this project, including:

- The regional "Energie-Afrique" programme of the African Development Bank (AfDB), aimed at designing a general continent-wide strategy for the energy sector
- The subregional Cooperative Programme on Energy and Development (COPED) executed by the European Development Fund (EDF) to assess the performance of electric power systems in West Africa
- The PRISME sectoral programme on the control of energy in buildings, carried out by the IEPF and the French Environment and Energy Control Agency (ADEME)
- The subregional programme to extend the Ivorian experience in monitoring electric power-billing of the public sector, funded by the Conseil de l'entente, FAC and ADEME.

Contacts have also been established with the African Association of Building and Public Works Laboratories to review the approaches for the transfer of knowledge to other francophone African countries.

4. Institutional framework for subsector

Côte d'Ivoire

Even before the 1972 Stockholm conference, Côte d'Ivoire established institutions to deal with environmental issues. In November 1990, the environment sector ceased being monitored by a national commission and became the purview of a newly-created ministry department. Since December 1993, the environment sector was restructured under the Ministry of Environment and Tourism. The main entities concerned by the project are described below.

The National Environment Council, an interministerial committee chaired by the Minister of Environment and Tourism. The council advises and provides the government with general policy guidelines on environmental matters.

The National Housing Commission, an interministerial agency chaired by the Minister of Construction and Urban Planning. The commission is the advisory arm of the government for general policy guidelines on construction and housing.

The Ministry of Environment and Tourism, through its Department of Environment, is responsible for general policy, regulation, awareness-raising and public education on environmental issues. It is also responsible for the EDF and FAC-funded Environment Communal Programme.

The Ministry of Construction and Urban Planning, through its Department of Construction and Sanitation, is in charge of technical control and monitoring of public buildings, and the inventory and monitoring of all maintenance work performed on state lands and buildings. It is also responsible, through its Department of Urban Planning and Housing, for the regulation and supervision of the urban planning sector, including processing applications for land development and construction, and delivering the necessary permits.

The Ministry of Mines and Energy, through its Department of Hydrocarbons and Energies, is responsible for the formulation and implementation of the energy policy. The public and parastatal companies in the energy sector, particularly EECI (development and supervision of the power sector) and CIE (power sector operations), are placed under this ministry. An Energy Conservation Division of the Department deals specially with the formulation and promotion of energy-saving strategies.

The duties of the Construction and Public Works Laboratory (LBTP) include testing and controlling building materials, issuing permits for grid connections (through the Sécurité des installations électriques (SECUREL) unit), and monitoring the power consumption of public entities. Under the privatization policy implemented by the government with international assistance, the LBTP, a former public establishment with industrial and commercial activities, became a semi-public company on 1 October 1993.

There are several higher education and research institutions in the construction, housing, and energy fields. The Ecole nationale supérieure des travaux publics (ENSTP) of Yamoussoukro provides basic training, continuous training, and skills enhancement courses for engineers and civil engineering technicians, including construction engineers and technicians.

The other key institutions involved in this project are:

- The Order of Architects, representing all architects in both the private and public sector
- The Union of Contractors and Industrialists of Côte d'Ivoire, which brings together the major construction and public works companies in the country
- The CODINORM Association (Côte d'Ivoire Standards Organization), a joint agency responsible for the programming, preparation and application of standards.

In addition to these main entities, there are a large number of other institutions in the environment, construction, and energy fields, particularly research and educational institutes, science and technology associations, non-governmental organizations (NGOs) in the field of development, and others who are interested in this project. It is noteworthy, however, that there are very few representative private sector institutions (in particular trade associations of suppliers of goods and

services, building managers, or others) compared to those representing the public and semi-public sector. As for NGOs, the Association Ivoirienne d'étude et de développement de l'habitat économique (AIDHE) is the only NGO devoted to energy conservation in buildings.

Senegal

Senegal has experimented with several organizational units in the field of environmental management since 1968, including:

- A National Environment Commission
- A Secretariat of State for the Protection of Nature
- An Advisory Commission for the Protection of Nature and Conservation of Natural Resources.

An environment department, created in 1975, was attached successively to the Ministry of Industrial Development and Environment; the Ministry of Urban Planning, Housing and Environment; the Ministry for the Protection of Nature; the Ministry of Environment and Tourism; and, since 1993, the Ministry for the Environment and Protection of Nature. The main agencies involved in the project are described below.

The Department of Environment of the Ministry of Tourism and Environment is the administrative unit responsible for the application of environmental policies and strategies in Senegal. The Department of Construction and Urban Planning of the Ministry of Urban Planning and Housing is responsible for regulatory policies and supervision of the construction and urban planning sector. The Buildings Administration Department, accountable to the General Secretariat of the government, administers government real estate properties, while the maintenance of the main buildings is carried out by the Army's Corps of Engineers.

The choices in energy policy, its orientation, and coordination are entrusted to the National Energy Commission, an interministerial entity chaired by the Prime Minister. The National Energy Committee, chaired by the minister in charge of energy (Minister of Industry, Trade and Industry), applies the directives of the commission.

The technical and administrative supervision of the energy sector, with the exception of fuelwood supply, is the responsibility of the Ministry of Energy, Trade and Industry. The major parastatal companies of the sector, including SENELEC (Senegalese Electric Power Company), are also under this ministry.

The Bureau of Energy Savings is responsible for formulating energy management policies and promoting energy conservation. The Bureau is at the Department of Energy, Mines and Geology of the Ministry of Industry, Trade and Industry.

The Centre for Study and Research on Equipment (CEREEQ) is the national laboratory responsible for the study and supervision of civil engineering works, including buildings. It is an independent public establishment with an industrial and commercial purpose, and reports to the ministry responsible for public works. It is very similar to the Ivorian LBTP, as they were both

established by CEBTP-Paris, a private-sector organization, before the nation's independence; both still receive technical assistance from CEBTP. The CEREEQ, like the LBTP, is a member of the Association of African Construction and Public Works Laboratories (Association Africaine des laboratoires du bâtiment et des travaux publics (ALBTP)).

Basic training and research in the construction sector are conducted by the Civil Engineering Departments at the Ecole nationale supérieure universitaire de technologie (ENSUT) de Dakar and Ecole polytechnique de Thiès (EPT), both of which have already produced publications — doctoral theses and dissertations — on the subject of energy in buildings. These institutions are both part of the University of Dakar.

Institutional framework of the project

The implementation of the project is entrusted by GEF to UNDP and, through the latter, to the Office for Project Services (OPS), the executing agency for UNDP. The government agencies involved are:

- The Department of Environment of the Ministry of Environment and Tourism in Côte d'Ivoire, represented by the head of the department, who is the National Director of the project
- The Department of Environment of the Ministry of Environment in Senegal, represented by the head of the department, who is the National Director of the project.

Staff at the project's headquarters, located in Abidjan, include the Regional Technical Advisor, the National Technical Advisor for Côte d'Ivoire, and their secretariats. The Dakar office accommodates the National Technical Advisor for Senegal and his secretariat. The Abidjan headquarters or the Dakar office may conceivably be located within an existing institution. They must have the usual facilities such as meeting rooms and offices for the use of visiting consultants.

Positioning the Project Implementation Team within a highly structured institutional environment is justified by strategic considerations. The two National Project Follow-up Committees will complement the existing institutional framework.

B. PROJECT JUSTIFICATION

In August 1992, the Ivorian government submitted to GEF a regional project involving ten francophone countries in West Africa. The project planned to finalize the results obtained in Côte d'Ivoire and disseminate them to other countries in the region. A regional project is justified on several grounds:

- The situation concerning energy efficiency in buildings is similar in many countries in francophone West Africa (Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal and Togo). Innovations made in the building sector in any of these countries are usually directly transferable to all others. For example,

the various construction codes in these countries are derived from the French code, so that they are very similar, as are the enforcement procedures.

- The education curricula and qualification requirements for architects and engineers in the various French-speaking African countries are fairly similar, so that the technical culture is identical, and the educational materials and aids developed for one country can readily be used in the other countries without requiring major changes. This situation facilitates the organization of training seminars and workshops at the regional level (for example, the 1992 Bamako seminar on GHG emissions from energy sources funded by the French Cooperation Agency and organized by ENDA-Energie).
- In order to obtain optimal distribution of energy-efficient building equipment (such as cooler units, air-conditioners, lighting systems, window panes and control systems) the market needs to be as large as possible, which would not be the case for any one country.

The GEF has authorized the project for two countries, and recommended cofinancing so that other countries in the region can rapidly be associated with the activities and benefit from the results. Although it initially concerns only two countries, the project was always conceived as an activity that could be extended to the entire region.

The choice of Côte d'Ivoire and Senegal was based on the strategy of initiating activities in the most technologically advanced countries, on the assumption that the knowledge could later be transferred to other countries of the region. Senegal was selected in view of the fact that it had already undertaken numerous activities in the areas of bioclimatic architecture and energy efficiency in buildings.

The two countries selected have a wide variety of climate zones that are representative of the entire region. The specific climate-dependent provisions of the codes that will be formulated will therefore be easily transferred to the other countries.

The large buildings in Côte d'Ivoire are mainly in the public sector (office buildings), while in Senegal they are in the private sector (large hotels). The activities carried out in both countries will thus demonstrate the feasibility of energy-efficiency measures in both the public and private sectors.

Given the context of a GEF pilot-phase demonstration project, and considering the limited amount of funds available, it would not have been advisable to include other countries in the core project (as is usually done in UNDP regional projects), especially in view of the current technical capacities of the francophone countries in the region.

The project is designed as the third phase of a longer four-phase programme:

- Ongoing technical assistance of the French Cooperation (since the early 1980s) in the areas of building design, energy saving, and environmental action.

- ESMAP programme for energy saving in buildings (1988–93). Stage 2 of this programme is complete.
- The present GEF project (1994-1997):
 - Technical and institutional capacity building and strengthening
 - Demonstration of the feasibility of retrofitting old buildings and designing energy-efficient new ones
 - Long-term investment plan (ten to fifteen years) based on retrofitting project portfolios.
- The post-project phase, involving retrofitting about 200 large buildings in the region (some of these activities may start during the current project). The financial plans will be established in consultation with other interested donors, in particular the World Bank and the AfDB.

The project is an appropriate response to the situation in the region at several levels. In terms of environmental action, little has been done so far in the subregion to limit GHG emissions caused by thermal electricity generation. GHG emissions in the project's host countries, and in other countries of the region, may increase significantly, owing to rapidly increasing urbanization, especially if present construction methods are not improved.

The project is also relevant to the energy situation in the subregion. In the target countries, the construction sector accounts for a major part of total electricity consumption. This sector is mostly responsible for the increase in demand in Senegal, and for the steady demand in Côte d'Ivoire. The sector offers an energy-saving potential which is fairly easy to tap. Savings of 20 to 30 percent could be achieved on retrofitted buildings, and energy savings of 50 to 60 percent could be realized on new ones.

The project will provide a cost-effective means of reducing GHG emissions in the region. Abidjan and Dakar have the largest number of buildings in francophone West Africa. The electricity companies in these countries cannot afford to build new production units to support further growth. Owing to the average age of most buildings, the time has come to renew their fittings and equipment. It is therefore timely to introduce and promote new energy-saving technologies.

Through this project, a technical assistance grant of US\$ 4.5 million (US\$ 3.5 million from GEF and US\$ 1 million from parallel funding) will allow electricity consumption to be reduced from 240 to 170 kWh/m²/year in 200 large buildings in West Africa, representing over one million square meters. The effect of this reduction will be felt for at least twenty years. Considering that the electricity saved through post-project investments would have been thermally produced from fuel, the additional cost of one ton of carbon dioxide equivalent (tCO₂e) avoided is US\$ 1 to US\$ 3, depending on local conditions and the integration time applied. The cost of retrofitting is about 15 US\$/m², which translates to a cost of US\$ 5 to US\$ 15/tCO₂e. It should be noted that retrofitting is cost-effective and has a very short payback time (one to two years).

In technical terms, too, the project is appropriate to conditions in the subregion. Owing to differences in climate, the buildings in Abidjan and Dakar have different energy consumption patterns. The work carried out in Côte d'Ivoire has demonstrated the advantages and feasibility of technology transfer to other countries in the region. To achieve their final aims, these studies have to be locally reinforced, adapted and disseminated, first regionally and then internationally.

1. Problem to be addressed and the present situation

In taking stock of the current situation in the construction sector, a complete energy diagnosis of all private and public buildings was found to be essential before any action or investment priorities could be defined. However, three main obstacles to carrying out such a diagnosis were identified:

- Lack of available data on the characteristics and the state of repair of buildings and their equipment
- Lack of equipment to acquire and manage this data
- Lack of consistency between the investigation and analysis methods.

Heavy energy operating costs divert resources which could otherwise be used to maintain or replace technical equipment. Architects, engineers, and staff of the administrative services in charge of building regulations lack the skills to optimize the energy efficiency of the buildings they design, supervise or manage. It is therefore essential to complement their training, and to include in the basic curriculum specific components pertaining to the heat and energy characteristics of buildings.

Training alone will not be enough; institutional innovations must be introduced, particularly construction standards based on the energy performance of the building envelope, the fittings, and the equipment. Incentives in the form of tax and import duties should be introduced to encourage the import of energy-efficient materials and equipment, and to incite or oblige the public or private owners or property developers to place orders for better designed, better equipped buildings.

There seems no awareness of the financial advantages of assessing construction projects from the point of view of energy, as well as that of demand-side management (DSM). Given their key role in construction decisions, financial managers should also be a primary target for training.

In most places in the region, the market for non-residential buildings is too narrow to justify the creation of purely national technical capacities in the area of energy efficiency (for example in Bamako, Cotonou, Douala, Lome, Niamey and Ouagadougou). It is, however, desirable that all countries in the region should benefit from the results of the project. Developing a regional capacity is necessary to tap into the existing reservoir of energy-saving opportunities, especially in view of the growth of the construction sector in the coming decades.

Modifications to the institutional framework in order to bring about the desired improvements remain the individual responsibility of each country, but the task can be facilitated by a regional pooling of technical know-how and experience.

2. Expected end-of-project situation

The expected outputs can be grouped under two headings: the immediate outputs, and such long-term outputs as are made possible by these immediate outputs.

The significant reduction (20 to 60 percent) of the electricity required to service these buildings, which is mainly of thermal origin in the countries being considered, will mean that a relatively large amount of carbon dioxide emissions and other effluents will be avoided. The specific goal for Côte d'Ivoire has been calculated. The average energy consumption of the existing buildings is on the order of 240 kWh/m²/year. The goal is to reduce it to approximately 170 kWh/m²/year in the existing buildings by renovating them, and to approximately 120 kWh/m²/year in the new buildings through improved initial design. No buildings in the region currently conform to this level of performance.

As regards the development of beneficiary countries, the passive energy-efficiency techniques developed for air-conditioned buildings will also be applicable to non-air-conditioned buildings to improve the ambient conditions in them, thus improving the living conditions of those social groups that cannot afford air-conditioning.

Short-term outputs

- Databases of energy consumption will be installed in buildings in Côte d'Ivoire and Senegal
- Data on GHG emissions linked to energy consumption in buildings will be inferred from the preceding output
- Analysis and diagnostic methods will be established
- Technical capacity will be built and/or enhanced within public or private structures of the environment, energy and building sectors
- Decision-makers (administrators and property developers), operators (architects and engineers), and users of buildings will be trained, informed or sensitized
- Energy sector operators will be trained in integrated least-cost planning (LCP) and demand-side management (DSM) methods
- Operators of the banking sector will be trained in energy-related building project evaluation
- Identification and financing mechanisms for energy-saving building projects will be set up
- The institutional framework will be adapted to include the application of technical criteria (energy performance of materials, equipment and buildings), while economic

incentives (particularly tax and customs) will be introduced to encourage the use of energy-saving technologies

- Energy operation committees will be set up in the main buildings of Abidjan and Dakar
- Selected buildings will be retrofitted, and energy savings and cost-efficiency will be demonstrated
- Environmental efficiency will be evaluated and included as externalities in the cost-efficiency calculations used as a base for the retrofit programme
- Retrofit project portfolios will be prepared and made available to banks and donors; any additional costs will be assessed and submitted to the GEF in its post-Pilot Phase.

Long-term outputs

- Reduced GHG emissions at low incremental costs
- Less CFC emitted by air-conditioning systems
- Reduced local pollution by thermal electrical plants
- More energy efficiency in building design
- Greater thermal comfort in non-air-conditioned new buildings
- Reduced public and private electricity expenditures
- Improved balance of payments for the states owing to reduced oil imports.

3. Target beneficiaries

Target beneficiaries in the host countries

In order to ensure sustainability of the project's results, the major beneficiaries will be the institutions operating in the environment, energy, and building sectors, the national or regional funding institutions, and the electricity companies. Individual beneficiaries will include architects (who will be trained either directly or through the training of architects to educate their colleagues) and consultant engineers.

States

The budgets of the states will benefit from the reduction in electricity-related public expenditure. In exchange, the ministries in charge of economy and finance will have to create incentives, as well as the economic and financial mechanisms required for the proper implementation of the post-project phase.

Central administration entities

The technical and institutional capacities of the central administration entities in charge of the environment, construction and energy will be enhanced. In exchange, they will have to participate

in the implementation of the laws and regulations adopted by the governments to bring the project to a successful conclusion. These groups must also make the results sustainable by ensuring that they are applied in the long run.

In Côte d'Ivoire, the Department of Environment at the Ministry of Environment and Tourism, the Department of Construction and Sanitation at the Ministry of Construction and Urban Planning, and the Department of Hydrocarbons and Energies at the Ministry of Mining and Energy will be responsible for this activity.

In Senegal, the Department of Environment at the Ministry of Environment and Protection of Nature, the Department of Construction and Housing Planning at the Ministry of Construction and Urban Planning, and the Department of Energy at the Ministry of Energy, Mining and Industry will be the administrative entities responsible for implementation.

Services in charge of managing real estate public property

These services will have their technical capacities strengthened in matters relating to the efficient use of energy in buildings. In Côte d'Ivoire, the Department of Construction and Sanitation at the Ministry of Construction and Urban Planning will be a beneficiary. In Senegal, the Engineering Services, General Directorate of Buildings and Properties of the General Secretariat of the government, the Department of Construction and Housing at the Ministry of Urban Planning and Housing, and the Social Housing Aid Office (BASSO) will be the focus of this effort.

Building and public works laboratories

The intervention and communication capacities of these laboratories will be strengthened as they contribute to the implementation of the project's technical activities. The laboratories involved will be the Building and Public Works Laboratory (LBTP) in Côte d'Ivoire, and the Experimental Centre for Research and Studies on Equipment (CEREEQ) in Senegal.

These two laboratories are members of the ALBTP, which includes about twenty African countries. They will serve as a relay to disseminate the outputs to laboratories of other countries associated with the project under parallel funding.

Testing, certification and standardization organizations

As a supplement to the above-mentioned laboratories, the capacities of other structures could be mobilized and developed for the testing and certification of building equipment. The standardization institutions (CODINORM in Côte d'Ivoire and Institut Sénégalais de normalisation (ISN) in Senegal) will be closely associated in project implementation, and will benefit from the project's support, as well as from some of its outputs. This will contribute to the achievement of the institutions' objectives, such as codes, standards and regulations.

Training and research institutions

These institutions will take part in project execution and receive some support in the form

of supplementary equipment and operating assistance to provide training and carry out studies and research in project-related fields. These institutions include:

- Côte d'Ivoire: Ecole nationale supérieure des travaux publics (ENSTP) of Yamoussoukro (a national higher education institution for public works), the Ecole des sciences de la nature et de l'environnement (School for Natural and Environmental Sciences) of the University of Abidjan-Abobo
- Senegal: Ecole nationale supérieure universitaire de technologie, ENSUT (the national university-level institute of technology) of Dakar, the Polytechnic of Thiès (EPT), and the Institut des sciences de l'environnement (ISE—Environmental Sciences Institute) in Dakar.

Power companies

The project will develop demand-side management (DSM) and integrated least-cost planning (LCP) capacities in the field of buildings within power companies.

Funding institutions

The technical capacity of funding institutions will be strengthened in terms of project appraisal using DSM and LCP, in anticipation of the intervention of these institutions in future energy sector development projects.

Contractors and property developers

Contractors and property developers will be sensitized to the design and operation of energy-efficient buildings. They will also be involved in the results of pilot retrofitting operations for feasibility demonstrations, and in the operational outputs of the database on buildings.

Architects

The project provides for the supplementary training of architects in designing buildings with good energy efficiency and/or thermal comfort. Some of them will take part in the demonstration pilot projects.

Consultancy firms

Through training and participation in pilot projects, such firms will have the opportunity to improve their capacity for the analysis of energy efficiency and thermal comfort in building projects.

Suppliers and fitters of electrical equipment

Suppliers will improve their understanding of the impact of code specifications on the building materials and equipment market. It is also important that equipment fitters be sensitized to the need to install efficient equipment.

Maintenance companies

The project will improve the technical capacities of these companies in terms of equipment selection, operation of buildings, and third-party investment concepts.

NGOs

The project will strengthen the capacities of local and international NGOs involved in the study of the social and economic dimensions and impacts of the project. NGOs will also be involved in the training of operators, and in the dissemination of scientific and technical information. The project concerns the Association Ivoirienne d'étude et de développement de l'habitat économique (AIDHE) (association for the study and development of low-cost housing) and the energy unit of ENDA, an international NGO based in Dakar.

Project beneficiaries in other countries

To allow this project the best chance of success in the long-term, the regional approach is the most appropriate. The governments initiating this project have therefore requested the GEF to include other West African countries in the project. The outputs described above (Section B2) will be disseminated to the other beneficiary countries (to entities similar to those mentioned in Section B3); this will be covered by parallel funds.

Broad dissemination of the project's findings (in the form of documents detailing energy-efficiency codes, thermal comfort codes, operating guides, rules, standards, and others) through UNDP agencies will prove beneficial for all tropical countries confronted by similar problems.

General benefits

The global environment will benefit from the expected reduction of GHG emissions. In the longer run, the populations of the host countries, and those of other countries associated in the project, will reap benefits through the reduction of charges and an improvement in the indoor ambient conditions of buildings. Even the users of non-air-conditioned structures will benefit from a greater degree of thermal comfort in their buildings.

4. Project strategy and institutional arrangements

Strategies

Many development projects in Africa have failed to achieve all their goals due to underestimating, or not fully taking into account, all the institutional, technical, social and cultural constraints that could possibly arise. This project has taken these considerations into account, and is based on a few key principles:

- A broad range of interventions have been included to cover the project's scientific, technical, institutional, financial and economic aspects in order to prevent one defaulting component from jeopardizing the success of the entire project

- Local institutions and national personnel will be fully involved in all aspects of the project, taking responsibility and receiving supervision and training from international consultants with relevant field experience
- All parties involved in the project will be provided with an accurate and detailed description of the objectives, outputs, activities, tasks and roles entrusted to them
- A phased approach will be adopted, whereby the outputs of the various stages can be put to concrete, optimal use at each subsequent stage.

Implementation arrangements and organization of the project

This project is a regional, autonomous project in terms of its design, definition, structures, and objectives. The organizational chart (Annex 1) was established with a regional perspective. (Follow-up and evaluation procedures are described in Section H).

This project was not designed as parallel, identical and separate activities to be conducted in both host countries, but as truly cooperative and collaborative operations between the Côte d'Ivoire and Senegal project teams. It is aimed at finalizing the elaboration of the Ivorian codes, and at initiating and conducting similar exercises in Senegal, and in such other countries as may become associated with the project through cofinancing arrangements. Experts from both Côte d'Ivoire and Senegal will travel to each other's countries. The Steering Committee, within which both countries are equally represented, will oversee the coordination of all project activities.

The principle of a joint implementation team that includes experts from both countries, as well as support from UNDP, has been selected for several reasons:

- One of the main objectives of the project is to develop the capacities of the institutions in the region. In the area of energy efficiency in the building sector, however, there is no central institution within which the project could be positioned for development, but rather a large number of diverse institutions, associations and organizations working together to design, control, manage and rehabilitate buildings.
- The capacities of each of these key institutions need to be evenly enhanced in order to create an appropriate, durable base for future investments in building energy efficiency.
- The project is designed not to rest on any one single structure which would induce sectoral imbalances, but rather to develop the capacities of each entity in an optimal, balanced manner, taking into account its relative importance within the sector.

Implementation arrangements

A Steering Committee will monitor whether the project is proceeding in conformity with the objectives, methods, and budgets set forth in this document. It will approve the project's orientation and appraise its results. The Steering Committee will include:

- Host country governments
- Donors: UNDP/GEF representative and other donors' representative(s)
- Officers in charge of implementing the project: the representative of the Executing Agency and the Implementation Team (in an advisory capacity)
- Operators—the administrative, technical, and economic operators of each country will be represented by the chairpersons of the respective National Follow-up Committees
- Observers—representatives of the financing institutions and other entities which will be involved at the post-project phase, including the World Bank representative and the African Development Bank representative.

The Steering Committee will usually meet every six months upon notice by the chair.

Project entities

Management and implementation

The governmental agencies in charge of implementing the project are the environment departments in both countries; the National Project Directors are the Directors of the Departments of Environment in both Senegal and Côte d'Ivoire.

Project activities will be undertaken by the Implementation Team consisting of: the National Directors, in a supervisory capacity; one Regional Technical Advisor, based in Abidjan; one National Technical Advisor for Côte d'Ivoire (Abidjan); and one National Technical Advisor for Senegal (Dakar).

The preparatory mission emphasized that, in view of the host countries' capacity building requirements, the Implementation Team should consist entirely of national staff. This approach calls for only light technical assistance and institutional support during the project's implementation phase. Funds for this activity are provided under budget line 11.

The Regional Technical Advisor will operate in both host countries. He/she will run the secretariat of the project Steering Committee, and serve as liaison between the committee and the officers in charge of implementing the project.

Each National Technical Advisor (NTA) will coordinate the project's activities in his or her country under the supervision of the National Director. The NTA will be in charge of running the secretariat of the National Follow-up Committee in his or her country, coordinating the institutional actions, and overseeing the logistical aspects and the smooth running of the project's activities. In addition, the NTA will be responsible for some products and/or technical and/or institutional activities of the project.

Project activities will be executed by the Implementation Team, national or international subcontracting institutions, and national or international consultants. Among the subcontracting organizations, the NGOs will play a special role, in view of their knowledge of the field and their familiarity with the methods to be used to disseminate the outputs and sensitize the decision-makers and users about the aims of the project.

Some activities will be carried out by local administrative entities with the supervision and financial and logistical support of the project (finalization of rules and regulations, standards, administrative and financial procedures, and other activities).

Since the project includes several diverse activities, it will be useful, and even crucial, to introduce relays between the Implementation Team and the operators (consultants or subcontractors). These relays will be the "Main Operators"—subcontracting firms or consultants with experience in the project area operating in both countries. They will assume the special role of certifying the consistency and quality of the products under their responsibility, and will assist the Implementation Team in its tasks.

The costs of the Implementation Team support staff (secretaries, drivers, messengers, and possibly guards, depending on the nature of the premises in Abidjan and Dakar) will be covered by the GEF inputs.

National Follow-up Committees

These committees are required in view of the diverse implications of the project's outputs for the various industrial sectors in the host countries. They will be advisory bodies which will make it possible both to inform the building, energy, and environment sectors on the progress of the project's activities, and to reflect the views of the operators in these sectors on the technical, social, and economic implications of the project.

The committees will include, at the national level, the major public and private operators interested in the project: administrative departments, building laboratories, testing structures, certification agencies, standards bureaus, training structures, electricity companies, professional societies (architects, engineers, property developers, buildings managers, contractors, equipment suppliers, and others). In keeping with the custom for such committees, the chair will be elected by his or her peers. The committees will usually meet twice a year upon notice from the chair.

Evaluation and review

See Section H (Project Review, Reporting and Evaluation).

Procedures for procurement of goods and services

These procedures will comply with those usually applied by UNDP and the Executing Agency. The latter will recruit the staff and consultants, and award contracts to the subcontractors, in agreement with UNDP and the governments of the host countries. The consultants and subcontractors will be selected primarily from local specialists and institutions with adequate

capacities to participate in the project. Where national capacities are not available in a specific area, international consultants or subcontractors will be called upon.

5. Reasons for GEF assistance

The environmental scope of the project, its originality, and its illustrative nature at the regional level make it eligible for support by the GEF. UNDP was selected by GEF Participants to implement technical assistance projects such as this one because of strengths such as:

- Its network extending throughout the host countries and in other beneficiary countries, and the experience of its field offices in project implementation
- Its experience in the areas of environment, development, energy and housing
- Its experience in the field of training and local capacity building
- The current orientation of its actions in favour of sustainable development.

The Office of Project Services (OPS) is the executing agency for UNDP. OPS specializes in the execution of development projects, and has extensive experience in executing regional projects in Africa. This project is designed to use the current technical expertise identified in both host countries by the preparatory missions. The subcontracting public entities and parastatal organizations have been identified, as have their respective detailed mandates. OPS is therefore expected to provide support services (procurement of equipment) and management services, rather than technical expertise. The technical support will be provided by the Implementation Team and the Main Operators.

6. Special considerations

One of the project's goals is to develop national and regional capacities. Local, recognized institutions will therefore be given priority in the selection of contractors.

The desire expressed by the host countries to involve other countries of the region in the project, and the limited resources of the GEF, point to the need for parallel funding. Other documents to supplement this Project Document will be prepared as soon as such funding sources are identified.

One of the outputs of the project will be the establishment of a data exchange network on the structural and architectural characteristics, as well as the energy consumption of buildings. This network will link Côte d'Ivoire, Senegal, and the other associated countries. The network, which could be used for exchanging other types of data, should be linked with the Prism Network, the future network envisioned for the AfDB African Energy Programme, and the UNDP Sustainable Development Network (if implemented).

7. Coordination arrangements

Links will be established between this project and the efforts undertaken by other cooperation agencies in the field of environmental protection, with each of these entities retaining entire control over their own activities. In particular, this project will be closely coordinated with other GEF

projects in Côte d'Ivoire, such as the UNDP project providing support to the National Environment and Natural Resources Management Programme of Côte d'Ivoire (under preparation). In Senegal, the project will be linked with the projects directed by the Conseil supérieur de l'environnement et des ressources naturelles (CONSERE). Linkages will be established with other projects involving the host countries in the areas of energy (for example, the AfDB African Energy Programme) and the rehabilitation of public buildings. The agreements regarding parallel financing to complement GEF core funding will be drafted between the governments and the donors with support from UNDP, in conformity with the project's objectives and strategies.

8. Counterpart support capacity

During the preparatory stage of the project, the various public and private operators concerned clearly demonstrated their interest in the project. In Côte d'Ivoire, extensive mobilization has already been achieved for the preparation of various standardization documents, in particular, a first draft of the code on energy efficiency in buildings within the ESMAP framework. Similar participation can be expected in Senegal, based on the views collected from the operators, and the seriousness of energy and environmental problems in the country.

The governments, and in particular the qualified national institutions, are in a position to provide counterpart staff for the international experts and consultants who will be recruited for the project. In view of the severe crisis affecting public finance in both host countries, no direct financial contribution can be expected from them. The project will, however, benefit from the existing institutional and technical framework provided by the relevant government services.

The Ivorian government finances studies and investment in the area of energy efficiency in buildings out of its Special Investment and Equipment Budget (BSIE). Such studies and investments will be inputs for the project to the extent that they support demonstration activities, and will later provide training sites for project operators.

The Government of Senegal makes important appropriations to the National Energy Fund on its Consolidated Investment Budget (BCI), which provides yearly funds for studies, as well as for investments in energy efficiency.

C. DEVELOPMENT OBJECTIVES

The primary strategic objective of the project in the long-term is the reduction or stabilization of GHG emissions associated with thermal electric power generation in West Africa through the large-scale application of energy-efficiency measures in new and existing buildings, and in the equipment and materials used for these buildings. Although the project's main benefits are environmental, it will also provide the following advantages for the host countries and for any associated countries:

- *Economic benefits.* Reduction in energy bills and decrease of public or private electricity expenditure. This will contribute to improving the macro-economic and fiscal situation of the states, as well as the financial results of the private and semi-public companies operating large buildings in West Africa (banks, hotels, and so on).

- *Institutional benefits.* Tangible advantages in this area are likely to encourage the governments to pursue the implementation of policies promoting energy efficiency, and to ensure the sustainability of the achievements of the project. By associating the financial sector with its efforts, the project aims to bring about a radical change in energy practices in the construction sector in Africa.
- *Social benefits.* The passive energy-efficiency techniques developed for air-conditioned buildings will be applied to non-air-conditioned buildings to improve indoor conditions. This will improve living conditions for the population and contribute to the goals of sustainable human development.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

The project is centred on five immediate objectives:

- Technical capacity building
- Institutional capacity building
- Demonstration of the feasibility of energy-efficient retrofitting and design of buildings
- Project portfolio for further investments (for the post-project phase)
- Publication of outputs and regional dissemination.

Each of the objectives corresponds to outputs which will provide concrete, measurable results. Each output is itself the result of one or more activities. In addition to the specific activities related to the project's outputs and objectives, there are general activities concerning the implementation of the project which are described below, under Output 6.1.

IMMEDIATE OBJECTIVE 1

Technical capacity building.

Output 1.1

Energy data on buildings.

Main Operator: LBTP (CI).

Operators: LBTP (CI)
 CEREEQ (SN)
 Direction de la construction et de l'assainissement (DCA) (CI)
 Direction de la construction et de l'habitat (DCH) (SN)
 DHE (CI)
 Direction de l'énergie (Ministère de l'énergie, des mines et de l'industrie (DE/MEMI) (SN)
 EECI
 SENELEC
 Private contractors in both countries
 National consultants.

The aim is to set up, on the premises of the LBTP of Côte d'Ivoire, a databank/server centre to collect and analyze energy data, on a national and regional basis using the communications capacity installed by the project.

The Department of Environment will be equipped with similar material, in view of its expected position as a central node in the future national environmental data exchange network. DCA, DHE, EECI, the World Bank and AfDB will be connected to this network.

Similar centres are planned in Dakar, at the CEREEQ, at the Department of Environment, at the departments in charge of construction and energy, and at SENELEC.

The Buildings and Public Works Laboratories were chosen for data gathering and archiving for several reasons:

- The data to be processed by the project will come from the public sector (administrative buildings), as well as the private sector (banks, hotels, and so on). Since the countries became independent, LBTP and CEREEQ have had valuable experience in public and private customer management, and in maintaining confidential records.
- The missions assigned by the Ivorian government to LBTP include survey and study activities in the fields of construction and energy. LBTP is the only institution with this knowledge.
- LBTP already has a computerized system for optimizing electrical billing in the Ivorian public sector, matched with a database concerning the consumption of the whole sector (10,000 delivery points, 330 GWh/year).
- The change in status of LBTP to a semi-public company, as of 1 October 1993, is part of the privatization policy adopted by the Ivorian government. This policy was implemented with the help of the international community, particularly the World Bank and UNDP—two of GEF's three implementing agencies. The choice of LBTP supports this privatization policy.
- CEREEQ in Senegal is a public institution with industrial and commercial features. It also has longstanding experience in conducting studies and civil engineering surveys for private customers. The project will help CEREEQ create new capacities, and/or strengthen its present capacities, in the field of energy in buildings so that it becomes fully capable of carrying out some of the project or post-project activities.
- LBTP and CEREEQ are perfectly integrated into the national network of operators in the construction, energy and environment sectors. This will facilitate the connection of national structures to the databanks/server centres, and their participation in data gathering activities.

- LBTP and CEREEQ have cooperated closely for a long time, and are both members of the African Association of Construction and Public Works Laboratories (ALBTP), which brings together all the laboratories of francophone Africa, thus providing a suitable forum for the regional dissemination of project outputs.

The adaptation and extension of the scope of application of the LBTP database, and the preparation of a standardized diagnosis methodology will provide both the public and private sectors (technical departments in charge of construction, energy, environment and planning, ministries of finance, banks, development agencies, and trade unions) with objective, standardized elements to assist in the decision-making process in the area of energy efficiency in buildings.

To achieve this objective, several interrelated activities are planned: designing and coordinating the activities required for this output, acquiring supplementary equipment for the operators concerned, setting up a framework, and defining a standardized methodology, as well as gathering and using data to carry out the required diagnoses.

The raw data collected will be confidential, and will remain the property of the private or public owners of the buildings concerned, who will have free access to their own data. As regards access of third parties, the raw or processed data will only be released, presented, or published with the prior consent of the owners of the data.

The procedures to access data during and after the project will be ruled by agreements between the operators. These agreements will be drawn up during project implementation, with the technical and institutional support of the project, within the framework of Immediate Objective 2.

The results constituting this output will be the property of the implementing agencies (the project's National Directors), who will be under obligation to ensure broad dissemination of the data to users. This requirement will also apply to all other project outputs. The activities leading to this output will occur over the entire three-year duration of the project. The technical consistency between and within activities, and between activities in different countries, will be supervised by LBTP, within the framework of its subcontract.

Activities for Output 1.1

- 1.1.1 The supplementary equipment needed will be provided to the laboratories and agencies involved. Operational support will also be provided to the administrative units involved in data acquisition.
- 1.1.2 A diagnostic methodology will be prepared. The aim is to design a standardized survey package to be used when visiting a building in order to:
 - Carry out various aspects of the investigation required by the Energy Efficiency Code, ensuring coordination between these aspects

- Determine the status of the building using the code requirements
- Allow computer processing of the data collected.

This preparatory phase will be followed by a training period for national auditors. The existing database will then be expanded to increase the capabilities of the database in Côte d'Ivoire by integrating the technical characteristics of buildings and equipment, as defined by the methodology described above. The expanded database will be connected to the project's headquarters and the counterpart agency in Senegal.

- 1.1.3 A general database will be established with the specifications of the buildings and their equipment: structural materials, fittings, energy-related equipment, and the costs of material and equipment. This activity, to be carried out from the very beginning of the project, depends to a certain extent on the market study (Output 2.1, and Activities 2.1.1 to 2.1.4).

Field data will be collected regarding specifications (including architecture) and the state of buildings in terms of repair, equipment and energy consumption. For this purpose, a team of national auditors, trained to use the tools described above, will be set up in LBTP and CEREEQ. The training will be completed by support provided during on-site investigations.

Data will be collected in close collaboration with owners, building managers, and their staff, and particularly the staff from the ministerial departments in charge of construction in the host countries. Technical assistance will be provided to support the teams established.

- 1.1.4 Diagnoses and training will be synthesized. For each building, the collected data will be analyzed, and a list of functional improvements, operational needs, and equipment upgrading requirements will be established. This activity will be carried out by the national auditors who took part in Activity 1.1.3, with the support of consultants.

One of the objectives will be to prioritize needs according to their cost and efficiency, and to define national investment and functional improvement programmes to be financed and implemented under the post-project phase (see Immediate Objective 4).

Output 1.2

Improved operation of buildings.

Main Operator: DHE (CI)
DE/MEMI (SN).

Operators: LBTP (CI)
CEREEQ (SN)
DCA (CI)
DCH (SN)
Private owners in both countries
National consultants.

The experience of industrialized countries and some developing countries, such as Jamaica and Côte d'Ivoire, shows that substantial savings can be achieved simply by managing buildings in a more energy-efficient manner. In Côte d'Ivoire, for instance, simulations have shown that such measures alone could easily result in savings of over 20 percent of the yearly electricity consumption. Moreover, the measures aimed at improving the operation of equipment are among those with the best cost-to-savings ratio. They include optimizing:

- The times of operation of equipment according to the period of occupancy of the buildings and their thermal inertia characteristics
- The temperature specifications (ambient indoor temperature, cold water outlet temperature, and ventilation temperature)
- The air renewal rates.

To extend these types of savings to all buildings, this project will place particular emphasis on training, sensitization, and involvement of building owners, managers and operators.

The activities leading up to this output will take place during all three years of the project. The technical consistency between and within activities, and between activities in different countries, will be supervised by the DHE (CI).

- 1.2.1 Trainers and organizers will be trained. The aim of this activity is to strengthen the national capacities in disseminating knowledge, and leading the activities described in 1.2.2, 1.2.3 and 1.2.4.

State technical managers and national consultants with previous experience in supporting energy-operating committees will be associated with this training activity.

- 1.2.2 Self diagnosis: the operators and managers will be provided with guidelines allowing them to carry out simple checks and measurements, analyze the results, draw conclusions, and apply the immediate corrective actions by themselves.

The first phase of the activity will consist in drafting a self diagnosis methodology, which will then be circulated in the framework of workshops and case studies by the trainers trained in Activity 1.2.1. The second phase will be dedicated to the regular follow-up of the results achieved by trainees in their various agencies.

- 1.2.3 Setting up and assisting energy-operating advisory committees. For any sustainable energy-saving action to be successful, the various operators involved in the use of energy and the financial management of the building in question must feel concerned and responsible. This is true for public as well as private buildings. The best way to bring this about is to promote cooperation between the building operators by involving them in an energy-operating advisory committee, which will meet regularly to determine the tasks and objectives for each party and assess the results. Approximately fifty such committees are planned for Côte d'Ivoire, and thirty for Senegal.

The energy-operating consultative committees will meet regularly (one day a month or every three months, according to the size of the building and the extent of measures to implement). Such meetings are usually prepared and led by an outside specialist who provides the committee with a work method, as well as an unbiased and disinterested point of view.

This activity will be entrusted to national consultants, previously trained (Activity 1.2.1.) and supervised by the Main Operator, at least in the initial stages. Financial resources will be budgeted to help launch these committees.

1.2.4 Incentive clauses will be finalized. Financial incentives in energy savings for maintenance companies will fulfill several objectives:

- Technical and financial efficiency: the maintenance operator will be paid in proportion to the savings he or she has brought about, and the owner will benefit from this efficiency without having to invest any additional funds
- Institutional efficiency: if the context is favourable (fully guaranteed long-term maintenance contracts), the incentive clause can encourage an operator to invest his or her own money in energy-saving equipment, so as to recover the investment through savings on future electricity bills.

The incentive clause should be handled with caution. A detailed survey of the building should be drawn up with both parties present in order to define the contractual criteria and their scope. An external consultant usually has to be called upon to support the owner at this stage. At a later stage, the consultant should return to check the correct application of the clause, and calculate the financial share earned by the operator.

The clause already tested in Côte d'Ivoire will be extended to the relevant buildings in both host countries. For this purpose, technical improvements will be made to the existing clause. The Main Operator will also assist national consultants and the administrative staff trained under Activity 1.2.1 in implementing the clause for the first buildings, and follow their results.

Output 1.3

Energy Efficiency Codes for buildings.

Main Operator: ENSTP (CI).

Operators: ENSTP (CI)
ENSUT (SN), EPT and CEREEQ (SN)
DHE (CI)
DE/MEMI (SN)
DCA (CI)
DCH (SN)
CODINORM
ISN
Consultants.

The Energy Efficiency Code is designed for air-conditioned buildings. It defines the rules of the art and the minimum energy performance criteria required of the building equipment and structure. Such codes are widely and successfully used in many countries. A first draft of an "Ivorian Energy Efficiency Code for Buildings" applicable to new or retrofitted air-conditioned buildings was designed within the framework of the ESMAP project, and was officially presented to national operators in March 1993.

To achieve the objective of this project, the code must be effectively applied in Côte d'Ivoire. A broader code must then be developed and implemented at the regional level. Since the calculation methods used in a regional code are the same everywhere, the only adaptations required will be to suit different climatic conditions (requiring the creation of regional climatic databases) and the different ambient indoor conditions set by national regulations. The groundwork for the regional code will not therefore need to be repeated. A regional code will facilitate the development of a regional market of energy-efficient materials and equipment.

The activities leading up to this output will occur during all three years of the project. The technical consistency between and within activities, and between activities in different countries, will be supervised by the ENSTP. The regulations and relevant institutional texts will be prepared by the competent administrative entities of each host country (see Immediate Objective 2 and Output 2.3).

Activities for Output 1.3

1.3.1 The Ivorian Energy Efficiency Code will be finalized. The main remaining tasks for this activity are described below.

Development of the code

- Carrying out further studies on the envelope, lighting, air-conditioning and energy operation of the building
- Drafting the chapter on the hot water system
- Completing various guides and implementation forms of the code
- Checking their compliance with the rules of construction already applied in Côte d'Ivoire
- Calibrating and comparing various thermal and energy CAD software programmes
- Designing an overall method for energy analysis in buildings.

Carrying out these tasks will require further economic studies to refine the code criteria, as well as the definition of new types of buildings (such as hotels), which will necessitate the completion of earlier market studies on materials and equipment (Activity 1.2.1).

The study of the overall buildings analysis method will require that national consultants be given the training required to use the simulation programmes. Taking into account the attrition of trained staff, at least four specialists in each host country should be trained for this activity.

For the technical aspects, the teams that carried out the initial work in Côte d'Ivoire will be called upon for support. A Senegalese consultant will work with the Ivorian teams to facilitate the transfer of expertise and outputs to Senegal. Progress will be monitored regularly by the representatives of international and/or regional scientific and technical assistance groups.

Implementation of the code

- Carrying out a public enquiry on the code, as prepared, to collect the suggestions and proposed amendments of all parties concerned.
- Testing the code by applying it to several building pilot projects.
- Training the construction operators to understand the code specifications, their impact, and adaptation procedures. This process includes a series of workshops for architects, engineers, suppliers, contractors, and others.
- Introducing compulsory application of the code in all public building projects, whether new or retrofitted.
- Training decision-makers in the administration, and the staff of banks and power companies.
- Introducing the code in the procedures of building permit delivery and identifying necessary revisions in the applicable regulations.

Impact assessment

- Training environmental personnel to assess the impact of code application on the global environment in terms of achieved GHG reduction, and the cost of one ton of carbon dioxide equivalent (tCO₂e) avoided with different integration periods
- Impact assessment of code implementation on depletion of the ozone layer through the reduction of CFC emissions
- Impact assessment of code implementation on the local environment.

1.3.2 A regional Energy Efficiency Code will be drafted. This activity will bring together all the preliminary code preparation efforts carried out in Côte d'Ivoire in the framework of the ESMAP programme, as well as all the activities described above. These endeavors include:

- Setting up a climatic database in Senegal
- Drafting a standard on indoor ambient conditions for public buildings, or buildings open to the public in Senegal
- Carrying out energy and economic studies on selected buildings
- Drafting sections of the code and implementation guidelines specifically suited to the conditions in Senegal, in keeping with the results of parametric studies
- Revision of texts by a Revision Committee including international and/or regional specialists.

The workload should be reduced because many of the results obtained in Côte d'Ivoire will be easily transferrable to Senegal, particularly in the northern climatic zone of Côte d'Ivoire, which shares the climatic features of some zones in Senegal. The approach followed in Senegal could later be applied to other countries in West Africa, allowing these countries to draft their own specifications regarding outdoor conditions (climatic data) and indoor ambient conditions (national comfort standards).

- 1.3.3 Operators will be trained. This essential activity is the prerequisite for effective implementation of the code. It concerns both the administrative personnel in charge of supervising code application, and the operators in charge of implementing the code: property developers, architects, consulting engineers, control officers, builders, suppliers, and others.

In view of the size of the target group, and because this form of training is ongoing, the first action should be to train national trainers in institutions such as ENSTP, ENSUT or EPT, using the technical team that drafted the codes. These trainers will further instruct different social and professional groups. The minimum number of people to train (architects and design or control engineers in the administration) is estimated at around 150 in Côte d'Ivoire and 120 in Senegal.

The necessary budget for the instruction of trainers in this first group of operators is entirely covered by GEF funding, as well as the corresponding budget for sensitizing decision-makers. For the supplementary budget for dissemination of the training to all the operators (private design offices, property developers, and others), structures such as the Development Fund for Vocational Training in Côte d'Ivoire and its counterpart in Senegal will be approached.

Output 1.4

Thermal Comfort Codes.

Main Operator: ENSTP (CI).

Operators: LBTP (CI)

ENSUT, EPT and CEREEQ (SN)
DHE (CI)
DE/MEMI (SN)
DCA (CI)
DCH (SN)
CODINORM ISN
Consultants.

The Thermal Comfort Codes concern buildings that are not air-conditioned, or are air-conditioned only periodically. To design and apply such codes, the technical and scientific principles of the thermal and energy behaviour of buildings are much the same as those required for the energy quality codes described above.

Urbanization and modernization of habitat have both expanded rapidly over the last two decades. Unfortunately, the so-called "modern" urban habitat is often poorly suited to the climate and to the social and cultural habits of the population. The thermal conditions in buildings, especially those without air-conditioning, are poor. Since the majority of the population cannot afford air-conditioning, this situation leads to physical discomfort and increased fatigue. These conditions have real consequences for the social and economic development of the country (see Section C). Moreover, some buildings in the tertiary sector systematically use intermittent air-conditioning, which should be avoided because it increases national energy consumption.

For all of these reasons, studies have been carried out for several years in Côte d'Ivoire, Senegal, and several other tropical countries to define the living standards for bioclimatic habitat in dry or humid tropical zones (Réalizations expérimentales en coopération (REXCOOP), Agence Française pour maîtrise de l'énergie (AFME), ESMAP, doctoral theses, and so on).

Within the framework of the present project, the aim is to prepare a synthesis of existing works and draft a regional code of non-air-conditioned habitat. The drafting and implementation procedures for this code will follow closely those used for air-conditioned buildings.

The activities leading up to this output will take place during the entire three-year span of this project. The technical consistency between and within activities, and between activities in different countries, will be supervised by the ENSTP within the framework of its subcontract.

Activities for Output 1.4

1.4.1 The Ivorian Thermal Comfort Code will be created. The main tasks to be carried out for this activity are described below.

Development of the code

- Carrying out further studies and research on the envelope and lighting
- Drafting guidelines and code implementation forms

- Drafting the code, taking into account the opinion of all the operators, and the existing building regulations.

Implementation and impact assessment

The approach will be the same as that defined in Activity 1.3.1.

- 1.4.2 The regional Thermal Comfort Code will be created. The main tasks to be carried out for this activity are described below.

Development of the code

- Preparing the regional draft code
- Studying the aspects specific to Senegal, as well as the contexts of other West African countries
- Developing guidelines and code implementation forms (common and special rules) in both host countries, and in other associated countries under parallel financing arrangements.

Implementation of the code

Implementation of the regional Thermal Comfort Code will follow the same main phases defined for the implementation of the regional Energy Efficiency Code for air-conditioned buildings.

- 1.4.3 Training for operators. This will follow the same principles applied in Activity 1.3.3 and concern the same operators.

IMMEDIATE OBJECTIVE 2

Institutional capacity building.

Output 2.1

Markets will have been studied and improvements proposed.

Main Operator: International consultant specialized in market studies in the construction sector.

Operators: National consultants.

To develop programmes for mastering energy in buildings, the market has to have regular supplies of energy-efficient materials and equipment. The prerequisite for this situation is to know and characterize the existing market, including the goods and services available.

The potential of the market must be analyzed in the context of promoting energy-saving measures. Once this analysis is complete, actions can be proposed so that energy-efficient materials and equipment can gain access to the market.

Activities 2.1.1 to 2.1.4 will be carried out in both host countries at the beginning of the project by a national consultant under the supervision of the Main Operator. These activities will be extended later to other beneficiary countries under parallel financing arrangements. The market studies in both host countries will be funded by the GEF.

2.1.1 A market study for building materials will be conducted. The materials to be studied include: structural materials (weight-bearing, filling and covering materials) and fittings (insulation, woodwork, glazing, solar protection, and others).

The activities will be conducted in three main areas:

- Existing and potential markets: size, supply mechanisms, price structure, constraints, and other characteristics
- Assessment of the positive or negative impacts of regulations (applicable standards, implementation procedures, public or private contract specifications, and other requirements) on an energy-efficiency policy
- Proposed measures leading to the general use of energy-efficient materials (incentives relating to the standards, regulations, customs, tax, costs, certification, labels, and other aspects), particularly their present status and any existing proposals.

2.1.2 A market study for building fittings will be conducted. The fittings concerned are air-conditioning equipment, and lighting and other electrical fittings. The study will include the same three areas defined in Activity 2.1.1.

2.1.3 A market study for maintenance will be conducted. This will analyze the market capacity to receive and maintain energy-efficient fittings. The study will include the same areas defined in Activities 2.1.1 and 2.1.2.

2.1.4 Activities 2.1.1 to 2.1.3 will help identify the needs and priorities for building the capacity to test and certify materials and fittings. This activity will define the means required to build or strengthen capacity in the priority areas. The projects and corresponding budgets will be prepared in view of obtaining funds for capacity building.

Output 2.2

Capacities in demand-side management (DSM) and integrated least-cost planning (LCP) of electricity supply in buildings will have been developed.

Main Operators: DHE (CI)
 DE/MEMI (SN)

EECI (CI)
SENELEC (SN).

Operators: Specialized organizations of industrialized countries
International consultants.

To be truly efficient in the long term, actions to master energy must be part of a global energy policy based on the analysis of electricity demand in buildings and on the matching integrated supply planning. The methods applied so far at the local level have focused only on the supply side, leaving aside any action on consumption. It is now important to encourage in key national and regional institutions the promotion of DSM and LCP.

The activities leading up to this output will take place over the entire three-year span of the project. The technical consistency between and within activities, and between different countries, will be supervised by the Main Operators.

Activities for Output 2.2

2.2.1 National capacity will be increased. In the first place, the needs of public and private institutions—power companies, governing authorities, and regional development banks—will be assessed. Planners from a governing administration, from the power companies of the host countries, and two or more persons from the AfDB will be trained. Training will take place in both the specialized international institutions and locally.

The corresponding budget is totally covered by GEF, except non-tuition costs for the AfDB representatives. The latter will cover travel costs, DSAs, and other expenses.

Training will be in DSM and integrated LCP. These two approaches are now well-mastered by the power companies in most industrialized countries. There are many experiments with LCP and DSM. The electrical utilities, research centres, regulation offices, and consulting firms in industrialized countries have extensive documentation on the subject, as well as teaching aids. The project will use experts from these organizations to lead training sessions in Côte d'Ivoire and Senegal, and to adapt the teaching material to local contexts. Subject to the availability of resources, the project will sponsor the participation of national experts from Côte d'Ivoire and Senegal in international conferences and workshops on LCP and DSM.

2.2.2 DSM scenarios will be prepared. In view of the long-term nature of the expected effects of the project, it is necessary to analyze the quality of the demand structure with different assumptions regarding the social and economic evolution of the countries involved in the project.

Under the supervision of the trainers, trainees from each country will design DSM scenarios for buildings. The scenarios will be studied and presented jointly by different operators of the local electrical sector: electrical utilities, governing authorities and regional development banks.

Output 2.3

Finalized procedures and institutional texts will have been prepared.

Main Operators: Implementation team.

Operators: DCA (CI)
DCH (SN)
DHE (CI)
DE/MEMI (SN)
DE (CI)
DE/MEPN, ISE (SN)
CODINORM ISN
NGOs (CI)
NGOs (SN).

Rules, regulations, and standards are required to strengthen the institutional framework to support the project. Drafting these texts is part of the activities already defined under Outputs 2.1 and 2.2. Their adoption and implementation requires the support and participation of staff in the concerned administrative entities. The coordination and preparation of the institutional regulations as laid down by the project will be carried out by the National Technical Advisor of each country.

Support will be provided to the governing administrative entities in the construction, energy, and environment sectors and to standardization organizations to enable them to draft the rules and regulations within the time frame of the project (convening meetings, collecting and distributing information, supplies, and so on).

Activities for Output 2.3

- 2.3.1 Regulations in the field of construction will be prepared. They will be drafted by the competent administrations with the help of the project and will refer to the other regulations in effect in the host countries.
- 2.3.2 Regulations in the field of energy will be prepared by the competent administrations with the help of the project. These regulations will be drafted in compliance with national Energy Plans adopted by the beneficiary countries.
- 2.3.3 Environment-related regulations will be drafted. The regulations pertaining to global warming will be drafted by the competent administrations with the help of the project. These regulations will comply with the United Nations Framework Convention on Climate Change (FCCC) adopted in Rio de Janeiro, and the ensuing decision-making mechanisms.
- 2.3.4 The mandatory standards in the energy and construction fields will be designed in close collaboration with the national organizations in charge of standardization, with support from the project. They will need to comply with other regulations in effect in the host countries

and, if possible, be as close as possible to ISO standards, European standards, and/or AFNOR standards in order to facilitate regional integration.

- 2.3.5 The human factor plays an important role in a project that hopes to achieve certain behavioural changes in the relationship between people and their habitat. The various target groups involved will therefore need to be reached through local NGOs who will conduct awareness-raising activities aimed at consumers and decision-makers. Informational presentations will promote the philosophy and characteristics of the project, and the need to abide by the provisions of the new institutional framework.

IMMEDIATE OBJECTIVE 3

To demonstrate the feasibility of energy-efficient retrofitting and design of buildings. Whether for retrofitting old buildings or for designing new ones, the core funding required for energy efficiency during the post-project phase will result from a classical economic analysis. Further environmental funding, if any, by GEF (in its post-Pilot Phase) or from other sources would only concern incremental costs. These investments would only be necessary if cost efficiency was not achieved, provided these incremental costs were justified by an environmental advantage (for example, such a cost could be the price for the international community to avoid one tCO₂e).

The cost of the pilot phase of this GEF project must be considered as the initial incremental cost necessary for creating the capacities required to establish the post-project phase on a sound and sustainable basis.

This objective demonstrates the advantages of investment in energy-efficient building technology compared to other ways of avoiding or trapping GHG emissions. Pilot projects are designed to demonstrate the environmental, economic, financial, and technical efficiency of the project as regards energy retrofitting of existing buildings and the design of new ones. They are also a way of testing the actual capacities of operators, and the efficiency of the institutional mechanisms. They are a demonstration of the applicability of the Energy Efficiency Code, and they provide the first experience needed for its revision.

The activities leading to the output under this objective will take place during the last two years of the project.

Output 3.1

Retrofitted buildings.

Main Operators: DCA (CI)
Private owner (SN).

Operators: LBTP (CI)
CEREEQ (SN)
International and national consultants.

Activities for Output 3.1

- 3.1.1 One representative building is to be retrofitted in each country: one public building in Côte d'Ivoire, and one hotel in Senegal. This activity will include selecting the pilot buildings, performing their energy audits, setting the energy-saving objectives to be reached, conducting the technical studies, arranging the financing, and monitoring and evaluating the programmes.

In the framework of this activity, innovative financial mechanisms, particularly third party investment, will be tested. The basic projects will be funded by the building owners, or by third party investors. The incremental costs of energy-efficient measures will be covered by the GEF project. If the planned GEF budget is exceeded, other sources will need to be found.

Output 3.2

Retrofitted buildings.

Main Operators: DCA (CI)
Private owners (SN).

Operators: LBTP (CI)
CEREEQ (SN)
National and international consultants.

Activities for Output 3.2

- 3.2.1 Equipment retrofitting operations will be undertaken. The cases selected for the project are air-conditioning in Abidjan, and lighting in Dakar. This choice was guided by the respective importance in Côte d'Ivoire and Senegal of the two issues, and also by the fact that the GEF budget will only allow funding of one case study per country, in view of the demonstration purpose of this output.

This activity includes the selection, study, and processing of one or several types of equipment of particular demonstration value, such as cooling towers, air-conditioning, equipment and control systems for lighting, and so on.

Depending on the results of the selection, the project will cover the costs of the entire retrofitting, or only the aspects related to energy efficiency. The basic project will be funded by the owners or by third party investors. The project may only cover incremental costs, in which case alternative funding sources may have to be sought, possibly from the financial market.

Output 3.3

New buildings designed according to code specifications.

Main Operators: Public or private architects.

Operators: LBTP (CI)
CEREEQ (SN)
DCA (CI)
DCH (SN)
National and international consultants.

Activities for Output 3.3

3.3.1 and 3.3.2

Designing buildings according to the Energy Efficiency Code and the Thermal Comfort Code.

These two activities are linked, and will require close collaboration with architects in each host country. The activities involve listing new projects, selecting pilot programmes, carrying out energy analyses, and submitting proposals to bring the programmes into compliance with the appropriate code.

As there are very few plans for large new buildings during the three years spanned by the project, the intention is to study:

- Most of the buildings to which the Energy Efficiency Code for air-conditioned buildings is applicable, as regards designing new buildings in the tertiary sector
- Most of the buildings to which the Thermal Comfort Code of non-air-conditioned habitat is applicable, as regards designing new buildings in the residential sector.

The training that architects will have received under Immediate Objective 1 will be applied to the building projects under consideration. Light follow-up and technical support will be provided to them in the study phase.

The additional costs of the studies and the costs of technical assistance will be charged to the GEF (within the budget limit) and to other possible financial sources from other donors or private owners, so as to carry out clearly identified additional actions.

IMMEDIATE OBJECTIVE 4

Future investment projects will be facilitated. The fundamental objective of the project is to set up the sustainable technical and institutional capacity required for fulfilling investment projects. The GEF project will not achieve its objectives if the funds necessary for future investment are not forthcoming.

The files demonstrating cost efficiency will be submitted to the international and regional donors (World Bank, AfDB, and others) and the multilateral (EDF) and bilateral donors (Caisse

Française de développement, and others). Environmental incremental costs (see Immediate Objective 3) will be submitted to GEF in its post-Pilot Phase, or to GEF member countries in the form of parallel funding.

The actual retrofitting operations will be a post-project activity, but some studies can start earlier as a launching and demonstration action if financing is available. Whether in the public or the private sector, the decision to actually launch retrofitting operations will remain with the building owners.

Further retrofitting operations will not be possible without the technical and institutional capability set up by the project. The corresponding programmes will use the information provided by the databases (Immediate Objective 1), the institutional mechanisms (Immediate Objective 2), and the results of pilot programmes (Immediate Objective 3).

Output 4.1

Investment project portfolio for public buildings.

Main Operators: DCA (CI)
DCH (SN).

Operators: LBTP (CI)
CEREEQ (SN)
National and international consultants.

Activities for Output 4.1

4.1.1 A project portfolio for investments in public buildings will be compiled.

Output 4.2

Investment project portfolio for private buildings.

Main Operators: LBTP (CI)
CEREEQ (SN).

Operators: Private owners (CI and SN)
National and international consultants.

Activities for Output 4.2

4.2.1 An investment project portfolio for private buildings will be compiled. Retrofitting for energy savings would be justified for approximately seventy-five public buildings and fifty private buildings in Côte d'Ivoire and Senegal. Activities 4.1.1 and 4.2.1 will consist in preparing the project files for the feasibility studies. The detailed technical studies will be carried out only after feasibility is demonstrated.

IMMEDIATE OBJECTIVE 5

Publication of outputs and regional dissemination. In view of the demonstration value of this regional GEF project, the publication of information, both internal and external, will be essential. This objective will be achieved in three ways:

- Regular publication of reports on work progress
- Publication of technical documents and regulations drafted under the project
- Broad dissemination performed under parallel funding using regional thematic workshops (on the methods and technologies used) can be organized to extend the project outputs to other countries in the region.

Output 5.1

Internal publication.

Activities for Output 5.1

5.1.1 Internal publication of information including:

- Reports from committees (Steering Committee and National Follow-up Committees)
- Activity reports from the Implementation Team
- Reports from operators (consultants and subcontractors).

Output 5.2

External publication of project activities. Regular information on progress of the project and interim results will be provided through the relevant periodicals: *Revue Ivoirienne de l'environnement* (Ivorian Environmental Bulletin, *La Rive*), *PRISME Bulletin*, and other publications.

Activities for Output 5.2

5.2.1 The following documents will be circulated externally using the appropriate medium (print, diskettes, magnetic tapes, electronic mail, also possibly audiovisual formats):

- Project reports (interim reports, final reports, and others)
- Technical documents for which broad circulation is justified, for example, draft codes, guidelines, standards, audit reports, economic surveys, market studies, teaching aids, and public information documents.

Output 5.3

Regional dissemination of project results.

Activities for Output 5.3

- 5.3.1 Association of other African countries with the project. The association with the project of other African countries confronted with problems similar to those of Côte d'Ivoire and Senegal will be covered by parallel funding. These countries could include the Conseil de l'entente: Benin, Burkina Faso, Niger, Togo, and other countries such as Cameroon and Mali.

The required activities will be described in a supplementary Project Document. The activities which may prove necessary are a preparatory mission in the associated countries, an extension of the market studies, the organization of topical meetings in the different countries, and technical assistance for the preparation of code provisions specifically adapted to the climatic conditions of each country, and to the indoor ambient conditions which they choose to apply.

OTHER ACTIVITIES RELATED TO PROJECT OPERATION

Output 6.1

The following project structures will be set up and start operating: Steering Committee, National Follow-up Committees, Implementation Team, and monitoring and evaluation mechanisms. The terms of reference of these entities are described in Section B4.

Activities for Output 6.1

- 6.1.1 The Steering Committee members will receive no fees for their work on the committee. The project budget will provide for the costs of travel of committee members to attend the meetings, but not for those of the observers, which will be assumed by their own organizations.
- 6.1.2 An Implementation Team will be set up. Offices will be rented and installed for the team. The corresponding budget is covered by GEF funding, including the computer and communications needs required for project operations, which will include electronic mail arrangements. Members of the Implementation Team will have to travel frequently between both host countries for the implementation of some activities and to attend coordination and evaluation meetings.
- 6.1.3 The National Follow-up Committee members will receive no fees. The project budget will, however, provide for the operating costs of these committees, and the costs of travel of the presidents of the National Follow-up Committees to participate in meetings of the Steering Committee when these are not convened in their own countries.

Output 6.2

Launching the project.

Activities for Output 6.2

6.2.1 A launching seminar will be held in Abidjan bringing together the donor organizations, the concerned administrations and institutions of the host countries, observers, and the project's leaders. National and international technical assistance experts will attend. The topics will be:

- Establishing links between different components of the project
- Recommendations for setting up National Follow-up Committees
- Detailed presentation of the project's objectives, methods, budgets and programming, as approved by donor organizations and host countries.

The launching seminar will be followed in each country by a project initiation conference which the concerned public and private operators will be invited to attend.

Output 6.3

Review and evaluation (see Section H).

E. INPUTS

Project inputs include GEF core funding, parallel funding by other donors, contributions from the host countries, and the supplementary funding provided by ongoing vocational training organizations and by such other funding sources as may be identified and approached during the course of the project.

1. Host country governments

Government of Cote d'Ivoire

These inputs include the studies and public funds investments (Budget spécial d'investissement et d'équipement (BSIE)) in the area of energy-efficient buildings. Not included are the contributions provided by temporary involvement in the project of administrative staff, or their participation within the framework of their normal job assignment, for example, when ministry staff is involved in preparing and revising rules and regulations.

Government of Senegal

Inputs from Senegal will consist of studies as well as investments in the area of energy efficiency in order to attain a number of objectives, especially Immediate Objective 3. These investments, amounting to a total of approximately CFAF 270 million, will consist of retrofitting older buildings or designing new ones. In addition, the substantial credit allocations made each year to the National Energy Fund on the Consolidated Investment Budget (BCI) will serve to fund studies on energy savings during the course of the project.

2. Global Environment Facility

These inputs are presented here according to UNDP and OPS budget line numbering.

GEF funding has been earmarked to allow both host countries to implement the project; it does not cover any other countries. GEF inputs are designed to fund activities in the area of technical and institutional capacity building in both countries, but not to finance the retrofitting activities. In view of the economic advantages afforded by retrofitting, and in keeping with GEF policies regarding incremental costs, this project is limited to the creation of those capacities required for post-project investments. Also funded under the project are some incremental costs incurred for studies and equipment required in order to demonstrate the feasibility of improving energy efficiency in buildings. The studies are funded partly on a consultancy basis (budget line 17.50), and partly under subcontract arrangements (budget lines 21.01 and 21.02), while the equipment is funded under budget line 42.09. The very limited investment budget is supplemented by government inputs.

Budget line 10—Staff

11. International staff

Taking into account the existing national capacities, the objectives of capacity building, and financial savings goals, a full-time international expert is not justified. The technical and institutional support provided by UNDP to the Implementation Team is estimated at 4 months per year, or 12 man months (m/m) for the duration of the project.

11.50 International consultants

The total time of individual international consultants is 21.5 m/m, not including 2 m/m for the evaluation missions (see budget line 16). The travel expenses and DSA for the international consultants are included in budget line 11.50.

13. Administrative staff

The following staff members are to be recruited in Abidjan: one executive secretary (bilingual French-English), one secretary, two drivers and one guard (depending on the nature of the premises).

The following staff is to be recruited in Dakar: one secretary, one driver and one guard (depending on the nature of the premises).

15. Mission expenses

The DSAs of international consultants are included in line 11.50. Mission expenses cover the following items:

- Travel of Steering Committee members
- Travel of Implementation Team members

- Travel of the Presidents of National Follow-up Committees
- Travel of national consultants between Côte d'Ivoire and Senegal
- Travel of Senegalese executives sent to Côte d'Ivoire for training
- Travel of Ivorian and Senegalese executives undergoing training in a foreign country.

16. Evaluation missions

Two evaluation missions are planned, involving about 2 m/m of international consultancy, with missions from UNDP Headquarters for project follow-up.

17. National staff

One Regional Technical Advisor (36 m/m), one National Technical Advisor (Côte d'Ivoire) for 36 m/m, and one National Technical Advisor (Senegal) for 36 m/m.

18. National consultants

The total time for individual national consultants (not including subcontracted national experts) is 35 m/m.

Budget line 20—Subcontracts

The subcontracts include:

- Contracts for services with local structures (LBTP, CEREEQ, ENSTP, ENSUT, EPT, and others)
- Contracts for services with local NGOs (mainly in training, information and sensitization).

Budget line 30—Training

This component does not include the launching seminar, training sessions, study trips, workshops, technical days, and interactive teaching aids. These are to be covered by parallel funding. Some training activities are included in the subcontracts.

Budget line 40—Equipment

41. Consumable supplies

These include:

- Support to data gathering structures in Côte d'Ivoire and Senegal
- Support to the training and research structures
- Support to administrative structures (for rules and regulations)
- Supplies for electronic office equipment, duplication machines, stationery, and other materials in the project's headquarters in Abidjan and in the Dakar office.

42. *Non-consumable supplies*

- Equipment for project headquarters in Abidjan
- Equipment for project offices in Dakar
- Equipment in EDP and telecommunications in Abidjan and Dakar
- Equipment of the national structures to set up and operate the energy databases
- Equipment of the teaching and research structures
- Investments in demonstration retrofitting of buildings and equipment.

43. *Offices*

Project headquarters in Abidjan—the office space requirements for the project in Abidjan are estimated at about 140 square metres (m²).

Project office in Dakar—the office space requirements for the project in Dakar are estimated at about 80 m².

Budget line 50—Miscellaneous

51. *Operational and maintenance costs of equipment*

Maintenance, servicing, and consumables for the office machines and vehicles in Abidjan and Dakar.

52. *Project publications*

Printing expenditure and publication of reports.

53. *Various expenses*

Telephone, telefax, e-mail, and other expenses.

54. *Support to UNDP country offices*

The additional costs for the Abidjan and Dakar offices resulting from the execution of the GEF project are estimated at 2 percent of the total budget.

93. *Project execution costs*

OPS costs are estimated at 6.5 percent of the execution budget, exclusive of the preparatory assistance mission already conducted, and of the support to UNDP country offices which are UNDP execution costs.

F. RISKS

1. Environmental risks

Implementation of this project entails no environmental risks.

2. Risks of non-achievement of the project

The preparatory assistance mission has already evaluated the potential causes which could prevent the project from reaching some of its objectives, or which could jeopardize the validity or applicability of its results. This evaluation was done in conjunction with the operators chosen to implement the project and with the beneficiaries of the project's results, in other words, those who will have to apply its outcomes in the long run (post-project period) in Côte d'Ivoire and Senegal. The risks could be threefold: technical, financial or institutional.

Technical risks -

On the scientific and technical level, the project could stumble on insufficient mastery of the energy aspects of a building, the unavailability of human resources (international and national consultants, operators to be trained, and so on) or lack of testing/measuring equipment or other necessary materials.

The probability of encountering these problems is very low. The first results obtained in Côte d'Ivoire from previous programmes show that technical obstacles to the success of such a project will be easy to overcome. The technical field of the project is already well mastered, and local capacities have already been identified and appear to be sufficient, in quality and numbers, to serve as a starting point for the project. The international consultants that have stated their interest and availability for the project are already involved in similar programmes, and will therefore have some experience in the area.

The operators consulted (property developers, building owners (including the governments), architects, engineers, and others) are motivated by the expected advantages of the project and eager to learn the energy-efficient techniques, given the opportunity. The risk of failure on this score is therefore very low.

Possible corrective measures to avoid this risk include planning the involvement of operators sufficiently ahead of time, training operators right from the beginning, and strengthening local capacity from the earliest stages of the project.

Financial risks

The financial risk for the project could be the unavailability of certain resources foreseen in the Project Document. The probability of this occurring is very low concerning the GEF funding, which represents the bulk of the project. There is, however, no guarantee yet on the parallel funding being sought. It would be detrimental to the host countries, and to the other West African countries, for these parallel funds not to be granted, or to be released too late.

Certain organizations which fund ongoing vocational training had expressed their interest at the time of the preparatory assistance mission for this project. The funds obtained from these groups must be available on time to link up with the instruction of trainers under the GEF budget.

To avoid the consequences of any such delay in financing, parallel funds could be granted to activities which are not tied to one another, which are far enough in time to allow slice funding, and which do not affect the immediate outputs of the Côte d'Ivoire and Senegal components. In case of the unavailability of some expected funds, the Implementation Team, with support from the Steering Committee, will have to seek other resources.

Institutional risks

As in any regional project, there is a risk that the project's activities do not progress at the same pace in both host countries, and in other countries involved, if any. Actual implementation of the incentive measures recommended by the project may also be delayed due to bureaucratic constraints.

As a possible corrective measure to avoid this institutional risk, the Steering Committee and the Implementation Team will seek to harmonize project progress in different countries. The risk of a lack of coordination between Côte d'Ivoire and Senegal is minimal, because the project brings together operators from both countries who have long-standing experience in working closely together.

When parallel funding is obtained, the involvement at the regional level of technical operators from the countries granting the funds will be a further guarantee of good coordination between the host countries and other francophone West African countries.

The Ministries of Finance in both host countries are associated in the project at the highest level (Steering Committee). They will therefore make the implementation of the project's recommendations their business, and will not hamper the achievement of the project's outputs.

The experience acquired elsewhere (Jamaica and Southeast Asia) demonstrates that technical energy-saving measures in buildings are sufficiently profitable and attractive for operators of the construction sector to have set among their priorities the alignment of their projects with the results of the present GEF project.

On the whole, once the objectives and the execution methods of the project are approved by all parties, the probability of this institutional risk occurring is low.

G. PRIOR OBLIGATIONS AND PREREQUISITES

In the preparatory phase, the following prerequisites and obligations were accepted by the parties:

- The governments will provide the project with support staff and the necessary premises defined in Section D and the attached budget.

- The governments and the parastatal and private operators will assign personnel to be trained by the project.
- The governments and the operators mentioned above will take special care to propose competent and motivated personnel, particularly for the training sessions abroad. The trained personnel will commit themselves to returning to their post or job of origin after training.
- The leaders of the project (UNDP, the Executing Agency, the Steering Committee, and the Implementation Team) will be free to turn down a candidate for training if they believe the individual does not have the required qualifications
- The governments will commit themselves to facilitating the smooth running of the project by granting external consultants visas and authorizations to enter the administrative or semi-public buildings which will be studied, tested, or retrofitted under the project.
- The Project Document will be signed by UNDP, but UNDP assistance will be provided only if the above obligations are fulfilled to its satisfaction. If one or several conditions are not fulfilled, UNDP will be free to suspend or withdraw its assistance.

H. PROJECT REVIEW, REPORTING AND EVALUATION

The project will be reviewed every year by the signatories. The review will be carried out jointly by representatives of the governments, UNDP (representing GEF), and OPS (as the Executing Agency). The Implementation Team will submit a project output assessment report at each multipartite review meeting. Other assessment reports may be requested, if needed, during the implementation of the project.

A final project report will be drafted for the final multipartite review meeting. A preliminary draft will be prepared and submitted to UNDP and the Executing Agency for technical approval at least four months before the final review.

The project will also be assessed at mid-term (eighteen months from the beginning of project implementation), and in an in-depth assessment six months before the end of the project. The terms of reference and evaluation calendar will be set after consultation between the parties involved. Under the structure defined for the project, it will be reviewed regularly by the Steering Committee and the National Follow-up Committees (see organizational chart in Annex 1). As far as possible, meetings of these committees will be coordinated with the annual reviews and assessment meetings described above, so as to limit the travel expenses of participants.

I. LEGAL CONTEXT

This Project Document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement (SBAA) between the Government of the Republic of Senegal and

UNDP, and between the Government of the Republic of Côte d'Ivoire and UNDP, signed by the parties respectively on 4 July 1987 and 3 December 1993. These agreements constitute the SBAA between UNDP and the host countries.

The following types of revisions may be made to the original Project Document with the signature of the Resident Representative of UNDP in Côte d'Ivoire, provided he or she is assured that the other signatories of the document have no objections to the proposed changes:

- Revisions in, or additions to, any of the annexes of the Project Document
- Revisions which do not involve significant changes in the immediate objectives, outputs or activities of a project, but are caused by the rearrangement of inputs already agreed to, or by cost increases due to inflation
- Mandatory annual revisions which rephase the delivery of agreed project inputs, or reflect increased expert or other costs due to inflation, or take into account agency expenditure flexibility.

J. BUDGETS

The project budget is attached.

**PROJECT BUDGET COVERING
GOVERNMENT OF CÔTE D'IVOIRE CONTRIBUTION**

Studies and investments in energy saving

The Ivorian Government has been active for several years in the area of energy saving in public buildings. The following amounts have already been invested (in CFA francs):³

Prior to 1989: LBTP studies + investments	CFAF 75 million
1991: LBTP studies + investments	CFAF 36 million
1992: LBTP studies = CFAF 50 million	
Investments = CFAF 100 million	CFAF 150 million
Total expenditures prior to 1993	CFAF 261 million

The allocations budgeted for 1994-1997 are approximately CFAF 65 million per year for studies, and CFAF 200 million per year for investments, which amounts to a total of CFAF 805 million (CFAF 205 million for studies and CFAF 600 million for investments) over the duration of the project. One third of these allocations may be considered direct project support (calorimetric testing cell, sets of capacitors, cooling towers, and other equipment).

Summary:	CFAF 265 million
Studies	CFAF 65 million
Investment	CFAF 200 million

³ According to the official exchange rate in 1994, US\$ 1 = CFAF 520.59.

PROJECT BUDGET COVERING GOVERNMENT OF THE REPUBLIC OF SENEGAL CONTRIBUTION

Over the last few years, energy savings have become a major concern for the Government of Senegal. Several activities have been undertaken by the Department of Energy with financing from the National Energy Fund. Such activities for 1993 included:

- Organizing two training workshops in efficient energy management for industrial technicians and managers of public buildings, at a cost of CFAF 65 million⁴
- Conducting an advertising campaign aimed at the general public to promote energy savings, at a cost of CFAF 52 million.

Total expenditures = CFAF 117 million.

The budget allocations for the duration of the project are:

Summary:	CFAF 390 million
Studies	CFAF 120 million
Investment	CFAF 270 million

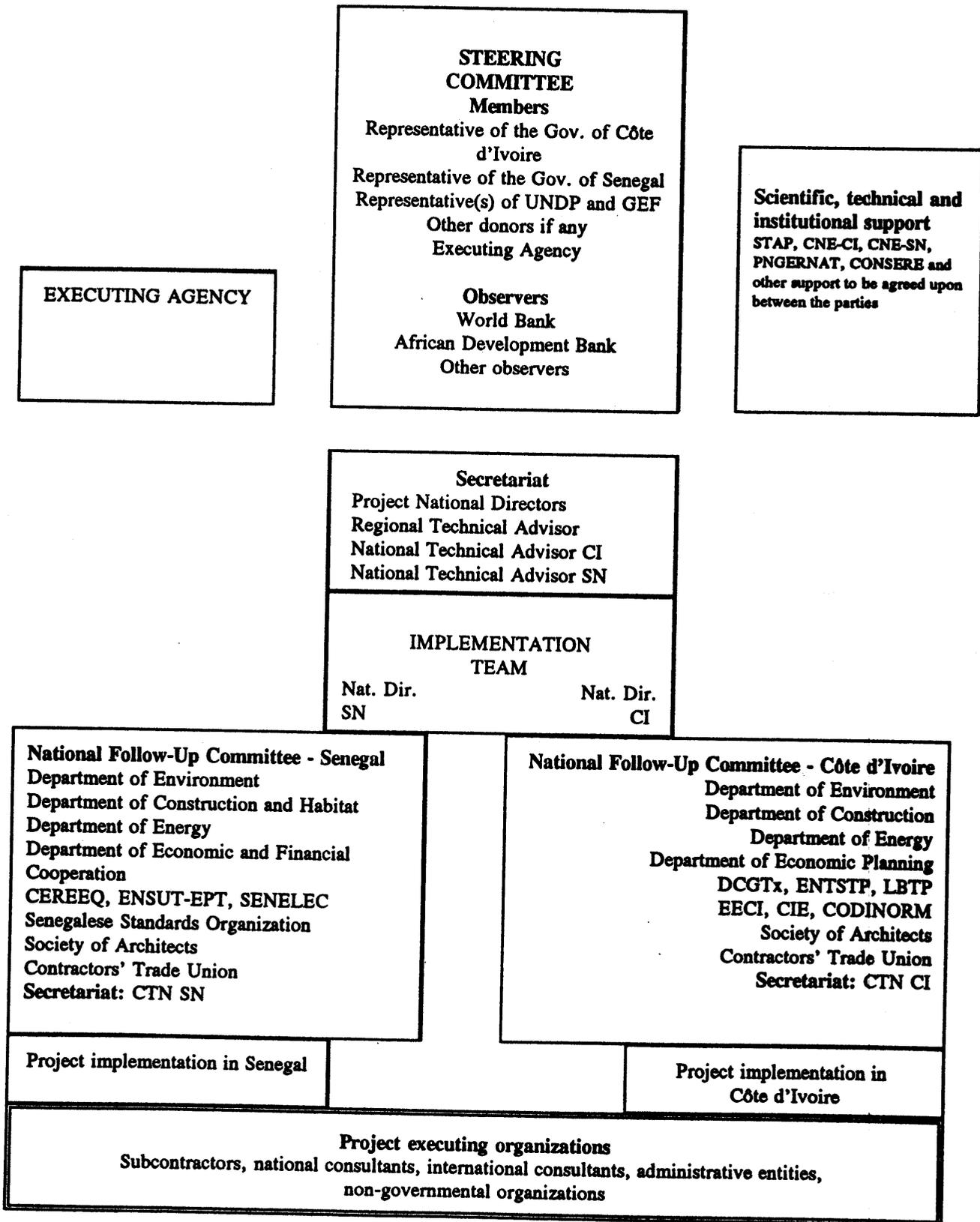
⁴ According to the official exchange rate in 1994, US\$ 1 = CFAF 520.59.

Project Budget Covering UNDP Contribution

	Total Cost	Preparatory assistance mission	Year 1	Year 2	Year 3
10. PERSONNEL					
11. International Personnel (12 m/m)	168,000		56,000	56,000	56,000
11.50 International Consultants (2.5 m/m + 21.5 m/m)	336,000	35,000	175,000	77,000	49,000
11.99 Total International Personnel	504,000	35,000	231,000	133,000	105,000
13. Support Personnel (secretaries, drivers)	168,480		56,160	56,160	56,160
15 Missions	172,800	28800	57,600	50,400	36,000
16. Evaluation Mission Costs	88,000		8,000	40,000	40,000
17. National Personnel					
17.01 Regional Technical Advisor (36 m/m)	99,000		33,000	33,000	33,000
17.02 National Technical Advisor CI (m/m)	81,000		27,000	27,000	27,000
17.03 National Technical Advisor SN (36 m/m)	81,000		27,000	27,000	27,000
17.50 National consultants (prep. assist. + 83 m/m)	195,950	9200	76,500	72,000	38,250
17.99 Total National Personnel	456,950	9200	163,500	159,000	125,250
19. Total Personnel Component	1,390,230	73,000	516,260	438,560	362,410
20. SUB-CONTRACTS					
21.01 Sub-contract LBTP	255,400		127,700	63,850	63,850
21.02 Sub-contract CEREEQ	72,600		29,040	21,780	21,780
21.03 Sub-contract ENSTP	195,000		78,000	78,000	39,000
21.04 Sub-contract ENSUT-EPT	90,000		36,000	36,000	18,000
21.05 Sub-contract ONG C.I.	16,000			8,000	8,000
21.06 Sub-contract ONG SN	28,000			14,000	14,000
29. Total Sub-contracts	657,000		270,740	221,630	164,630
30. TRAINING					
32. Seminars, group training	15,740		15,740		
32. Training the trainers	40,000		20,000	20,000	
39. Total Training Component	55,740		35,740	20,000	
40. EQUIPMENT					
41. Operations, consumable equipment	212,750		72,000	72,000	68,750
42. Non-consumable equipment:					
42.01 Equipment - LBTP	29,000		29,000		
42.02 Equipment - CEREEQ	29,000		29,000		
42.03 Equipment - DE, DCA, DHE in CI	33,000		33,000		
42.04 Equipment - DE/MEPN, DCH, DE/MEMI in SN	33,000		33,000		
42.05 Equipment - ENSTP	30,000		30,000		
42.06 Equipment - ENSUT and EPT	30,000		30,000		
42.07 Equipment - Project HQ in Abidjan	76,000		76,000		
42.08 Equipment - Project offices in Dakar	41,000		41,000		
42.09 Restoration buildings/equipment	365,000			182,500	182,500
43. Premises	54,000		18,000	18,000	18,000
49. Total Equipment	932,750		391,000	272,500	269,250
50. MISCELLANEOUS					
51. Equipment O&M	90,000		30,000	30,000	30,000
52. Report expenses	38,000		8,000	8,000	20,000
53. Sundry	60,000	15,000	15,000	15,000	15,000
54. UNDP Country Office costs	70,000		30,000	20,000	20,000
59. Total Miscellaneous	258,000	15,000	83,000	73,000	85,000
93. Executing Agency Costs (6.5%)	208,280	5280	82,000	65,000	56,000
99. TOTAL GEF INPUTS	3,500,000	93280	1378740	1090690	937,290

Annex 1

PROJECT ORGANIZATION CHART



Annex 2

GREENHOUSE GAS EMISSIONS DUE TO ENERGY PRODUCTION IN CÔTE D'IVOIRE AND SENEGAL

The following data are drawn from the report:
"Global Environment and Long-Term Management Strategies
for Energy and Non-Energy Resources: West Africa"
(ENDA—Energie, Dakar, Dec. 1992; 104 p.)

Energy and GHG emissions

West Africa

Among the factors with negative environmental impacts in Côte d'Ivoire, Senegal, and other countries in West Africa (such as energy use, bush fires, the clearing of farm land, pastoral activities, urban waste, raw sewage, and use of chemical fertilizers), none is currently being analyzed from the point of view of its contribution to the degradation of the global environment. No specific measures aimed at mitigating global environmental effects have as yet been undertaken, and there exist no voluntary programmes to reduce GHG emissions.

Côte d'Ivoire

With a final energy consumption of 3.4 Mtoe in 1990, Côte d'Ivoire emitted 25 MtCO₂e. This translates to 2.1 tCO₂e per capita for that year.

The fossil energy consumption in Côte d'Ivoire has reached about 936,000 tep in 1990. The emissions of GHG corresponding to this consumption (4.5 MtCO₂e) are distributed as follows:

- Carbon dioxide: 62 percent
- Nitrogen oxide: 20 percent
- Carbon monoxide: 10 percent
- Other gases: 8 percent.

The sectoral distribution of GHG emissions from fossil fuel energy production shows that the transportation sector alone accounts for 69 percent. The remaining emissions are equally distributed between the industrial sector (12 percent), and housing and services (13 percent), while agriculture (including fishing) represents only 6 percent.

GHG emissions generated by electricity production are increasing sharply. The projections of CIE, an electric power utility, as regards fossil fuel consumption for the current fiscal year are 360,000 tons, against 172,000 tons in 1989-90, 210,000 tons in 1990-91, and 223,000 tons in 1991-92.

Senegal

With a final energy consumption of 1.146 Mtoe in 1988, Senegal has emitted the equivalent of 7.7 MtCO₂, or 1.1 tCO₂e per capita for the year. The distribution of Senegalese emissions of GHGs due to energy consumption is 47 percent from fossil energy, and 53 percent from biomass. The final consumption of fossil energy in Senegal (almost entirely generated from oil) reached 565,000 toe in 1988. The GHG emissions due to this consumption are distributed as follows:

- Carbon dioxide: 73 percent
- Nitrogen oxide: 15 percent
- Other gases: 12 percent.

The sectorial distribution of GHG emissions from fossil fuels shows that industry and transportation alone account for 73 percent.

GHG emissions due to the production of electricity show a significant increase that corresponds to the national electricity consumption curve. The consumption of oil products by SENELEC, an electrical power utility, reached 295,000 tons in 1992, compared with 260,000 tons in 1990 and 1991.

Energy consumption in buildings

Côte d'Ivoire

The forecasts for global electricity consumption for 1992–93 are practically the same as that for the previous period: 2000 GWh, of which 95 percent is supplied by the power utility, and 5 percent is self-generated. The efficiency ratio of the network operated by CIE is expected to reach 83.5 percent, with loss levels of 1.3 percent in production, 5.9 percent in transportation, and 9.2 percent in distribution.

Of the electricity sold by CIE, 49.5 percent is thermal, 39 percent is hydraulic, 10 percent is imported from Ghana (VRA), and 1.5 percent is purchased from private producers. Thermal production has increased markedly, since it represented an average of only 26 percent during the previous three years. This pattern is expected to continue in the coming years, particularly as operation of the Fox-Trot natural gas field is going to begin soon.

Consumption is distributed as follows: 43 percent low tension, and 57 percent high and medium tension. It is estimated that the share of electricity consumed in buildings is around 48 percent—equal to the entire sector of industry and cottage industry. Public lighting consumes the remaining 4 percent of electricity. Within the buildings, public services consume 30 percent, or 15 percent of the total national electricity consumption (30 percent multiplied by 48 percent). The private sector consumes 26 percent (13 percent of the total consumption), and the domestic sector consumes 44 percent (22 percent of the total consumption).

The main electricity consumption items in buildings are air-conditioning (46 percent, or 22 percent of the total consumption) and lighting (23 percent). These two items together represent one-third of the total electricity consumption.

The energy analyses carried out in the framework of the preparatory works for the Ivorian Energy Efficiency Code for Buildings show that the large buildings in Abidjan, used as offices, have a specific consumption between 230 and 350 kWh/m²/year. If a limited number of simple and economically realistic prescriptions were respected, this value could be reduced to 170 kWh/m²/year.

Senegal

The global electricity consumption in 1992 was 980 GWh, 82 percent of which was supplied by SENELEC, and 18 percent was self-generated. SENELEC increased its sales by 9.5 percent in comparison with the previous year.

The efficiency ratio of the network operated by SENELEC has reached 80 percent, with loss levels of 6.5 percent in production and 13.5 percent in transportation and distribution.

The origins of SENELEC's sales have been 99 percent from thermal production and 1 percent from purchases from private producers. The consumption is distributed as follows: 38 percent low tension, 40 percent medium tension, and 22 percent high tension. It is estimated that about 56 percent of consumption is due to buildings, and 42.5 percent due to the industrial sector. Public lighting represents the remaining 1.5 percent. Public services represent 11 percent of the electricity consumed in buildings (6 percent of total electricity consumption), the private services sector 42 percent, and the household sector 47 percent.

Although there is no confirmed data available on the distribution of consumption by type of use in buildings, the respective shares of air-conditioning and lighting are estimated to be at least in inverse proportion compared with Côte d'Ivoire, with lighting therefore representing possibly over 50 percent.