Global Environment Facility

GEF

MOHAMED T. EL-ASHRY
CHIEF EXECUTIVE OFFICER
AND CHAIRMAN

June 6, 2000

Dear Council Member:

I am writing to notify you that UNDP, the Implementing Agency for the project entitled, *Tunisia: Experimental Validation of Thermal and Energy Performance in Buildings and Removal of Barriers to their Introduction in Thermal and Energy Regulations for New Buildings*, has submitted the proposed project document for CEO endorsement prior to final approval of the project in accordance with UNDP procedures.

Over the next four weeks, the Secretariat will be reviewing the project document to ascertain that it is consistent with the proposal included in the work program approved by the Council in August 1998, and with GEF policies and procedures. The Secretariat will also ascertain whether the proposed level of GEF financing is appropriate in light of the project's objectives.

If by July 3, 2000, I have not received requests from at least four Council Members to have the proposed project reviewed at a Council meeting because in the Member's view the project is not consistent with the Instrument or GEF policies and procedures, I will complete the Secretariat's assessment with a view to endorsing the proposed project document.

We have today posted the proposed project document on the GEF website at www.gefweb.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Mohamed T. El-Ashry

Cc: Alternates, Implementing Agencies, STAP

GEF SECRETARIAT, 1818 H STREET NW, WASHINGTON, DC 20433 USA
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United Nations Development Programme
GLOBAL ENVIRONMENT FACILITY (GEF)

23 May, 2000

Dear Mr. El-Ashry, Mohamed :

Subject: **TUN/98/G31/A/1G/99 – Experimental Validation of Thermal and Energy Performance in Buildings and Removal of Barriers to their Introduction in Thermal and Energy Regulations for New Buildings**

I am pleased to enclose the revised version of the project entitled **"Experimental Validation of Thermal and Energy Performance in Buildings and Removal of Barriers to Their Introduction in Thermal and Energy Regulations for New Buildings"** approved through the July 1998 Intersessional of the GEF Executive Council. This was first submitted on 13 March 2000 and we would like to respond to comments made by Mr. Johan Wide.

Regarding the first comment, we admit being a bit puzzled as to exactly what Mr. Wide meant. It seems to indicate that he wants a new endorsement letter. This is of course not desirable. It is true that the formulation of the project document has taken a long time since the brief was approved, but this in no means is a reflection of wavering country commitment. It rather illustrates the problems we had with the consultants working on this proposal.

With regard to the second comment, please note that we have revised the matrix presenting the Council member's comments and the way in which they have been addressed in the prodoc. The matrix is included in the attached file of annexes as the last 3 pages of that file.

Having said this, I think the document articulates well the importance for and the desire of the country to see this project move forward. Mr. Marcel Alers, Regional Coordinator for RBAS was on mission in Tunis in February and had extensive meetings and discussions with the national executing agency (ANER) and they are extremely motivated and keen on starting the implementation of this project. The support provided through this project is key in the process of introducing new building codes and standards, that have already been elaborated in an earlier phase. This second phase will validate the codes and standards and remove the barriers to their introduction. The government is totally committed to mandate building codes, once they have been validated. This is the purpose of the project.

/...

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Chief Executive Officer
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PM

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I hope that this additional explanation will prove to be helpful in addressing the concerns raised by Mr. Wide. As per paragraph 29 and 30 of the GEF Project Cycle, we are submitting this project to you for circulation to the Executive Council Members for comments and, subsequently, for your final endorsement.

Thank you in advance for expediting the review and approval of this project.

Yours sincerely,

Rafael Asenjo
Executive Coordinator

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PROJECT OF THE GOVERNMENT OF TUNISIA
PROJECT DOCUMENT

Number & Title:	**TUN/98/G32/A/1G/99** Experimental validation of thermal and energy performance in buildings and removal of barriers to their introduction in thermal and energy regulations for new buildings.
Duration:	Five years
Project Site:	Headquarters in Tunis, Tunisia; projects throughout Tunisia
ACC/UNDP Sector:	035 Energy
Government sector:	Energy
Government implementing agency:	Ministry of Environment and Land-Use Planning (MEAT)
Executing agency:	National Agency of Renewable Energy (ANER)
Estimated starting date:	December 1999
Government inputs:	$ 1,692,800 (in-cash) DT 412,000 (in-kind)
Private sector inputs:	$ 2,664,000
French GEF inputs:	USD 1,970,000[1]
UNDP/GEF inputs:	USD 4,360,000

UNDP Financing
UNDP/GEF USD 4,360,000

Brief Description: The overall objective of this project is to assist Tunisia in reducing the long-term growth of GHG emissions related to consumption of fossil energy in the commercial and residential buildings sectors. Growth in energy consumption in the buildings sector will result in its surpassing the transport sector as the largest source of greenhouse gas emissions in Tunisia. The government is committed to a range of actions to limit the growth of emissions including implementing an optimal-efficiency building code for residential and commercial sectors if it can demonstrate that the codes will provide equivalent or better comfort levels and not add significantly to overall construction costs.

The long-term policy and overall objectives will be achieved through:

- demonstration throughout Tunisia, in a variety of typical building types, of the efficacy and acceptability of buildings built according to the proposed optimal building code specifications;
- extensive awareness raising and promotion on a national and individual level to gain the support of main stakeholders; and
- extensive capacity building of architects, the construction industry, and regulatory officials in energy-efficient design and construction and updating of energy efficiency standards.

On behalf of the Government

Signature	Date	Name/Title (Please type)

On behalf of UNDP

Signature	Date	Name/Title (Please type)

Operational rate of exchange : The United Nations operational rate of exchange at signature date of document

PROJET DU GOUVERNEMENT DE LA TUNISIE
DOCUMENT DE PROJET

Numéro et Titre :	**TUN/98/G32/A/1G/99** Validation expérimentale des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.
Durée :	5 ans
Site du projet :	**Siège** à Tunis : projets à être développés sur tout le territoire tunisien
Secteur ACC/UNDP:	**035** Energie
Secteur Gouvernemental :	Energie
Agent Gouvernemental (de mise en œuvre) :	Ministère de l'Environnement et de l'Aménagement du Territoire.
Agence d'Exécution :	Agence Nationale des Énergies Renouvelables (ANER)
Date approximative de démarrage :	Décembre 1999
Contribution du Gouvernement	1.692.800 $ sous forme de cofinancement parallèle 412.000 DT en nature (appui administratif, logistique, opération et maintenance).
Contribution du Secteur privé :	2.664.000 $
Contribution du FEM Français :	1.970.000 $
Contribution du PNUD/FEM :	4.360.000 $

Financement du PNUD
PNUD/FEM : 4.360.000 $

Description du projet : L'objectif global de ce projet vise à appuyer la Tunisie à réduire la croissance à long terme des émissions de gaz à effet de serre provenant de la consommation d'énergie fossile dans les secteurs tertiaire et résidentiel. La croissance de la consommation d'énergie dans le secteur résidentiel dépassera celle du secteur des transports pour devenir la plus importante source d'émission de gaz à effet de serre en Tunisie. Le gouvernement a engagé un certain nombre d'actions notamment, l'application d'un code d'efficacité optimale des bâtiments pour les secteurs tertiaire et résidentiel afin d'obtenir les meilleurs niveaux de confort et de ne pas augmenter de façon significative les coûts globaux de construction.

La politique à long terme et les objectifs globaux du projet seront atteints à travers :

- la démonstration sur tout le territoire Tunisien, au moyen d'une variété de types de constructions, de l'efficacité et de l'acceptabilité des constructions réalisées selon les spécifications du code d'efficacité optimale des bâtiments ;
- la promotion et l'élévation de la prise de conscience à un niveau national et individuel pour gagner l'appui des décideurs ;
- le renforcement des capacités d'intervention des architectes, des industriels de la construction, des législateurs en matière d'efficacité énergétiques et de construction ainsi que l'actualisation des standards d'efficacité énergétique.

Au nom du Gouvernement Tunisien

Signature	Date	Nom/Fonction

Au nom du PNUD

Signature	Date	Nom/Fonction

TUNISIA – EXPERIMENTAL VALIDATION OF BUILDING CODES AND REMOVAL OF BARRIERS TO THEIR ADOPTION

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ACRONYMS

AFE	Alliance Women and Environment (Alliance Femmes et Environnement)
AME	Tunisian Agency for Energy Management (L'Agence pour la Maîtrise de l'Energie)
ANER	National Renewable Energy Agency (L'Agence Nationale des Energies Renouvebles)
BTC	Building Technical Center
CITET	International Environmental Technology Center (Centre International des Technologies de l'Environnement de Tunis)
CPE	Comfort and Efficiency Performance (Confort et Performance Energetique)
DT	Tunisian Dinar (Dinar Tunisien)
EVP	Experimental Validation and Demonstration Process
FA	Financial Accountant
FFEM	French Global Fund for the Environment (Fonds Francais pour l'Environnement Mondial)
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GOT	Government of Tunisia
INNORPI	National Institute of Standards and Industrial Proprety (L'Institut National de la Normalisation et de la Propriété Industrielle)
MEAT	Ministry of Environment and Land-Use Planning (Ministere de l'Environnement et de l'Amenagement du Territoire)
MEH	Ministry of Housing and Public Buildings (Ministere de l'Equipement et de l'Habitat)
MOI	The Ministry of Industry
MOT	The Ministry of Tourism
NOA	The National Order of Architects
ODC	Organization of Consumers Defense (Organisation pour la Défense des Consommateurs)
ONTT	National Office of Tunisian Tourism (Office National Tunisienne de Tourisme)
PM	Project Manager
PPER	Project Performance Evaluation Report
PSP	Preparatory Studies Process
PT	Project Team
PV	Photovoltaic
RTMB	Maghreb Regional Project for Thermal Standards for Buildings – (Réglementation Thermique Maghrébine des Bâtiments)
STEG	Tunisian Electricity & Gas Company (Société Tunisienne d'Electricité et de Gaz)
TEEF	Tunisian Energy Efficiency Fund
TOE	Tons of Oil Equivalent
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

SECTION A: CONTEXT

Tunisia is a relatively small country in Northern Africa, consisting of 155,360 sq. km of land area and an estimated population of 9.25 million as of July 1997. Located between Algeria to the west and Libya to the east, Tunisia occupies a strategic location in the Mediterranean. With a 1996 GDP of $17.6 billion and $1,930 per capita, Tunisia is a lower-middle income country according to World Bank classification.

Unlike its neighbors, Tunisia's economy is not based on petroleum. Tunisia produces only about 89 thousand barrels/day of oil and oil products. Its net exports (about 23 thousand barrels/day) are less than 2% of those of Libya or Algeria. Tunisia's economy is based on services instead of oil. Over half of the wealth in Tunisia's economy derives from services, of which the most important is tourism. The country's economic interests are a source of motivation for long-term environmental protection.

Tunisia is governed by President Ben Ali's party – the Democratic Constitutional Rally - which controls about 80% of the seats in the country's Chamber of Deputies (Chambre des Deputés). The government's recent economic policy has emphasized privatization of trade and commerce and simplification of the tax structure. Its legal system is based on a combination of French civil law and Islamic law. Tunisia is a member of a large number of international organizations, such as the United Nations, World Bank and other multilateral and international organizations and is a party to international agreements on bio-diversity, climate change, desertification, ozone layer protection and other issues.

1. Description of Subsector

This GEF project addresses energy consumption in the new commercial and residential buildings subsector of the buildings sector.

Energy and Buildings Subsectors

Tunisia's energy production and consumption are largely based on oil and gas, which accounted for all but about 13.5% of the country's energy production in 1995 (See Table 1). Consumption of wood for home cooking, rural solar energy and other renewable energy sources account for about 12% of total energy use. The electric sector uses a small amount of hydroelectric resources. Tunisia began using large amounts of natural gas for power generation in 1995.

Table 1: Tunisia Energy Production by Fuel Type, 1995

	Production	
Energy Source	**Mtoe**	**% of Total**
Coal	69	1.1
Oil & Petroleum Products	3,311	54.6
Natural Gas	1,924	31.7
Wood Waste/Renewable Energy	755	12.4
Hydroelectricity and Electricity Imports	10	0.2
Total	**6,069**	**100.0**
Source: Energy Statistics of Non-OECD Countries		

Between 1970 and 1996, total energy consumption in Tunisia grew at an average annual rate of 3.5%. Over the last decade, sectoral demand has also evolved towards an increase in the share of service and residential sectors, with an accompanying reduction in the share of the industrial sector in relation to the total demand.

During the period of exploitation of Tunisia's oil and gas resources from 1970 through 1980, there was strong development of industry and the industrial sector (heavy chemicals, cement, etc). Industry at that time became the largest consumer of energy. The average annual growth rate of final energy consumption

reached 12.1% during the period, as compared with an annual GNP growth rate of 7.3%. From 1980 through 1985, however, the country's oil and gas production stagnated, the energy surplus began to decline, while the country continued its strong economic development and energy demand continued to increase. After 1985, there began a total transformation of the Tunisian economy with decline of heavy industry and a reorientation towards the service and light industry sectors (e.g., textiles). Tunisia's standard of living has substantially improved with this strong economic growth.

This improved quality of life, the development of the service sector and the more widespread use of heating, lighting, water heating and air conditioning, have brought the share of the service/residential sector from 21.1% of final energy consumption in 1985 to 25.4% in 1996. During the same period, the share of the industrial sector, that has traditionally represented the largest portion of final energy usage, has declined from 40.6% in 1985 to 35% in 1996. The transport sector, which has generally increased in line with GDP, remains stable with a share of 32%.

A study carried out by the Tunisian Agency for Energy Management (AME) in 1997 as part of Tunisia's Agenda 21 programme demonstrates that energy demand will increase dramatically over the next three decades. The tendency for the combined share of the service and residential sectors to increase would also continue, and starting around 2010, the service and residential sectors would together account for the largest share of energy demand. Once more, this was identified as being mainly due to the increased consumption in buildings. Table 2 shows these predicted trends.

Table 2: Energy Consumption Trends

Forecast of the Evolution of Energy Consumption by Sector 1985–2020					
	1985	1990	1996	2010 (*est.)	2020 (*est.)
Total Energy	**Mtoe**	**Mtoe**	**Mtoe**	**Mtoe**	**Mtoe**
Consumption	2.9	3.5	4.3	9.3	14.2
Share by Sector	**%**	**%**	**%**	**%**	**%**
Industry	40.6	40.9	35.1	29.5	28.1
Transport	32.3	30.2	31.8	29.5	28.1
Residential/Tertiary	**21.1**	**22.3**	**25.4**	**32.0**	**35.6**
Agriculture	6.0	6.6	7.7	5.7	4.5
(*est.) assuming an average 5% per annum progression in energy demand between 1996 and 2020					
Source: AME – *Energie 21 : Analyse de la Demande et Maîtrise de l'Energie*, September 1997					

The reasons for increased energy demand in the service/residential sector are well understood. The Tunisian climate varies from region to region but in most parts of the country winter temperatures can be uncomfortably low and summer temperatures uncomfortably high. In the past, traditional construction methods and architecture provided a satisfactory level of comfort in the hot summer period, and simple heating methods were sufficient for the cold winter period. The modern building design and construction methods adopted more recently do not, however, provide satisfactory levels of comfort during these periods of extreme weather conditions.

As standards of living have risen and increased purchasing power has allowed the population to aspire to a more comfortable living and working environment, the use of heating and air conditioning equipment has increased. New service sector and luxury and high-income residential buildings are now almost systematically equipped from the outset with heating and air-conditioning equipment. In most cases there are no energy efficient modifications being made to the design or envelope of the buildings themselves.

The residential buildings for lower income people are in general not equipped with space conditioning at the outset. However, an increased purchasing power of the population has resulted in a trend of owners purchasing and installing heating and air conditioning equipment some time after their original construction. The design and envelope of these lower income buildings are not adapted to the use of such equipment. The result of these trends substantially increases energy demand for the country and as a result increases greenhouse gas emissions.

2. Host Country Strategy

Through the National Renewable Energy Agency (L'Agence Nationale des Energies Renouvelables or ANER) the Government of Tunisia (GOT) is managing a concerted policy to improve energy efficiency, increase reliance upon renewable energy sources and reduce deforestation caused by energy consumption. Founded in 1985 as the Agency for Energy Management, ANER estimates that its programmes have already saved an estimated 1,000 MTOE of energy. In 1995 ANER inaugurated the second phase of its programme that defines its goals through the year 2010. Pursuant to the May 25, 1994 recommendations of the Ministerial Council under President Ben Ali, ANER is seeking to reduce energy use by a total of 7,600 MTOE by the year 2010. The average annual energy reductions of 506 MTOE per year are equal to around 10% of current total energy consumption.

ANER plans to achieve reductions in energy consumption in part through a comprehensive energy efficiency programme that includes:

- Energy efficiency standards for buildings;
- Labeling and standards for electric appliances (e.g., refrigerators, freezers and air conditioning);
- Incentive programmes to encourage the purchase of energy efficient appliances and equipment, e.g., a compact fluorescent light leasing programme that is currently being planned with the country's national electric and gas company, Tunisian Electricity and Gas Company (Société Tunisienne d'Electricité et de Gaz or STEG); and
- Energy efficiency awareness campaigns.

In the area of renewable energy ANER intends to implement the second phase of a programme to increase the use of solar photovoltaic (PV) systems for rural electrification and solar energy collectors for water heating. In the programme's first phase a total of 5,200 PV systems and 30,000 square meters of solar energy collectors for water heating were installed. A total of 15,000 PV systems will be installed during a five-year period under this programme. In addition, ANER will work towards the installation of 50,000 square meters of solar energy collectors for household water heating.

ANER also plans to reduce greenhouse gas emissions through a programme to combat deforestation and to rationalize wood consumption for energy use. This programme includes initiatives to improve traditional wood ovens used primarily to bake bread. ANER is also working towards the production of industrial gas from urban and animal waste. GOT has also worked to reduce greenhouse gases through STEG policies to improve efficiency and increase reliance upon natural gas. Whereas natural gas was not a major fuel source in Tunisia prior to 1995, it is now the primary fuel source for power generation. This ambitious programme is designed to limit the increase in greenhouse gas emissions and at the same time meet the increasing energy demand of the country's expanding economy.

In early 1990 AME identified the service and residential sectors as the main source of an expected future surge in demand for energy in Tunisia. The agency went further to clarify that this expected surge, and accompanying shift in demand among sectors, will mainly be due to increased activities in the buildings sector. As a result, the GOT identified the buildings sector as the main target to curb the rise in future energy demand and that, as a result, the initial and most important step towards achieving this objective would be the adoption of energy efficient building standards for new buildings.

The GOT has decided to adopt regulatory measures introducing energy efficient building standards for new buildings in a stepwise process. This process will begin with *minimum* standards to be introduced in 2000, culminating in the endorsement and adoption of *optimal* standards by the GOT by the end of year 2004.

In order to better ensure that optimal standards would ultimately be implemented, Tunisia joined in 1991 a regional programme for energy efficiency in buildings in the Maghreb countries (Tunisia, Algeria and Morocco) with financial support from the Directorate General for Energy of the European Commission. The Tunisian authorities, who took on the task of regional coordination by AME, embraced this programme – Maghreb Regional Project for Thermal Standards for Buildings (Réglementation Thermique Maghrébine des Bâtiments or RTMB) – as the primary means to achieve the energy efficiency objective for new building construction.

The RTMB programme is divided into three phases: Phase 1, the Preparatory Studies Process (PSP); Phase 2, the Experimental Validation and Demonstration Process (EVP) for which GEF support is requested; and Phase 3, the Implementation Process focusing on the adoption of the regulatory measures to introduce optimal standards by the GOT as described below.

Phase I, the PSP, has been completed in Tunisia. The PSP identified a number of barriers to the sustainable and successful adoption of the new regulatory energy efficiency building measures at optimal levels by the GOT. These are described in Sec B1. They are related to lack of documentation of the efficiency standards, insufficient capacity to implement and enforce these standards, lack of stakeholder awareness of economic benefits derived and insufficient market demand. Through the proposed project, Phase II of the RTMB will be carried out between 1999 and 2004. This will *validate the proposed optimal energy efficiency codes* that will be developed and demonstrated in the project and ensure their subsequent adoption as standards.

The present proposal is designed to remove the barriers identified and ensure support for the future implementation of "win-win" projects following the removal of the barriers. As such, the project falls within the programming context of Operational Programme No. 5 "Removal of Barriers to Energy Efficiency and Energy Conservation" of the GEF Operational Strategy.

For significant energy savings to be achieved, it is essential that the regulatory measures introducing optimal standards be adopted. If the identified barriers are not removed, it will not be possible for the GOT to adopt the optimal standards, despite the long term economic (in terms of energy savings) and environmental (in terms of reduced conventional and greenhouse gas emissions) advantages for the country. The regulatory measures in question are designed to ensure that energy efficient building codes and practices are used in the design and construction of all new buildings in the Tunisian commercial and residential sectors.

3. Prior and Ongoing Assistance

A number of incidences of prior and ongoing assistance have relevance to the present UNDP/GEF project. They are shown in Table 3.

Table 3: Relevant Donor Assistance to Tunisia

Project/Description	Status/Dates		Cost 000 US$	Donor	Executing Agent
	Start	End			
Maghreb Regional Project for Thermal Standards for Buildings – Preparatory Studies Process (RTMB/PSP) Two Phases	1991	1999	525	European Commission	ANER
Feasibility Study for Experimental Validation Phase	1997	1998	50	FFEM	ANER
Greenhouse Gas Reduction, National Action Plan GHG National Inventory	1996	Ongoing	565.4	UNDP/GEF	Ministry of the Environment and ANER
Capacity Building in Maghreb Region: Response to Climate Change Challenges and Adherence to Climate Change Framework Convention	1994	1997	2,368.0	UNDP/GEF	Tunisian Ministry of Environment
Total Specified			**3,513.4**		

RTMB Preparatory Studies

Launched in 1991, with the support of the European Commission – Directorate General for Energy – DG XVII, the RTMB programme (Réglementation Thermique Maghrébine des Bâtiments) is a regional programme for energy efficiency in buildings in the Maghreb countries (i.e., Tunisia, Morocco and Algeria). The programme is further advanced in Tunisia than in the other two countries and Tunisia, through ANER, is responsible for the coordination of the regional programme.

The RTMB programme is divided into three phases. Phase 1, the PSP, will be completed in Tunisia in 1999. hase 2, the EVP, for which the GEF Project Brief has been accepted, will run from 1999 to 2004. Phase 3, or the Implementation Process, involves adoption of regulatory measures to impose optimal standards by the GOT, and is currently scheduled for 2004.

The purpose of the PSP was to determine the standards to be adopted and the means to adopt them. The work during this phase has two main parts. Part 1 involved the acquisition of all data necessary to determine the standards to be imposed by the new regulations, in particular:

- Collection of climatic data on which to base the zoning of the country and the development of the detailed models to be used to carry out technical and economic evaluations and recommendations as to building design, as well as of simplified models to be used when the regulations are in place;
- Studies to determine thermal comfort levels in the Maghreb climates; and
- Data concerning the building sector: statistical description of existing buildings in the service and residential sectors, projected flows of new buildings, description of the different characteristics of building envelopes for residential and service sector buildings, inventory of building materials used and usable and determination of their characteristics.

Part 2 determined the future regulatory requirements and the means to satisfy such requirements, such as:

- Technical and economic evaluation to determine the regulatory criteria and the possible levels of regulatory requirements;

- Evaluation of the cost of compliance with different levels of regulatory requirements;
- Development of tools to assist in the application of the legislation and tools to control its application; and
- Determination of the desirable levels of regulatory requirements on the basis of experimental and operational verifications to be carried out in the context of the EVP.

The PSP in Tunisia has resulted in the specifications for *minimum* and *optimal* levels of energy efficient building standards, the identification of the technical and financial means required to comply with the standards and the determination of the barriers which exist to the adoption of optimal standards.

Regulatory measures are to be taken in two stages. The first stage, which will result in the adoption of minimum standards, is scheduled for 2000. The second stage to adopt optimal standards is scheduled for 2004, at which time the EVP should have removed the barriers identified. Adoption of optimal standards will be necessary to achieve the future energy savings and corresponding reduction in greenhouse gas emissions targeted by the GOT.

Phase 2, the EVP, which will run from 1999 through 2004, has the overall objective of removing the barriers that presently exist to the successful adoption of regulatory measures imposing energy efficient building standards at the *optimal* level. The EVP has two main components as follows:

- A demonstration project component involves building in different geographical areas a representative sample of demonstration projects that represent the proposed "optimal" energy efficiency building standards. The demonstration project concludes with analyzing and evaluating the results with a view to validation of the standards and, if necessary, fine tuning the new design and building techniques utilized.
- A second component comprises a set of accompanying measures. The component involves disseminating the results of the demonstration projects and informing the general public and building construction community via awareness-raising campaigns of the advantages of adopting the optimal standards. These measures pave the way for the future regulatory measures at optimum levels of efficiency to be adopted in 2004 by preparing the different market players to adapt to the future optimal standards and ensuring that the effort is sustainable after the project is complete.

Feasibility Study for Experimental Validation Phase

A feasibility study for the EVP in Tunisia was prepared in 1997 and funded by the French Global Fund for the Environment (Fonds Français pour l'Environnement Mondial or FFEM). The feasibility study determined:

- The mechanism of the EVP and its zone of intervention;
- Its operational components;
- Its technical specifications; and
- The cost of the process, the funding mechanism and potential funding sources.

Climate Change Capacity Building

Tunisia has also executed several projects related to climate change, including a $2.4 million project involving regional cooperation with other countries in the Maghreb region (Algeria, Libya and Morocco). This project involved the development of GHG inventory assessments, establishment of policy dialogues, evaluation of technological options, investigation of climate change impacts and analysis of adaptation opportunities.

Greenhouse Gas National Action Plan

Another climate change project devoted exclusively to Tunisia is the 1996 project, executed by AME and the Ministry of the Environment. This $565,400 project involved the development of greenhouse gas inventories, evaluation of mitigation options, a study of Tunisia's vulnerability to sea level rise, the preparation of sector plans and the drafting of national policy statements.

4. Institutional Framework

The ANER will have ultimate responsibilities for executing the project to which the UNDP and many Tunisian groups will make strong contributions. Three ministries, the Ministry of Environment and Land-Use Planning (Ministere de l'Environnement et de l'Amenagement du Territoire or MEAT) where ANER is housed, the Ministry of Housing and Public Buildings (Le Ministere de l'Equipement et de l'Habitat or MEH) and the Ministry of Tourism will be involved in the project. Two other counterparts that will have responsibilities for the successful performance of this GEF project will be the National Institute of Standards and Industrial Proprety (L'Institut National de la Normalisation et de la Propriété Industrielle or INNORPI) which is housed in the Ministry of Industry and the International Environmental Technology Center (Centre International des Technologies de l'Environment de Tunis or CITET).

The Ministry of Environment and Land-Use Planning

The Ministry of Environment and Land-Use Planning was created in 1991. Its responsibilities up to 1998 included land use planning as a tool for sustainable development, preventing soil degradation and desertification, sustainable water resources management, preservation of continental and marine biodiversity, afforestation, sustainable coastal tourism, urban and rural sanitation, urban and industrial solid waste and information education and awareness-building for the environment. In 1998 responsibility for renewable energy and energy efficiency was transferred to MEAT when AME under MOI became ANER under MEAT.

Tunisian National Renewable Energy Agency (ANER)

ANER, which was formerly the Agency for Energy Management (L'Agence pour la Maîtrise de l'Energie or AME) until decree number 98-2532 on December 18, 1998, is a public enterprise under the authority of the Minister in charge of environment. Created in 1985 originally under the Minister in charge of Energy, ANER is responsible for the implementation of sustainable energy policies. ANER develops and implements long-term efficiency strategies with respect to the use of both renewable and non-renewable energy resources. Its official mission statement is to promote the use of renewable energy, as well as economic activity that uses less energy and produces less pollution, while at the same time assuring a balance among interests in economic growth, quality of life and protection for the environment. ANER has a staff of 70 executives, professionals and support staff.

ANER has been instrumental in the successful development and implementation of a comprehensive energy efficiency programme in Tunisia. In particular this includes the successful adoption of regulatory and legislative measures encouraging energy efficiency and conservation. Its successful efforts also include initiatives advocating energy audits, providing financial support to energy efficient demonstration projects, as well as adopting legislation that reduces import duties on energy efficient and renewable energy equipment. In the context of the regional RTMB programme described earlier, ANER has been a leader in getting the building project up and running. Since 1991 it has invested a great deal of time and effort in determining the basis for regulatory measures that would limit the growth of consumption in the Tunisian building sector. Eventually the techniques and methods developed in Tunisia will be transferred to the other Maghreb countries.

ANER's role as lead executing agent for the GEF project is justified on the basis of the importance of energy consumption in buildings and ANER's prior experience in this area. ANER has extensive

experience in developing energy efficiency programmes and implementing them throughout Tunisia. Its success in reducing energy use in the industrial sector (by at least 1000 Mtoe) is documented in reports by the agency.

ANER has worked closely with the United Nations Development Programme (UNDP) and the other funding agency, FFEM, to formulate this project. ANER also completed the PSP or first phase of the RTMB process (documented in "Reglementation pour l'amelioration du confort et de la maîtrise de l'energie dans les bâtiments des pays du Maghreb") and a feasibility study ("Projet Tunisie – Efficacite Energetique dans l'habitat") as described in section A3. These preliminary efforts have created the foundation for this GEF project.

Ministry of Housing and Buildings

The MEH has responsibility for the oversight of the buildings construction industry and for ensuring that the standards adopted for the buildings sector are consistent with other government priorities, e.g., affordability of housing. Three MEH departments will be involved in steering the project. They are the Housing Department (Direction Générale de l'Habitat), the Urban Management Department (Direction Générale de l'Urbanisme) and the Public Buildings Department (Direction Générale des Batiments Civiles). The first has responsibility for national policy concerning new housing as well as the improvement of the existing housing stock, the second deals with elaboration of overall construction regulations, while the third regulates or oversees a variety of matters relating to public buildings, including the standards for their construction.

Ministry of Industry

The Ministry of Industry (MOI) has responsibility for the indicative planning in the energy sector and in this role monitors the trends in energy supply and demand. It is the authorizing agency for INNORPI and also provides assistance to the industrial sector.

National Institute of Standards and Industrial Property

The INNORPI is the only organization in Tunisia accredited for the development and implementation of standards. INNORPI's staff of about 120 people has developed about 4,500 standards in Tunisia. INNORPI is also the lead organization in charge of coordination of independent agencies (e.g., testing laboratories).

National Office of Tunisian Tourism

The National Office of Tunisian Tourism (Office National Tunisienne de Tourisme or ONTT) is a public entity under the Ministry of Tourism. Its mission is to orient, oversee and control investments in the tourism sector and to promulgate regulation and legislation in the sector. It promotes and manages infrastructure in the tourism sector, promotes Tunisian tourism overseas and oversees and analyzes national and international trends in tourism. Within ONTT the Department of Tourism Investment maintains a technical commission on which ANER is represented. This Department oversees the planning and construction of new hotel projects from their conception through their execution. ONTT will be represented on the Steering Committee for the project.

International Environmental Technology Center

CITET is a public entity under MEAT created within the framework of the national strategy for the protection of the environment and sustainable resource management. CITET is the focal point for development and transfer of ecologically sound technology to support sustainable development. CITET provides the interface between the public and private sectors, applied research and industry, technology innovation centers and economic and environmental actors and potential and actual users of sustainable

development technology, whether situated in Tunisia, in the region or elsewhere. CITET is proposed to house the Technical Buildings Center to be expanded under the project.

Technical Consultative Commission

The Technical Consultative Commission was created by Decree N° 94-357 of 10 March 1994. Its members are representatives of the Ministry of Industry, the Ministry of Environment, the Ministry of Finance, the Ministry of Economic Development and the Central Bank of Tunisia. The President is the Managing Director of ANER. The role of the Commission is to determine the amount of the government financial contribution made available to each investment. The Commission meets every three months or on an ad hoc basis when necessary at the request of the Managing Director of ANER.

Section B : PROJECT JUSTIFICATION

1. Problem to Be Addressed : The Present Situation

In Tunisia the combined energy demand of the service and residential sectors will equal that of the transport sector by 2010, thus buildings will become the largest energy consuming sector in the country. As emphasized above, the use of energy in buildings has been identified as the source of this increase in demand. Because ANER has not previously targeted energy conservation measures and practices in this sector, it estimates that the potential for energy savings and GHG reduction in this sector is particularly high.

When launching the RTMB in 1991, the GOT recognized that regulatory actions would be essential to the adoption of energy efficient building measures for new buildings. The PSP went further and demonstrated that to achieve the targeted reduction in energy consumption set by the government, a set of "optimal standards" would be necessary. Complete ranges of standard levels were then designed and recommended for adoption by the PSP.

The GOT recognizes the potential for curbing the expected rise by adopting regulatory requirements to introduce energy efficient building standards for new buildings. A number of critical barriers currently exist that inhibit the GOT from adopting the optimal standards and future regulatory requirements (designed and recommended through the PSP) needed to ensure that the energy savings targets and the resulting reductions in greenhouse gas emissions are achieved.

Although the proposed "optimal standards" are based on building design and techniques already documented and proven to work in other countries, there is no meaningful or worthwhile track record for such standards and practices in Tunisia. As such, the PSP recommended that, before proceeding to the adoption and implementation stage, the standards need to be validated and "fine tuned" in the Tunisian context. Such fine-tuning would only be possible through an extensive validation and demonstration activity where standards developed through the PSP would be implemented in new buildings and then monitored and evaluated in terms of performance over a set period of time.

Adhering to the standards would require modification of building design and construction methods. Furthermore, the use of energy efficient building materials would also be required, which due to low demand and unstructured market conditions, are not readily available in Tunisia. Moreover, the large majority of architects are not trained in energy efficient building design, while builders and contractors are not familiar with energy efficient building techniques.

Lastly, and in large part because of the above, a building that complies with the proposed standards would likely have a higher initial cost than a building which does not. The PSP estimated that the additional cost attributed to adhering to an energy efficient code of building practice would be an average of 6% in the service sector and 5% in the residential sector. Acquisition costs of new buildings, particularly in the residential sector, are already particularly high in Tunisia, and as a result, the GOT recently made a political commitment to reduce housing costs. While this proposed GEF project will contribute to transforming the building and construction market into one that is much more energy efficiency oriented and one where the cost of adopting a more energy efficient approach towards building is comparable to current building costs, it will not be successful unless it significantly reduces the economic costs associated with the optimal standards.

Consequently, the barriers to the adoption of regulatory energy efficiency measures in buildings at an optimal level to be overcome are as follows:

- Lack of documentation that the standards developed in the Preparatory Studies Process (PSP - Phase 1 of the RTMB programme) are technically adequate, cost effective and economically acceptable;
- Insufficient in-country capacity and know-how in the building sector (including architects and contractors) to apply energy efficient design and building techniques, and thus be in a position to comply with standards;
- Insufficient capacity among relevant Government agencies to enforce, monitor and update (as necessary) energy efficiency standards in buildings;
- An underdeveloped local market to demand and supply energy efficient building materials; and
- Lack of awareness by all stakeholders (general public, contractors, architects, building material vendors, and public and private building owners) of the favorable economic and environmental results of applying energy efficient building standards.

Removing the above barriers will serve to activate market forces, promote market transformation to one that is more energy efficiency oriented and reduce the initial incremental cost of adopting energy efficiency measures in buildings. If the above barriers are not removed, it will not be possible for the GOT to adopt the proposed standards at an optimal level despite the long term economic (in terms of energy savings) and environmental (in terms of reduced greenhouse gas emissions) advantages for the country. The proposed project is therefore designed to remove these barriers.

2. Expected End of Project Situation

The expected results of the successful implementation of the current proposal are as follows:

- By 2004 the adequacy and cost effectiveness of the draft standards developed by the PSP will be documented in 10 buildings or building complexes in the service sector and 840 housing units in 36 complexes in the residential sector (at three different economic levels: luxury, economy and social),[2] with the participation of both public and private sector entities;
- Necessary technical adjustments and fine-tuning will have been made to the draft optimal standards based on the ongoing evaluation, verification and monitoring of the performance of the buildings;
- By 2004 sufficient capacity and know-how will exist with all parties involved in Tunisia to implement, enforce, monitor and update the standards to be adopted;
- By 2004 a mature and well structured market for energy efficient building materials and related services will exist in Tunisia to the extent that such a market is able to respond to the demand arising from the adoption and implementation of optimal standards;
- By 2004 all stakeholders (including the population) will be well informed of the proposed adoption of the standards as well as the environmental and financial benefits of their implementation and enforcement;
- By 2004 the transformation of the market and the reduction of the existing associated transaction costs will reduce the initial incremental cost associated with energy efficient building design (currently at 6%) to a level (estimated at 2 to 3%) that can be readily absorbed by developers and owners;
- By 2004 an institutional mechanism and framework for implementing and enforcing the standards will be in place and ready to operate as soon as standards are adopted by the government; and
- Annual average energy savings generated as a result of the adoption of standards will amount to 0.134 Mtoe, representing approximately 0.42 million tons of CO_2. Over the period from 2004 to 2024, a total of 8.4 million tons of CO_2 emissions will have been curbed.

The above immediate results and outputs expected from the successful implementation of the proposed project will ensure that the overall objective of the project (to ensure adoption of optimal standards and

[2] Economy housing is simple but unsubsidized housing obtained privately. Social housing is housing built and managed by the government and made available to those with low incomes.

their long-term sustainability in the Tunisian context) is achieved. Table 4 shows the national benefits of adopting optimal standards over the life span of the buildings built under the standards.

Table 4: Cumulative National Benefits of Adoption of Optimal Standards

Time span (years)	20	25	40	50	75
Energy savings [Mtoe]	2.683	4.15	10.165	15.521	33.623
Reduction in energy expenditure (MTDinars)	832	1286	3151	4812	10423
Foreign currency savings (MTDinars)	413	639	1565	2390	5178

3. Target Beneficiaries

The principal beneficiaries of the project will be the owners and occupants of new buildings designed to consume less energy and operate at lower utility costs. The rest of the population will benefit indirectly from the project through the reduced/limited pollution from the electricity generation that would have been needed to meet the higher demand of the new buildings. The buildings sector design and construction industry will benefit from having a superior product to provide to the market and from the training in energy efficient construction techniques that they will learn during the capacity building phase. The buildings supply industry will benefit from the demand for new products. The GOT and delegate agencies and ministries will all benefit from lower investment and expenditures, particularly in foreign currency, for meeting the energy needs of many of these beneficiaries. Other Mahgreb countries will benefit from the transfer of knowledge, techniques and lessons learned that will occur during and after the project is completed through Tunisia's continuing participation in the regional RTMB programme.

4. Project Strategy and Implementation Arrangements

Project Strategy

The GEF project presents an opportunity for public and private sector entities to work cooperatively in accomplishing many of the policy objectives for energy efficiency and to begin removing some of the most important barriers to its successful implementation. The overall objective of the project is to remove barriers to improving the efficiency of new buildings through the adoption and enforcement of regulatory measures that introduce energy efficient building standards at an optimal level for all new buildings in the Tunisian commercial and residential sectors (public and private). The strategy to achieve this objective is to conduct an experimental validation process that demonstrates empirically the effectiveness of the optimal standards while carrying out an extensive capacity building and dissemination process that guarantees the ability and willingness to use the standards effectively.

Component 1: Experimental Validation and Demonstration of Building Energy Specifications

The strategy for this component is to provide an adequate, empirical basis for validation of the building standards developed in the prior efforts described above (i.e., the PSP phase). The Component 1 strategy addresses the technical, cultural and economic basis of the building efficiency improvements that will eventually be proposed for incorporation into the optimal building standards.

This component's strategy relies on a process of experimental validation and demonstration. A representative sample of service and residential sector building types will be erected under this component. A competitive solicitation will invoke responses from both the private and the public sectors. To be eligible, the projects submitted must comply with technical specifications prepared by the project incorporating all or part of the future energy efficiency building standards that are proposed for adoption. The degree of compliance with the future energy efficiency building standards will entitle the project to a rating or label Confort and Energy Performance (CPE) of 2 to 4 stars. In its use of competition to attract participants, the project will raise awareness of the new energy efficient design and construction techniques throughout the industry and not just in those who eventually win the bids and then participate in the actual experimental construction process.

The project is designed to share the incremental costs among the project participants (GEF, FFEM, GOT and the private sector) with different portions of the costs borne by each party. For example, the GEF, the GOT and building contractors will share the additional costs of building *construction* while the incremental cost of the *design* of the more efficient structures will be covered by the FFEM and GOT. Moreover, the incremental funding needed for monitoring, verification and validation of the standards incorporated will also be covered in this component and shared by GEF and FFEM. This last item includes identifying those modifications that potentially might be needed in the specifications for use later on in the project and the subsequent standards to be adopted by the Government.

The architects working on the new building design, the contractors and the monitoring/evaluation teams will be assisted by international and national technical experts. Results of energy efficiency validation activities will be disseminated nationally and regionally.

Component 2: Accompanying Measures (Awareness- and Capacity-Building)

This project component is designed to remove barriers to implementation of optimal energy efficient building standards and to stimulate a market for energy efficiency investments and related undertakings. One example is motivating building contractors and architects to incorporate more efficient design and construction techniques in their normal offerings and in the process to lower the cost of the additional efficient measures. The Component 2 strategy addresses policies, capability development, awareness-building and government regulation to tap more of the economic potential for end-use efficiency and the associated reduction of GHGs, than is currently being achieved in the country today. The associated strategy relies on three primary activities. The first is raising public awareness and demand for more efficient buildings. The second is building a strong and continuing capacity of the buildings design and construction industry to fill the demand for more efficient buildings. The third is ensuring that the capacity of the government oversight and promotion function is adequate to gain increased efficiency design and construction as the techniques are developed and become applicable to the Tunisian economic and social context.

To accomplish the strategy, the project will assist the GOT to mount an extensive awareness raising and promotion campaign designed to gain crucial public support for the adoption of the optimal level of standards. The campaign will address issues of common importance to all stakeholders who will be

affected in one way or the other by the implementation of the standards. The campaign will also focus on individual stakeholders and target specific concerns or reservations that they may have. This campaign will capitalize on results reached and lessons learned in Component 1 of this project and will focus on gaining the necessary support to ensure adoption of the standards. Lastly, market issues pertaining to the availability, adequacy and price of energy efficient building materials will also be addressed through this activity.

The project will also mount an extensive local capacity building effort through a series of training activities in the areas of energy efficient building design and construction techniques, as well as in the enforcement, monitoring and updating of energy efficiency standards. Another capacity building effort will be the design and construction of a Technical Building Center (TBC) to be located in CITET. The TBC would provide the technical support base to serve the long-term institutional needs and requirements of buildings sector stakeholders, in particular the architects and construction industry. It will be particularly important that the TBC be ready to provide this support at the time of adoption of the new standards to ensure the sustainability of the effort.

The accompanying component will also involve preparation of technical specifications for the building labeling process, as well as the overall project management.

In all three activities, Component 2 will make use of international and national technical expertise.

Implementation Arrangements

This project will have national execution with full responsibility assigned to the ANER within the Ministry of Environment and Land-Use Planning. ANER will be the lead agency in a project that involves several ministries as described below. ANER is an excellent choice for the execution and the lead because it has been the central agency responsible for conception and implementation of a variety of successful energy efficiency and renewable energy projects and programmes in Tunisia for almost a decade. ANER was also the Executing Agency for the projects that lead up to this project (as described in Section A4). The strategy and implementation arrangements are designed to ensure that the achievements of the project can be incorporated into the ongoing operations of ANER.

Project Functions and Duties

The GEF project organization will be highly focused to ensure effective management of the work activities. Annex 1 provides an organigram. This will be accomplished by a special purpose Project Team (PT) housed within ANER, thereby ensuring access to administrative facilities in addition to the financial, economic and legal departments of the organization. The PT will consist of a Project Manager, two Principal Service Sector Engineers, two Residential Sector Engineers and two Instrument Technicians. The PT will be supported as needed throughout the project by a financial accountant, an economist, a lawyer and a communications specialist drawn from within ANER. The PT will work closely with the developers of the validation projects, with the building designers and architects for the operational aspects and with national and international consultants for the follow up, verification and validation of the projects and for the awareness and promotion campaigns.

The Project Team will report to a Steering Committee and be overseen by a Supervisory Board. It will also work closely with a Technical Consultative Committee, which is an existing institutional body that is responsible for granting approval of financial incentives to energy efficiency investments.

The Supervisory Board will be responsible for advising on the overall policy issues pertaining to the project. This Board will also evaluate the work carried out and monitor the progress of the project. The Board will meet *no less frequently* than quarterly. The TOR for the Supervisory Board is located in Annex 2. Composition of the Board is one representative each from:

- GOT
- GEF
- FFEM

The Steering Committee will be responsible for ensuring coordination between relevant proponents and stakeholders and the selection of the validation experiments (building and construction projects), oversight of the day-to-day operations of the project and preparation of and review of materials for meetings of the Supervisory Board. The Steering Committee will meet at least quarterly during implementation of the project. The TOR for the Steering Committee is located in Annex 2. Composition of the Committee is:

- General Directorate for Housing
- General Directorate for Public Buildings
- General Directorate for Urban Management
- Tunisian National Tourist Office
- The National Order of Architects
- The National Order of Engineers
- Association of Consultant Engineers
- Organization of Consumers Defense
- Alliance Women and Environment
- Association of Real Estate Promoters

Project Team Personnel

Project staff comprise three profiles:

- Full-time for duration of project
  Part-time for duration of project
- Full-time for selected periods of project activities

The Project Manager (PM) is a full-time employee of ANER and will be committed half time to the day-to-day tactical management of the project. The PM will manage closely all project work activities and will be responsible for ensuring that all work remains consistent with project objectives and the GEF Project Document. The PM will be committed to the project for its full term, approximately five years. The PM will be responsible for personnel recruitment and assignment to project activities, and in doing, so will seek advice from the Steering Committee as needed.

The Service Sector Engineers, Residential Sector Engineers and Instrument Technicians will provide support for the PM (in varying amounts over the life of the project). TORs for the PT and the support staff are provided in Annex 2.

Administrative and financial matters will be handled by the Financial Accountant (FA) who will be dedicated to the project for half time by ANER. The duties of the FA will include financial oversight and management and financial reporting according to the requirements of the funding organizations. The FA will play a particularly important function in support of the project because of the different sources of funding for the project. The FA will set up and administer a Disbursement Mechanism as described and indicated in the diagram below.

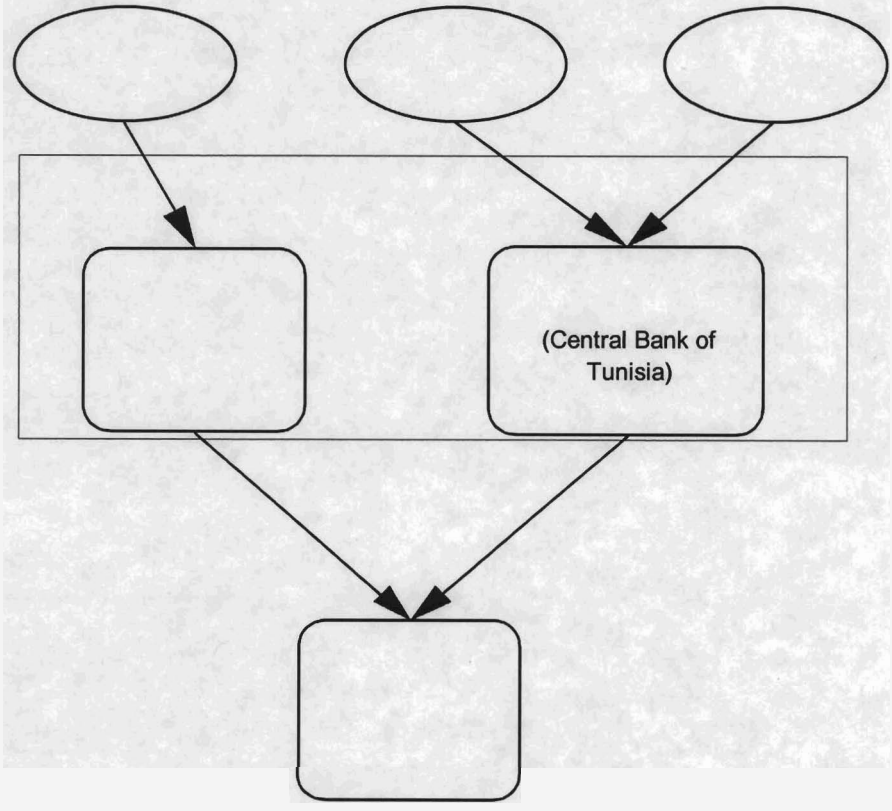
Financial Management

Separate disbursement procedures will be followed according to the source of the funds. The national executing agency will open a distinct account in the project's name which will be credited with advances of GEF funds. Payments to this account will be made semi-annually on the basis of a pre-determined

disbursement schedule that will be updated during the life of the project to reflect project requirements. ANER will manage the account and authorize payments to the different beneficiaries according to the procedures and regulations specified by the two funding sources. Funds coming from the Tunisian Energy Efficiency Fund (TEEF) (an existing Tunisian Government line of credit to cover the contribution to additional construction costs associated with energy efficiency improvements) will be disbursed according to the disbursement procedures already established for the fund.

At the request of ANER and in the overall framework of the global GEF budget, UNDP/Tunis will play both a substantive and an administrative role as follows :

* all payments in hard currency (international consultants and sub-contracts, DSA for study tours, equipment purchase outside Tunisia) ;
* management of the equipment purchase process (grouped purchases, best prices, import procedure, customs formalities, application of UN immunities and privileges) ;
* any other support such as identification of international experts and consulting firms, direct payments in local currency, preparation of special service agreements (SSA), as required to facilitation sound project management substantively and financially.



The ANER economist will be involved during the last two years of the project for 50% of his time to prepare a macroeconomic analysis of the project, paying particular attention to the internal rate of return, both economic and financial, of the technical improvements to the buildings.

The ANER lawyer will be involved for 50% of his time during the first year and 25% thereafter and will be responsible for the preparation of programme contracts between the Project Developers and ANER. He will compile the legal files, in particular terms of reference, project specifications, calls for tender, tender procedures, as well as the files for submission to the Technical Consultative Commission and subcontracting agreements. He will also participate in the preparation of regulatory texts in the context of the overall project.

The Communications Specialist will be involved for 100% of his time during the first year and the two final years of the project to design the project presentation documentation and all other documentation necessary to publicize the project. He will also be responsible for relations with the press and other media as well as the organization of events to promote and disseminate the results of the project (annual information meetings).

The PM will consult with the Steering Committee if it appears that significant changes will be required in the way the work activities are assigned and accomplished.

5. Reasons for GEF Assistance

The entire project of experimental validation and accompanying measures has a total estimated cost of US$ 116.68 million. This includes baseline costs of US$ 106.00 million (representing primarily the cost for construction of the buildings without the additional energy saving measures and equipment). This cost will be covered from Tunisian sources, both public and private. Of the remaining costs, about US$ 4.35 million will be contributed by the Tunisian Energy Efficiency Fund (US$ 1.69 million) and other local sources (US$ 2.66 million) for additional construction costs that are recoverable through this "win-win" activity.

The incremental costs, i.e., those covering the cost of barrier removal activities and the cost of reducing the transaction costs to secure the global environmental benefits in a sustainable fashion, amount to US$ 6.33 million. To cover these incremental costs, the FFEM (Fonds Francais pour l'Environnement Mondial) will contribute US$ 1.97 million. GEF funding will cover the remaining US$ 4.36 million.

Without GEF funding, the experimental validation process could not be implemented, the barriers to adoption of regulatory requirements imposing energy efficient building standards would not be removed, the GOT would not be in a position to adopt the regulatory requirements introducing the needed optimal standards and the savings that would accrue from those standards would not occur.

ANER estimated that adopting the said regulatory requirements would result in average annual energy saving over 20 years of 0.134 Mtoe/year by limiting the growth in energy demand from the buildings sector. Such savings would consequently result in a reduction of potential greenhouse gas emissions equaling 0.417 Mtons of CO_2/year. GEF funding for barrier removal activities is critical to secure these global benefits.

Through a barrier removal process, the project will ensure sustainable global benefits in terms of energy savings and long-term GHG emission reductions. This will be achieved through ensuring rational use of energy in the residential and commercial sectors. As such, the current project is in line with GEF Operational Programme 5 *"Removal Of Barriers to Energy Efficiency and Energy Conservation"* of the GEF Operational Strategy. Furthermore, the current proposal also corresponds to the following operational guidance of the GEF Operational Programme:

- It is country driven (the initiative came from ANER which has already been instrumental in promoting and adopting energy efficiency measures in other sectors) and is in conformity with the commitments of Tunisia's National Environmental Programme;
- It will result in transfer of environmentally sound technology and know-how as well related national capacity building;
- The success of the current initiative in Tunisia will strongly contribute to the adoption of similar regulation in neighboring countries through the associated regional RTMB programme. As such, the project will also leverage energy savings and greenhouse gas emission reductions in the other Maghreb countries; and
- The reduction in greenhouse gas emissions corresponding to reduced energy consumption will contribute to the mitigation of climate change.
- Anticipated Greenhouse Gas Reductions

An assessment of the potential GHG emission reductions to be achieved from the proposed project (Components 1 and 2 combined) were calculated under the PSP.[3] This assessment also included the expected energy savings resulting from compliance with the optimal energy efficient building standards for the 20-year period following adoption of the proposed regulatory measures. The results of this assessment are shown below:

Residential Buildings

Based on 40,000 new housing units per annum, potential cumulative energy savings will amount to 1.9 Mtoe over the 20-year study period corresponding to a reduction in CO_2 emissions of 5.9 million tons.

In the residential sector in Tunisia, energy savings following implementation of the new regulations at the optimal level will be obtained in two different ways depending on the category of building. For a housing unit which is not equipped at the outset with heating or air conditioning equipment (economic or social housing), the improved thermal comfort is likely to delay, or even avoid, such equipment being installed. In this case, a potential increase in energy demand is avoided.

For a housing unit which is equipped with space conditioning from the outset (luxury and some economic housing), the new building standards will result in the installed equipment consuming less energy than the same equipment installed in a building which does not conform to the new standards and will result in immediate energy savings

Service Sector Buildings

It has been estimated that on average 300 new service sector buildings per annum (about 70,000 square meters per year) will be built between 2004 and 2023. Potential cumulative energy savings resulting from adoption of the new regulations at the optimal level in the service sector have been estimated at 0.8 Mtoe over the 20-year period corresponding to a reduction in CO_2 emissions of 2.5 million tons. Since the buildings in question will be almost systematically equipped with heating and air conditioning from the outset, energy savings will be immediate.

6. Special Considerations

The entire project is couched in a broader regional project, the RTMB, which promises to bring regional benefits far beyond the scope of the UNDP/GEF project. Tunisia is a leader in the regional project and has progressed the furthest in the three-phase project. Through its leadership of the RTMB, the benefits, the lessons learned and the results will be ably disseminated to the other participants of the regional project.

[3] See "Reglementation pour l'amelioration du confort...," op. cit. and UNDP Project Brief for this project.

The second special feature is the emphasis on stimulating private sector investment in energy efficiency improvements and improving the private sector's capacity to understand the benefits of the energy saving improvements. It is expected that designers and builders will communicate these ideas to the ultimate purchasers or occupants of the buildings constructed, not only within the framework of the project but also in buildings built after the project is completed. The accompanying measures that reinforce the sustainability of the effort are expected to produce additional energy saving and greenhouse gas reduction benefits.

One of the goals of the project is to raise awareness and public demand for energy efficiency buildings. NGOs have a key role in the preparation and implementation of awareness building campaigns for decision makers and target groups such as builders and owners.

National NGOs such as ODC (Organisation de Défense du Consommateur) and Alliance Femme et Environnement in particular will be asked to build on project results and lessons learned.

7. Coordination Arrangements

A number of coordination arrangements will be critical to the success of this project. Over the course of the work activities, the project will reinforce the effective coordination with both national and international activities.

National Coordination

Coordination will be necessary in order to ensure the effective participation of the large number of key stakeholders in the development and acceptance of the optimal energy efficiency standards in the buildings sector. The key stakeholders in the government sector are the MEAT, the MOI, the MEH, ONTT and CITET. The effective functioning of the Steering Committee will ensure coordination between these key stakeholders.

The funds committed by the GOT will be provided under the Law on Energy Efficiency which provides for a financial contribution to be made to Tunisian real estate project developers who agree to incorporate energy efficiency measures into their programmes. The financial contribution will be approved by the Technical Consultative Commission in the context of agreements to be signed between ANER and the different real estate project developers who participate in the EVP. Furthermore, the continuing participation of ANER on the Technical Consultative Commission ensures coordination between the other financial support activities of ANER in the area of energy efficiency and the activities involved in the project.

Other key players in the private and "other" government sector that will be involved, *interalia*, are:

- The National Order of Architects (NOA);
- Private and public sector trade associations and promotional organizations;
- Higher education and research institutes;
- General contractors and construction companies; and
- Local government entities.

A major portion of the activity comprising Component 2 of the project will be to effect the necessary coordination and dissemination of information with these stakeholders on the opportunity to participate in the beginning of the project and later on the results of the project.

International Coordination

Two major coordination activities are envisioned at the international level: coordination of donors and regional coordination. Coordination among international donors to the project (i.e., the FFEM and the GEF) will take place on two levels. The first is the progress reporting that will occur throughout the project and in the form of the trimester reviews. GEF and FFEM will receive the progress reports that will provide the information on the entire project, both will be invited to participate in the review meetings, and both will be represented on the Supervisory Board. At the second level, the Disbursement Mechanism described previously will be used to ensure complete financial coordination between the two funds and Tunisian funds.

Regional coordination will be handled through the RTMB project also (described earlier) for which Tunisia is the leader.

8. Counterpart Support Capacity

The Ministry of Environment has expressed its full commitment to sponsor the objectives and outputs of this GEF project and to continue with their full implementation beyond the project completion date. ANER is fully committed to performing the execution activities associated with the project, including collaborating with the key stakeholders in the project, and has committed the staff necessary to support the project throughout the project life, including the required progress reporting. As described earlier, personnel of ANER will be assigned to the project to handle the financial administration and management of the project. This personnel has demonstrated its capacity to handle financial management of this type in numerous projects with international donors. FFEM is committed to providing its financial input (as described in Section E).

Section C: DEVELOPMENT OBJECTIVES

The Tunisian government is committed to a national programme of improving energy efficiency and was one of the first developing countries to adopt and begin implementing a coherent national energy conservation policy. The National Energy Conservation Plan was initiated in the early 1980s. Its objective was to limit the increasing demand for energy, to promote the use of natural gas and to develop renewable energy. In 1986, the Tunisian Agency for Energy Management (Agence pour la Maîtrise de l'Energie – AME), was created within the Tunisian Ministry of Industry in order to develop and implement the necessary measures to achieve the objective of this plan. At the outset, the need for energy conservation was economically driven as a result of fuel shortages and existing high level of energy prices. Starting in the 1990s, however, awareness as to the absolute necessity to limit the increase in greenhouse gas emissions resulted in AME (now ANER) integrating climate change mitigation considerations into its programmes.

Following Tunisia's ratification of the United Nations Framework Convention on Climate Change, two important measures were taken in the energy sector:

- Adoption of the Energie 2010 Action Plan. The plan's objectives are to: maintain a balance between energy supply and demand, provide sufficient energy resources to permit economic growth and protect the environment.
- Adoption of new legislative and regulatory measures in 1993 and 1994 that provide financial incentives for energy audits and energy efficient demonstration projects and reduce import duties on energy efficient and renewable energy equipment.

The first ten years of AME's energy efficiency efforts were successfully concentrated on the industrial sector. The main objectives for the period 1995 to 2010 are to improve energy efficiency in all sectors of the economy and to develop the use of renewable energy technologies. The adoption of regulatory measures introducing minimum energy efficient building standards will provide a major contribution to this goal.

The above government initiatives form the foundation for additional efforts to improve efficiency but are not sufficient to achieve the goals set due to the barriers discussed in Section B. The development objective of the proposed UNDP/GEF project is to remove these barriers by demonstrating the efficacy and effectiveness of an optimal building standard in advance of adopting it in the country and by building the capacity of all stakeholders to operate within the framework of the optimal standard. Specifically, the development objectives are to:

- Remove the barriers within the architectural and construction industry and within the Ministry of Housing and Public Buildings by demonstrating that the cost of the optimal standard is achievable with a minimum additional construction cost (once the construction techniques become routine);
- Remove barriers to adoption of the optimal standards by documenting that the standards are technically adequate, cost effective and economically acceptable;
- Remove barriers in implementation of the optimal standard by improving the capacity of relevant Government agencies to enforce, monitor and update energy efficiency standards in buildings;
- Remove the barrier of lack of availability of energy efficient materials by creating a sufficient demand for them;
- Remove the barrier of lack of awareness by launching a promotional campaign to disseminate the existence of the new activity and the results of the demonstration as soon as they become available; and
- Remove the barrier of lack of sustainability by developing a "pipeline" of design and construction technicians capable of incorporating efficient techniques and equipment into new construction.

SECTION D: IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

Component 1: Experimental Validation and Demonstration

Immediate Objective:

1. Set up and successfully conduct the Experimental Validation and Demonstration Process and verify the conformance of the individual building efficiency construction projects as built against the design as accepted.

Improvement Targets (by the year 2005)

Objective 1 All stakeholders in the regulation, design, construction and finance of new buildings in Tunisia will experience concrete proof of the concept of optimally efficient building design and construction and will therefore have a basis for lending their support to the implementation of optimal building codes based on the analysis of the empirical results of the experimental validation and demonstration process.

IMMEDIATE OBJECTIVE 1: SET UP AND CONDUCT THE EXPERIMENTAL VALIDATION AND DEMONSTRATION PROCESS

Set up and conduct the Experimental Validation and Demonstration process

Party responsible: ANER's Project Team

Success Criteria

- By the end of year one of the project, 46 energy efficient building demonstrations (36 residential buildings of 840 housing units and ten buildings in the service sector) will be selected from among those responding to the solicitation, their designs evaluated and design subsidies paid according to additional costs incurred,
- By the end of the project, the building designs selected will be constructed according to the designs as accepted and will be operational (with monitoring equipment installed) long enough to be able to effectively monitor performance and extract results for formulation of recommendations for optimal building codes, and

  By the end of the project, architects, builders and financial supporters as well as key policy stakeholders will be able to use the energy efficient techniques in new construction without significant additional costs.

This objective will be met through the following outputs:

Output 1.1 Solicitation and Design of Energy Efficient Building Demonstration Projects
Output 1.2 Construction of Demonstration Buildings
Output 1.3 Monitoring to Determine Performance of Demonstration Buildings as Built

Output 1.1 Solicitation and Design of Energy Efficient Building Demonstration Projects

A process will be initiated with incentives for architects and building designers to design buildings constructed to validate and demonstrate energy-efficient design features. This experience will become the basis for recommending and adopting optimal standards.

Activities for Output 1.1

This activity comprises the process of informing the stakeholders about the project; solicitation of demonstration projects according to the type of buildings sought; evaluation and verification of the efficiency of the design of the selected proposed projects (and the efficiency level to be assigned to each design); and payment of subsidies for additional design costs.

1.1.1 Inform developers about the opportunity to participate and provide programme materials ("tools" described in Component 2, Objective 2 Tools Development) criteria and instructions. Carry out in two successive waves one year apart – first developers already familiar with the project and second others that will be attending workshops and receiving promotional material. Solicit and evaluate proposals for their fit with project criteria and level of efficiency (according to CPE levels) to be attained by the design. Select final participants (to go on to the next stage of construction of the demonstration projects). Includes preparing lists of local and international consultants qualified to participate in the process.

1.1.2 Selected developer participants complete design according to CPE label objectives in two stages (Simplified Design and Detailed Study Design) according to and with the assistance of the materials/tools provided to developers in 1.1.1.

1.1.3 Verify the design and pay subsidies to designer (half after preliminary design accepted and half when detailed design is completed). Project Team may recommend design adaptations or refinements to the designer and/or subsequent builder.

Note: Throughout the activities for Component 1's Outputs 1.1 and 1.2, there will be ongoing dialogue and one-on-one advice and technical assistance provided by project experts through workshops and routine project operations.

Output 1.2 Construction of Demonstration Buildings

The actual construction of the demonstration buildings selected under Output 1.1 occurs, with payment of subsidies for additional construction costs.

Activities for Output 1.2

This activity will construct 36 residential building complexes of 840 housing units (of which one-third "luxury" units, one-third economy units and one-third social units) and ten structures/complexes in the service sector, inspect for buildings compliance with initial design and pay subsidies for additional construction costs.

1.2.1 The builders construct the buildings as designed and/or as adapted necessary according to recommendations of the Project Team.

1.2.2 The Project Team verifies the construction of the experimental buildings according to Detailed Study Design as approved and adapted (per 1.2.1).

1.2.3 The Project pays the subsidies and award the CPE label to those satisfactorily completing construction and complying with the design specifications in the Detailed Study Design.

Output 1.3 Monitoring to Determine Performance of Demonstration Buildings as Built

Monitoring of the energy efficiency and comfort performance of the buildings constructed in Output 1.2 and analysis of the actual performance vs. the expected performance, as predicted by the CPE label initially awarded for the building design.

Activities for Output 1.3

The Project Team and national and international experts will simulate the overall performance of each building or building complex built in the programme, procure and install appropriate measurement equipment to measure empirical performance, keep the measurement equipment operating throughout the measurement period, compare the two and report the results. The monitoring will take place at two different levels. For the overall performance monitoring, all of the buildings or building complexes in the project will undergo generalized monitoring (of comfort and overall energy consumption). For a smaller sample (6 residential operations and 3 service sector buildings or building complexes) detailed measurement and evaluation of the performance of individual energy efficiency measures will be conducted.

1.3.1 Implement overall performance monitoring programme (i.e., prepare terms of reference for the simulation and monitoring teams, select team members, simulate building performance, procure and install measurement equipment, ensure its correct operation and data collection during the life of the project and compare actual to simulated performance.

1.3.2 Implement detailed monitoring of individual energy efficiency measures (selecting a sample of six residential buildings representing the north and south of Tunisia as well as the three different economic levels of the building occupants and of three service sector building, e.g., a hotel, a hospital and an office) and separately monitoring performance of wall and roof insulation, window and solar technology, building inertia, HVAC systems and lighting. Follow a similar process of establishing detailed monitoring team terms of reference, selection of the team members, procurement and installation of and data collection from monitoring equipment, and analysis of actual and simulated performance of the individual measures.

omponent 2: Accompanying Measures

Immediate Objectives

1. Mobilize and ensure the capacity of the stakeholders, participating institutions (public and private) and Project Team to successfully carry out the project;

2. Develop the "tools" of the EVP process: the Comfort and Energy Performance (CPE) Label and the handbooks of energy efficient measures and techniques;

3. Fully document and evaluate the activities and results of the project, the "tools" developed and the empirical results obtained in a manner that can be used to support the replacement of the "minimal" building efficiency standards with the optimal building standards demonstrated in the project; assure the wide dissemination of interim and final results of the project, both nationally and regionally and the sustainability of the overall project's objectives for comfortable levels.

Improvement Targets (by the year 2005)

Objective 1 Mobilize and ensure capacity of participants (in particular, the Project Team but also key participants and stakeholders) to successfully carry out and participate in the project, including an evolving communication document about the project (i.e., the participation process, the CPE label and the results of annual reviews) and a process of selecting and training the trainers from the buildings sector to leverage the capacity to communicate widely throughout the country.

Objective 2 Prepare project technical support materials (i.e., tools for architects, developers and builders and labeling/rating regime).

Objective 3 Evaluate project results, refine proposed optimal standards based on the results and ensure sustainability of the process after project completion.

IMMEDIATE OBJECTIVE 1: MOBILIZE AND ENSURE CAPACITY OF PARTICIPANTS AND STAKEHOLDERS TO SUCCESSFULLY CARRY OUT PROJECT

Build the capacity of the institutions that will be carrying on the regulation, design and construction of energy efficient buildings according to the optimal regulation to be adopted at the end of the project.

The party responsible for Objective 1 is ANER's Project Team.

Success Criteria

- Early in the project, the three principal members of the Project Team will have completed a study tour in France and the United States and will have absorbed information, techniques and lessons learned in prior parallel activities relevant to successfully carrying out the project.
-
- After the study tour, the entire Project Team will have participated in a five day workshop with international experts to ensure that the lessons learned are internalized and homogeneous among the Project Team and its principal international and national experts that will be participating in the project.
- After one- and two-day workshops, the key stakeholders (both national and local) in the building standards and likely participants in the Experimental Validation and Demonstration Process will become thoroughly oriented in (and supportive of) the purpose, methods and activities to be undertaken in the project (through explanatory materials, workshops and kick off meeting).
- Throughout the project, the project is well managed and lessons learned are extracted at appropriate intervals so that a useful evaluation of the process can be conducted (e.g., in central and local annual reviews).

This objective will be met through the following outputs

Output 1.1 Project Team Capacity Building
Output 1.2 Institutional Capacity Building
Output 1.3 Project Management
Output 1.4: Training and Communication

Output 1.1: Project Team Capacity Building

A Project Team fully capable of handling all aspects of the project including project startup, operations, fiscal control, selection and oversight of consultants, communications with stakeholders and project and process data collection.

Activities for Output 1.1

Prepare the Project Team by organizing and conducting a study tour to France and the United States to study relevant activities where optimal building codes have been implemented in a fashion similar to the process proposed for Tunisia and by ensuring transfer of knowledge gained to the entire PT and key consultants.

1.1.1 Organize and conduct Project Team study tour for the three principal members of the Project Team (Project Manager, Principal Service Sector Engineer and Principal Residential Sector Engineer) accompanied by two international experts (the Regulation Expert and Technical Expert).

1.1.2 Organize and conduct one five-day workshop with the above personnel/consultants (specified in 1.1.1) and the rest of the Project Team to reinforce the experience of the Project Team on the study tour and convey it to the others and to ensure a common point of view among the entire Project Team and the international consultants that will be working most closely with the Project Team throughout the project. All of the activities to be undertaken in the project will be reviewed in this workshop in light of the lessons learned on the study tour, particularly project management, project materials preparation, institutional capacity building and project conclusion and evaluation.

Output 1.2: Institutional Capacity Building

Orientation and awareness raising for the key stakeholders relevant to the project (primarily, the ministries and offices involved in the project and the electricity company at the national level and local construction officials) to reinforce the purpose of the project, the process to be undertaken during the project and their respective roles in making the project a success.

Activities for Output 1.2

1.2.1 Design and implement a workshop of two days for the national (centralized) administration who will eventually be taking decisions on implementation of the optimal building code to raise their awareness and improve their participation in the process.

1.2.2 Design and implement five workshops of one day each for the local construction authorities (Ministry of Housing) and the local building construction inspection authorities (Ministry of Interior) to raise their awareness and improve their participation in the process.

Output 1.3: Project Management

Overall project management of all aspects of the project.

Activities for Output 1.3

Effectively manage all aspects of the project including project start-up, operations (particularly the Experimental Validation and Demonstration process), fiscal control, selection and oversight of consultants, communications with stakeholders, project and process data collection and evaluation.

1.3.1 Manage the preparation for the implementation of the Experimental Validation and Demonstration process (Component 1), including the preparation of communication materials and events needed for solicitation of participants and orientation of stakeholders.

1.3.2 Manage the implementation of the Experimental Validation and Demonstration process, including the solicitation and evaluation of proposed energy efficient designs, the awarding of subsidies at two different points in the process and the collection of data needed for progress reporting, annual reviews and final evaluation.

1.3.3 Manage the conclusion of the project, including the evaluation of the results, the dissemination of lessons learned and the recommendations to the government for the structure and content of a proposed optimal building code for a range of building types.

Output 1.4: Training and Communication

Workshops and training handbooks for developers, designers and builders; a kick-off and annual review meetings; a final conference and exhibition and other communication documents for the Experimental Validation and Demonstration process.

Activities for Output 1.4

Prepare training and communication materials and conduct kick-off and review meetings; a conference; and a workshop series for developers, designers and builders.

1.4.1 Prepare and conduct kick-off and annual review meetings with Steering Committee and/or Supervisory Board and/or ministries and offices involved in the project and the electricity company at the national level.

1.4.2 Prepare and conduct local annual review meetings in ten cities with local construction officials.

1.4.3 Prepare and conduct final conference and exhibition based on the results of the activities specified in Component 2's Outputs 3.1, 3.2 and 3.3.

1.4.4 Produce the evolving communication documents or booklets containing specifications for the CPE label (described in Output 2.2), the seven sectoral handbooks (described in Output 2.3) and the results of the annual reviews.

1.4.5 Produce two training handbooks (one for developers and the other for designers and builders) using a team of up to eight international and up to eight local experts representing the range of expertise needed for the handbooks (e.g., building design and development and building construction experts for the service sector and the residential sector); the local experts will train local "trainers" who would then conduct two series of one-day workshops in five Tunisian cities (one series for developers and the other for designers and builders in the cities of Tunis, Sousse, Sfax, Djerba and Tozeur).

IMMEDIATE OBJECTIVE 2: DEVELOP THE "TOOLS" OF THE EVP PROCESS

Develop the "tools" of the Experimental Validation and Demonstration process, particularly the specifications for the levels of the Comfort and Energy Performance (CPE) label that will become the basis of the optimal building codes to be promulgated by the end of the project and the Sector Handbooks.

The party responsible for Objective 2 is ANER's Project Team.

Success Criteria

- By the end of 2003, the preliminary efficiency levels concerning energy usage and comfort performance for the CPE label will be determined;
- By the end of the fourth quarter acceptable incremental costs for each level of the CPE label will be determined;
- By the end of the fifth quarter, an assessment calculation method for verifying compliance with the different levels will be produced;
- By the end of the fifth quarter, a series of seven sector handbooks will be produced.

This objective will be met through the following two outputs:

Output 2.1 Preparation of the Tunisian CPE Label for Application in the EVP process
Output 2.2 Preparation and Production of Sector Handbooks

The CPE label forms the basis for differentiating the energy and comfort performance of the buildings constructed in the Experimental Validation and Demonstration process (Component 1) and for the eventual proposed optimal building codes for adoption by Tunisia (replacing the minimal building codes being adopted in the year 2000).

Activities for Output 2.1

Develop and validate, via a calculation methodology adapted to Tunisia, a set of efficiency performance levels (and their associated procedures, systems and construction products having incremental costs that will be acceptable in the Tunisian buildings market) for the building types representing the bulk of the buildings constructed in Tunisia.

2.1.1 Drawing on studies done in preparation for the project, determine efficiency levels (representing both energy and comfort performance) for the CPE label for seven different building types (housing units/complexes designed and constructed either with or without space conditioning and five different types of service sector buildings/complexes, i.e., hospitals, offices, schools, hotels and others).

2.1.2 Determine acceptable incremental costs for CPE levels based on the difference in costs incurred for the building built according to minimal standards vs the costs calculated for building the structure according to the different CPE levels.

2.1.3 Produce an assessment calculations methodology that is simple to use yet correctly predicts the performance of buildings built according to the CPE label specifications under different climate zone conditions and types of comfort required by the eventual occupant.

Output 2.2 Sector Handbooks

A set of seven handbooks for the different generic types of buildings constructed in Tunisia covering: the CPE label concept, how to participate in the EVP process and therefore receive financial assistance and the calculation methodology and the recommended measure by type of building to attain the levels of the CPE label in an efficacious and cost-effective manner.

Activities for Output 2.2

Produce seven sectoral handbooks representing the main building types in Tunisia.

2.2.1 Produce seven sectoral handbooks representing the main building types in Tunisia (two for the residential sector representing housing units equipped with space conditioning and housing units not initially equipped with space conditioning and one each for the five main service sector building types: hospitals, offices, schools, hotels and others.)

IMMEDIATE OBJECTIVE 3: PROJECT WRAP-UP

Evaluate and disseminate the results of the work accomplished in the project in order to convince stakeholders of the efficacy of adopting an optimal building code for new construction in Tunisia and therefore pave the way for the elaboration of the optimal building code.

The party responsible for this objective is ANER's Project Team.

Success Criteria

- By the end of the project, a thorough evaluation of the entire project will be produced including a set of recommendations for adoption of an optimal building code for new construction.
- By the end of the project, the levels of performance for the CPE label will be refined based on the empirical data gathered throughout the project and proposed as a basis for the optimal building code.
- Throughout the last half of the project, a process will be completed to ensure the sustainability of the process set up under the project, including establishing the basis for support for the establishment of a technical building center.
  By the end of the project a final report will document the process, the lessons learned and the recommendations made to the GOT.
- Annually throughout the project, a financial audit will be conducted to ensure fiscal soundness of the operations and a final financial audit will report on the entire five years of fiscal performance of the project.

This objective will be met through the following outputs:

Output 3.1 Evaluation
Output 3.2 Refinement of Standards
Output 3.3 Sustainability of the Process
Output 3.4 Final Report
Output 3.5 Audit

Output 3.1 Evaluation

A thorough evaluation of the entire project, incorporating the results of the annual reviews and including a set of recommendations for adoption of an optimal building code for new construction.

Activities for Output 3.1

Conduct a thorough qualitative and quantitative evaluation of the project including a recounting of the results achieved (vs. projected), the lessons learned, the modifications needed to the CPE label based on the analysis of the empirical data and recommendations on adoption of an optimal building code for Tunisia based on project results backed by macroeconomic analysis.

3.1.1 Analyze data collected in the cost-assessment and performance-monitoring activities and aggregate by building type to make alterations as needed to the CPE label levels and measures;

3.1.2 Analyze participants' and stakeholders' behavior and attitudes based on formal and informal surveys conducted at the conclusion of workshops, each annual meeting, a specific building project under the EVP and the entire project;

3.1.3 Based on 3.1.1 and 3.1.2, produce specific recommendations for the approach to implementing an optimal building code for Tunisia.

Output 3.2 Refinement of Standards

A rigorous analysis of the performance of the specific building measures installed in the EVP buildings selected for detailed monitoring at the building measure level (as described in Output 1.3 of Component 1) and of the overall monitored performance of all the buildings built under the project and recommendations based on the results of the analysis on modifications to the originally proposed optimal standards.

Activities for Output 3.2

Carry out studies and sensitivity analyses of the actual performance of the buildings built under the project, analyze data collected in the cost-assessment and performance-monitoring activities and aggregate by building type to make recommendations as indicated in the CPE label levels that were initially adopted for use in the EVP to make them appropriate for adoption as the set of optimal building codes for Tunisia.

3.2.1 Incorporate studies completed prior to the start of the project and in the initial phases of the project on building and measure performance of new construction in Tunisia under the regulation existing before 2000 and the minimal regulation being adopted in 2000;

3.2.2 Analyze data collected in the cost-assessment and performance-monitoring activities and aggregate by building type and revise the benchmark analysis of building types according to the results obtained;

3.2.3 Carry out sensitivity analysis of the results;

3.2.4 Based on the results of the sensitivity analysis, produce final recommendations on modifications to the proposed optimal standards.

Output 3.3 Ensure Sustainability of the Process

A process to ensure that activities begun under the project are sustainable, there is support for establishing a technical building center in Tunisia, a regional conference transfers project results to the Maghreb Regional Project for Thermal Standards for Buildings, and there is continued adoption of efficiency and comfort measures for buildings.

Activities for Output 3.3

Carry out activities designed to improve long-term capability of key stakeholders to continue to deploy and develop efficiency and comfort measures for buildings.

3.3.1 Summarize sustainability gained through the process by contributing sustainability issues to the design of the evaluation activity described in Output 3.1 and then drawing from the results of the evaluation. Sustainability issues would include:

- Sufficiency of the technical basis for arguing for the implementation of the optimal building code,
- Capability of the construction industry to comply with the proposed regulations,
- Availability of building materials and components needed to meet the improved energy and comfort designs,
- Capability of the construction inspectors to enforce the proposed regulations
- Setting up of an autonomous system to monitor posteriori application of thermal regulations for energy efficiency as per label specifications
- Existence of a "pipeline" of capable technicians produced from the educational institutions to carry on the activity.

3.3.2 Conduct studies and make recommendations on the means to provide market-based incentives for those energy efficient (and comfort providing) measures that for reasons of initial cost, market sustainability, or other barriers could not be included in the proposed optimal building codes.

3.3.3 Develop support and specifications for the construction and operation of a Technical Building Center to be established under CITET. This is expected to offer demonstration, educational and outreach activities to support continued energy and comfort progress to the development, design and construction communities.

3.3.4 Transfer lessons and successes of the project through a regional international conference to be held in Tunisia that involves Tunisian, Moroccan, Algerian, Mediterranean and North African and other interested professionals active in building development and design. (See also Component 2, Output 1.4.3.)

Output 3.4 Final Report

The final report on the project.

Activities for Output 3.4

Product will be the Project's final report.

3.4.1 Prepare a final report incorporating all results and interim materials produced throughout the project. Report's format and organization should consider variations in topics and level of treatment that reflect the interests of the different audiences and funding sources).

Output 3.5 Financial Audit

Annual and final independent financial audit of the funds utilized in the project.

Activities for Output 3.5

Conduct financial audits and report the results.

3.5.1 Prepare financial audits at the end of each year of the project for review by the Supervisory Board and the Steering Committee. Prepare a comprehensive audit of the entire project at the end of the five years containing the information and taking the form required by the different funding sources.

SECTION E: INPUTS

This project has four sources of inputs: the GOT, the private sector in Tunisia, the UNDP/GEF and the French Global Fund for the Environment. The explanation of the inputs of each of these is shown below and the four separate budgets are provided in Section J.

1. GOT Inputs

The GOT will assign or transfer the staff listed below to the project. Such staff will be suitably qualified and experienced. The GOT will be responsible for financing the payment of salaries (given in the table below in Tunisian Dinar or DT) and allowances commensurate with current policies and future policies that may from time to time be decided by the GOT.

Personnel – In-Kind

Position Title	Work Months	Total Personnel Costs (DT)
Project Manager (1)	30	58,000
Principal Service Sector Engineer (2)	60	115,000
Principal Instrument Technician (6)	60	60,000
Financial Accountant (8)	30	58,000
Economist (9)	12	23,000
Lawyer (10)	15	29,000
Communications Specialists (11)	36	69,000
Total	**243**	**412,000**

Facilities – In-Cash (parallel financing)

The GOT is also responsible for providing the office space, including utilities, for the staff. It will contribute $ 62,000 to cover these direct operating costs of the project team and support staff within ANER and $ 60,000 to cover part of the costs of organizing national and local annual meetings.

Contribution in Cash (parallel financing)

The GOT, through the Tunisian Energy Efficiency Fund, will contribute $ 340,800 to cover part of the incremental construction costs related to the ten service sector buildings that participate in the EVP and $ 1,230,000 to cover up to 50% of the incremental construction costs (but not exceeding $ 50,000 per building) related to the 36 residential buildings constructed under the project.

2. Private Sector Inputs (parallel financing)

The total contribution of Tunisian Project Developers participating in the project is estimated at $ 106,000,000 baseline construction costs for ten service sector buildings and 36 residential building complexes and $ 2,664,000 covering part of the incremental construction costs. The contribution of the Project Developers to the incremental construction costs represents at least 50% for service sector buildings. For residential buildings, this contribution represents at least 50% for luxury complexes, and about 40% for economic complexes and zero for social complexes.

3. UNDP/GEF Inputs

The table below shows the UNDP/GEF contribution to personnel. A contingency of US$ 34,928 has been set aside to cover international consultant needs that may arise during the project.

Personnel

Position Title	Work Months	Total Salary Costs (in US$)
International Consultants		
Regulation Expert (12)	1.5	27,505
Financial Expert (13)	2.0	39,293
Technical Expert (14)	3.5	65,489
Energy and Comfort Techniques Experts (15)	3.4	64,179
Buildings Energy and Comfort Measurement Expert (16)	1.4	26,196
Buildings Energy and Comfort Simulation Expert (17)	1.8	34,927
Buildings Energy and Comfort Techniques Experts (18)	4.6	87,319
Buildings Energy and Comfort Regulation Expert (19)	1.2	21,393
Contingency for Other International Experts	1.8	34,927
Subtotal International Experts	**21.2**	**401,230**
National Consultants		
Buildings Energy and Comfort Engineers (21)	19.8	75,094
Measurement Engineers (20)	33	130,323
Subtotal National Consultants	**52.8**	**205,417**
National Project Staff		
Second Service Sector Engineer (4)	48	80,333
Principal and Second Residential Sector Engineers (3, 5)	96	160,666
Instrumentation Technician (7)	36	31,435
Subtotal National Project Staff	**180**	**272,434**
Total Personnel	**254**	**882,079**

Travel Costs GEF

UNDP/GEF will cover half of the travel costs for international experts associated with the monitoring activities in Component 1 ($28,400); and in Component 2 all of the travel associated with the international study tour, and half of the travel associated with development of sector handbooks, evaluation, refinement of the standards and the market-based incentives analysis ($31,980). The total cost of travel covered by GEF is $60,381.

Training and Related Costs GEF

Item	Cost $
Project Team International Study Tour	81,730
Conference meetings	309,981
Total	**391,712**

Equipment and Supplies

See details in Annex 3.

Item	Cost $
National Procurement	
Computers/Printers/Access to Internet and Minitel and Vehicles (2)	65,926
International Procurement	
Monitoring Equipment Purchase*	349,275
Technical Building Center Equipment*	497,717
Total Equipment and Supplies	**912,918**

* Monitoring equipment will be specified in the first year of the project before any construction of buildings. Technical Building Center Equipment includes approximately $87,319 for computers and related equipment but otherwise the requirements for equipment and construction will be detailed during the project.

Subcontracts

$1,827,756 is needed for the incremental costs associated with the EVP (Component 1) to cover a portion (approximately 25%) of the incremental building costs of the experimental building projects. $1,423,295 of this amount will cover the subsidies for the 46 buildings/complexes to be built under the EVP (based on calculations done in the PSP). However, the remaining $401,666 will be put aside as a reserve of in case of difficulties in financing the residential projects.

Handbook production (printing) will require $96,051. The contract for this will be awarded after competitive solicitation.

Communications, Reporting, UNDP Oversight

$192,101 is allocated for UNDP mission costs, including the finalization of the Project Document ($61,123) and oversight of the project over the five years of its operation ($130,978). This latter includes project initiation meeting, tripartite reviews, the mid-term evaluation and support for board and committee meetings. These costs are shown on line 16 of the UNDP Roll-up Budget, Section J.

4. French Global Fund for the Environment Inputs

In parallel to the UNDP/GEF inputs, the French GEF (FFEM) will be providing a substantial amount of funds for international and local consultant assistance and their associated travel. FFEM funds will also be used for efficiency label production, monitoring equipment for the buildings constructed under the EVP and additional equipment for the Technical Building Center, as shown below.

Personnel

FFEM will contribute $1,379,048 to cover personnel costs as shown in the table below.

Position Title	Work Months	Total Salary Costs (in $)
International Consultants		
Regulation Expert (12)	3	54,661
Financial Expert (13)	4.4	78,086
Technical Expert (14)	3	53,428
Energy and Comfort Techniques Experts (15)	3.4	60,414
Building Energy and Comfort Measurement Experts (16)	1.4	24,659
Building Energy and Comfort Simulation Expert (17)	1.8	32,879
Building Energy and Comfort Techniques Expert (18)	4.6	82,196
Building Energy and Comfort Regulation Expert (19)	3.7	102,334
Architects and Design Engineers (C1:1.1a&b) (19A)	19.3	345,224
Subtotal	***44.6***	***833,881***
National Consultants		
Architects and Design Engineers (C1:1.1a&b) (22)	84	345,224
Measurement Engineers(20)	34.4	122,678
Building Energy and Comfort Engineers(21)	21.7	77,265
Subtotal	***140.1***	***545,167***
Total FFEM Personnel	**184.6**	**1,379,048**

Travel Costs

FFEM will provide $200,478 for the travel expenses of international consultants. Of this, roughly two-thirds or $ 127,404 is for travel expenses for the experts involved in the incremental design cost determinations in Component 1. Another $26,734 is travel associated with the monitoring of the buildings constructed in the projects. $23,837 will cover travel expenses of the international technical support team. $4,315 is for international experts associated with the training of designers and builders. $8,520 is for the travel of the experts producing the efficiency labels and the sector handbooks. $6,165 is for the international consultants handling the evaluation and the refinement of the standards after the EVP is completed, and $3,493 is for international expert involved in ensuring the sustainability of the process.

Subcontracts

FFEM will provide $53,428 for the cost of label and handbook production.

Training and Related Expenses

FFEM will provide $73,977 to cover part of the costs of the training programs.

Equipment

FFEM will provide $180,832 for the purchase of equipment necessary to set up the Technical Buildings Center.

Reporting Costs

FFEM will cover the cost of financial audits for each year of the program at $16,439 per year or $82,196 total.

SECTION F: SUSTAINABILITY OF THE PROCESS

By the end of this GEF technical assistance project, sustainability of project results will be ensured by:

a) the existence of a research unit within CITET dealing with buildings, which will prepare studies to introduce new building techniques and materials,

b) an updated regulatory framework governing energy efficiency,

c) co-ordination among various research teams (engineering schools in Tunis, Sfax, Gabes, Monastir and the school for architecture and urban management studies),

d) training sessions for designers, developers, and local administration (municipalities).

Institutional mechanisms (law standards) under the responsibility of the Ministry of Equipment and INNORPI as well as financial mechanisms managed by the Bank of Habitat (low-interest loans) will be implemented in light of pilot activities carried out under the project (labels, sectoral manuals originally set up by the project).

Attention will be given in the course of the process to designing a posteriori monitoring system able to ensure that regulations are indeed respected.

The issue of additional costs for thermal efficiency in social housing will be the object of attention throughout the project. In effect, the ability of households to absorb such costs along with national policy to provide low-cost housing need to be taken into account.

SECTION G: RISKS

The proposed GEF project faces certain risks that are inevitable in any project formulated towards barrier removal in energy efficiency but also poses some risks that are particular to the experimental nature of the project. While the government can effect the removal of some barriers, this particular project depends heavily upon the voluntary actions of private and public sector entities not directly under the authority of the executing agency. As discussed below, the proposed programme will mitigate the risks associated with the voluntary actions required. The successful implementation of the project is deemed essential to prepare the ground for the adoption of the regulatory measures needed to secure the targeted energy savings required to curb the expected rise in energy demand. Construction techniques to be proposed will of course subjugate energy efficiency to security norms (including seismic and fire risks).

Contractor Validation

The biggest risk, as indicated above, is that it will not be possible to convince private and public contractors to participate in validation projects and, as such, not complete the necessary representative sample of Tunisian building types needed to validate the proposed standards. This risk has been significantly mitigated by the numerous preliminary contacts that have already been made with prospective candidates from the public and private, service and residential, sectors. These potential participants have indicated their willingness to participate and make a clear commitment to the process as long as their "true" incremental cost do not make their participation economically unfeasible. In formulating the project for the review of the three supporters (GOT, FFEM and GEF), the concept of initial incremental cost was explained and accepted as the basis of the financial incentives that will be provided to the participants to gain their participation. The level of the incentive was determined based on the requirements established in the context of the PSP feasibility study (and UNDP/GEF Project Brief) where all these proponents were involved.

Initial Incremental Costs

There is also the risk that the initial incremental cost of the demonstration projects is higher than initially estimated by the PSP. This risk has been mitigated in the strategy for the project. The total initial incremental cost of the validation projects has been calculated using an average of 6% for the service sector and 5% for the residential sector. It is likely that in fact certain projects will have a slightly higher incremental cost and others a slightly lower one than estimated. In these circumstances the reduced incremental cost of one project will compensate for the increased incremental cost of another project. This supposition has been born out by experience in France that has shown that this level is, on average, sufficient.

Failure of Validation

There is also a technical risk that the verification and monitoring of the demonstration projects do not result in validation of the draft standards. This could occur for a variety of reasons, e.g., the standards are not adequately prepared for the conditions in the country or the construction techniques required are too sophisticated or exacting for the level of the construction workers. The standards to be verified and validated have been drafted by national and international experts, based on design and technology already proven in other countries (e.g., France) and have already been adapted to the specific nature of the Tunisian climate through the work undertaken in the PSP. Nevertheless, to mitigate the risk that the standards are inadequate, fine-tuning will be done throughout the verification and monitoring period. To mitigate the risk of bad workmanship, the participants selected must demonstrate a good prior track record in terms of workmanship. Moreover, the participants will take part in the workshop series where the subject of correct installation procedures will be covered. A final means of risk mitigation would be to draw upon the funds reserved for undefined incremental costs to work more closely with the construction

companies to increase their level of workmanship. Therefore, it will be much less likely that the draft standards will not prove their worth in terms of the performance of the buildings by the time of project termination.

Insufficient Market

Another risk is that the local market for energy efficient building materials does not develop sufficiently during the duration of the project for the necessary cost reductions to take place. This risk will be mitigated with increased demand for these materials spurred by the adoption of initial minimum standards in 2000 and subsequently by the validation projects themselves, as well as by the simultaneous nationwide awareness and promotion campaign.

Insufficient Support

There is also the risk that, despite successful validation, support for the standards by the end of the present project is insufficient to justify adoption of the regulatory measures by the GOT. All indications now suggest that if the standards are validated and barriers removed, the GOT is very likely to endorse and promulgate them. The GOT is clearly aware that endorsing such standards is, in the long term, in the best interest of the country as this is the best and perhaps only way that its energy savings targets can be met effectively. Moreover, with the public and institutional support that will be generated through the awareness and promotion campaign, one of the biggest concerns of the Government will be removed. This campaign will ensure dissemination of the results of the validation projects and demonstrate the future economic, financial and environmental advantages of adopting the standards for all proponents (general public, contractors, architects, building material vendors, public and private building owners). Sufficient support should therefore be available.

Long-Term Incremental Costs

The final, longer-term risk is that the initial incremental cost of buildings complying with the standards is not reduced to the acceptable level of 1 to 2 %. While this risk cannot be fully mitigated within the timeframe of the project, it is at least comforting that the predicted reduction is a conservative estimate that should be readily achievable. A similar process carried out in France for residential buildings resulted in the reduction of the initial incremental cost from 10% to 2% in a five year time period. spite the careful risk mitigation strategy that is incorporated into the project, there is nevertheless no guarantee that efforts under the GEF project for the adoption of building standards will be successful. While ANER is very well placed to help encourage the adoption of these optimal standards, inevitably the decision to act rests with senior government officials. The GEF project attempts to mitigate these risks by relying initially upon voluntary participation in an experiment with building standards that will increase familiarity with the measures and reduce resistance to their ultimate adoption.

SECTION H: PRIOR OBLIGATIONS AND PREREQUISITES

The prior obligations of the GOT to the project are as follows:

- Agreement to make a financial contribution of $ 1,692,800 to the project for design and construction subsidies as described in Section E. hereof
- Agreement to make an "in kind" contribution to the project, the value of which is DT 412,000 as described in Section E. hereof, by providing the Project Manager, the Principal Service Sector Engineer and an Instrument Technician, national support staff (financial accountant, a lawyer, an economist and a communications specialist) and project offices and operating budget
- Agreement to house the Technical Buildings Center in the premises of the Centre Interational des Techniques de l'Environnement in Tunis, or in other suitable premises.

The project document will be signed by UNDP, and UNDP assistance to the project will be provided only if the prior obligations stipulated above have been met to UNDP's satisfaction.
Prerequisites of the project are:

- Designation of the Project Manager
- Constitution of the Project Team, Supervisory Board and the Steering Committee
- Opening of the bank accounts necessary for the receipt and disbursement of funds.

The Project Document will be signed by UNDP and UNDP assistance to the project will be provided, subject to UNDP receiving satisfaction that the prerequisites listed above have been fulfilled or are likely to be fulfilled. When anticipated fulfillment of one or more prerequisites fails to materialize, UNDP may, at its own discretion, either suspend or terminate its assistance.

SECTION I: PROJECT REVIEW, REPORTING AND EVALUATION

Project Reviews, Reporting and Evaluation

1. (a) The project will be subject to tripartite review (joint review by representatives of the GOT, executing agency and UNDP) at least once every 12 months, the first such meeting to be held within the first 12 months of the start of full implementation. The national Project Manager shall prepare for and submit to each review meeting a Project Performance Evaluation Report (PPER). Additional PPERs may be requested, if necessary, during the project.

   (b) A project terminal report will be prepared for consideration at the terminal tripartite review meeting. It shall be prepared in draft sufficiently in advance to allow review by Government and UNDP at least four months prior to the terminal review.

2. Following the initial joint review, the project may also be subject to additional, interim reviews of specific components or component progress toward selected outputs at six month intervals, because of the innovative nature of the project and the creation of new organisations to carry out the component objectives. The need for such interim review; and its organisation, terms of reference and precise timing, will be decided after consultation between the parties to the project document.

3. The project shall be subject to a mid-term evaluation approximately 30 months after the start of full implementation. The organisation, terms of reference and exact timing of the evaluation will be decided after consultation between the parties to the project document, plus any associated UN agency. Funds have been included in the budget for an international consultant team to perform the mid-term evaluation. These funds and mission may not be reduced or eliminated except by the written agreement of all parties to the project document. A time schedule of reviews, reports and the mid-term evaluation is attached as Annex 6.

4. As the project progresses, the steering committee will refine quantifiable success criteria which will serve to empirically measure project results. This exercise – to be carried out in line with current UNDP policy and procedures in project evaluation - will serve in evaluating the various stages of activities : drawing up of technical documents, training, project design, construction of buildings, thermal measurements...

SECTION J: LEGAL CONTEXT

This project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the GOT and the United Nations Development Programme, signed by the parties on 25th April 1987. The host country implementing agency shall, for the purpose of the Standard Basic Assistance Agreement, refer to the government cooperating agency described in the Agreement.

The following types of revisions may be made to this project document with the signature of the UNDP resident representative only, provided he or she is assured that the other signatories of the project document have no objections to the proposed changes:

(a) Revisions in, or addition of, any of the annexes of the project document;

(b) 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;

(c) Mandatory annual revisions which re-phase the delivery of agreed project inputs, or reflect increased expert or other costs due to inflation, or take into account agency expenditure flexibility.

SECTION K: BUDGET

The budgets showing the GOT in-kind contribution, Tunisian private sector inputs, UNDP/GEF inputs and French Global Fund for the Environment in-kind contributions are shown on the following tables.

BUDGET CONCERNANT LA CONTRIBUTION DU FEM GLOBAL

(en dollars des E.U.)

Pays : TUNISIE
Numéro : TUN/98/G32/A/1G/99
Titre : Validation expérimentale des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.

	TOTAL	1999	2000	2001	2002	2003	2004
10. PERSONNEL							
11.50 Consultants internationaux							
11.51 Formulation du projet	61123	61123					
11.52 Surcoûts conception secteur tertiaire	-						
11.53 Surcoûts conception secteur résidentiel	-						
11.54 Suivi thermique général	61123				30562	30562	
11.55 Suivi thermique spécifique	64179				32090	32090	
11.56 Formation aspect institutionnel administration centrale/locale	13098		6549	6549			
11.57 Conseiller Technique projet	-						
11.58 Conseiller Financier projet	-						
11.59 Appui technique ponctuel projet	-						
11.60 Préparation documents pédagogiques	87319	21830	65489				
11.61 Elaboration Label							
11.62 Conception guides sectoriels	21393	10697	10697				
11.63 Evaluation Processus PAE	14408						14408
11.64 Mise à jour des normes	39293					19647	19647
11.65 Evaluation durabilité processus règlementaire	39293					19647	19647
11.66 Audit projet	-						
11.99 SOUS TOTAL	**401229**	**93649**	**82734**	**6549**	**62651**	**101945**	**53701**
15. DEPLACEMENTS							
15.01 Déplacements Consultants internationaux	60381	8732	26196	8732	8732	7990	
15.02 Déplacements à l'étranger Experts nationaux	25322	4366	8732	4366	4366	3493	
15.03 Déplacements équipe nationale projet	39791	8700	16000	8091	7000		
15.04 Déplacement en Tunisie experts nationaux	-						
15.99 SOUS TOTAL	**125494**	**21798**	**50927**	**21189**	**20098**	**11482**	
16. COUTS DES MISSIONS							
16.01 Appui au siège	126990	25398	25398	25398	25398	25398	
16.99 SOUS TOTAL	**126990**	**25398**	**25398**	**25398**	**25398**	**25398**	
17.50 CONSULTANTS NATIONAUX							
17.51 Surcoûts conception secteur tertaire							
17.52 Surcoûts conception secteur résidentiel							
17.53 Suivi Thermique général	86882				43441	43441	
17.54 Suivi Thermique spécifique	43441				21721	21721	
17.55 Appui Technique projet	272434	4366	60250	60250	70728	41913	34927
17.56 Conception document présentation du projet	3493	3493					
17.57 Préparation rapport annuel	10478		2620	2620	2620	2620	
17.58 Conception document pédagogique	41913	6985	34927				
17.59 Formation Formateurs doc.pédagogique	6985		6985				
17.60 Conception Label							
17.61 Conception guides sectoriels	12225	3493	8732				
17.99 SOUS TOTAL	477852	18337	113514	62869	138509	109694	34927
19. TOTAL DE L'ELEMENT PERSONNEL	**1131565**	**159182**	**272574**	**116005**	**246656**	**248519**	**88628**
20. SOUS TRAITANCE							
20.01 Surcoûts réalisation secteur tertiaire	1190329			297582	297582	297582	297582
20.02 Surcoûts réalisation secteur résidentiel	637427			159357	159357	159357	159357
21.01 Edition Label							
21.02 Edition rapport annuel	39293		9823	9823	9823	9823	
21.03 Edition documents présentation projets	26196	8732	17464				
21.04 Edition guides sectoriels	30562		30562				
29. SOUS TOTAL SOUS-TRAITANCE	**1923806**	**8732**	**57849**	**466762**	**466762**	**466762**	**456939**
30. FORMATION							
32.01 Voyages Etudes	81730	17464	34927	8732	7509	6985	6112
32.02 Formation de groupe équipe projet	26196						
32.03 Formation de groupe pour administration	13098		13098				
32.04 Réunions centrales annuelles	52391		13098	13098	13098	13098	
32.05 Réunions annuelles d'information	130978		32745	32745	32745	32745	
32.06 Séminaire	-						
32.07 Séminaire Clôture du projet	87319						87319
39. TOTAL FORMATION	**391712**	**17464**	**93868**	**54574**	**53352**	**52828**	**93431**
40. MATERIEL							
45.01 Equipements de mesure pour suivi thermique	349275			174637	174637		
45.02 Matériel logistique équipe projet (micro, imprimante)	8732	4366	4366				
45.03 Véhicules roulants	43659	43659					
45.04 Equipement Centre Recherche Bâtiments	497717				165906	165906	165906
49. TOTAL MATERIEL	899383	48025	4366	174637	340543	165906	165906
50. DIVERS							
53.01 Abonnement Internet, Minitel	13534	2707	2707	2707	2707	2707	
59. SOUS TOTAL DIVERS	13534	2707	2707	2707	2707	2707	
99. TOTAL GENERAL	**4360000**	**236110**	**431363**	**814686**	**1110020**	**936721**	**804904**

BUDGET CONCERNANT LA CONTRIBUTION DU FEM FRANCAIS
(en dollars des E.U.)

Pays : TUNISIE
Numéro : TUN/98/G32/A/1G/99
Titre : **Validation expérimentale** des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.

	TOTAL	1999	2000	2001	2002	2003	2004
10. PERSONNEL							
11.50 Consultants internationaux							
11.51 Formulation du projet	-						
11.52 Surcoûts conception secteur tertiaire	123294		41098	41098	41098		
11.53 Surcoûts conception secteur résidentiel	221930		73977	73977	73977		
11.54 Suivi thermique général	57537				28769	28769	
11.55 Suivi thermique spécifique	60414				30207	30207	
11.56 Formation aspect institutionnel administration centrale/locale							
11.57 Conseiller Technique projet	41098		12329	8220	8220		12329
11.58 Conseiller Financier projet	41098		12329	8220	8220		12329
11.59 Appui technique ponctuel projet	16439			8220		8220	
11.60 Préparation documents pédagogiques	82196	20549	41098	20549			
11.61 Elaboration Label	82196	20549	41098	20549			
11.62 Conception guides sectoriels	20138	10069	10069	0			
11.63 Evaluation Processus PAE	13562					0	13562
11.64 Mise à jour des normes	36988					18494	18494
11.65 Evaluation durabilité processus règlementaire	36988					18494	18494
11.66 Audit projet	82196		16439	16439	16439	16439	16439
11.99 SOUS TOTAL	**916078**	**51167**	**248438**	**197271**	**206929**	**120623**	**91649**
15. DEPLACEMENTS							
15.01 Déplacements Consultants internationaux	200477	20048	40095	40095	40095	40095	20048
15.02 Déplacements à l'étranger Experts nationaux	-						
15.03 Déplacements équipe nationale projet	-						
15.04 Déplacement en Tunisie experts nationaux	-						
15.99 SOUS TOTAL	**200477**	**20048**	**40095**	**40095**	**40095**	**40095**	**20048**
16. COUTS DES MISSIONS	-						
16.01 Appui au siège	-						
16.02 Déplacements siège	-						
16.99 SOUS TOTAL							
17.50 CONSULTANTS NATIONAUX							
17.51 Surcoûts conception secteur tertaire	123294	0	41098	41098	41098		
17.52 Surcoûts conception secteur résidentiel	221930	0	73977	73977	73977		
17.53 Suivi Thermique général	81785				40893	40893	
17.54 Suivi Thermique spécifique	40893				20446	20446	
17.55 Appui Technique projet	-						
17.56 Conception document présentation du projet	-						
17.57 Préparation rapport annuel	-						
17.58 Conception documents pédagogiques	39454	6576	32879				
17.59 Formation Formateurs doc.pédagogique	6576	0	6576				
17.60 Conception Label	19727	8220	11507				
17.61 Conception guides sectoriels	11507	3288	8220				
17.99 SOUS TOTAL	**545167**	**18083**	**174256**	**115075**	**176414**	**61339**	**0**
19. TOTAL DE L'ELEMENT PERSONNEL	**1661721**	**89298**	**462790**	**352441**	**423438**	**222057**	**111697**
20. SOUS TRAITANCE							
21.01 Surcoûts réalisation secteur tertiaire	-						
21.02 Surcoûts réalisation secteur résidentiel	-						
22.01 Edition Label	24660	12330	12330				
22.02 Edition rapport annuel	-						
22.03 Edition documents présentation projets	-						
22.04 Edition guides sectoriels	28769		28769				
29. SOUS TOTAL SOUS-TRAITANCE	**53429**	**12330**	**41099**	**0**	**0**	**0**	**0**
30. FORMATION							
32.01 Voyages Etudes	-						
32.02 Formation de groupe équipe projet	-						
32.03 Formation de groupe pour administration	-						
32.04 Réunions centrales annuelles	-						
32.05 Réunions annuelles d'information	-						
32.06 Séminaire de formation	74000	8240	32880	32880			
32.07 Séminaire Clôture du projet	-						
39. TOTAL FORMATION	**74000**	**8240**	**32880**	**32880**	**0**	**0**	**0**
40. MATERIEL							
45.01 Equipements de mesure pour suivi thermique	-						
45.02 Matériel logistique équipe projet (micro, imprimante)	-						
45.03 Véhicules roulants	-						
45.04 Equipement Centre Recherche Bâtiments	180850				82200	57550	41100
49. TOTAL MATERIEL	**180850**	**0**	**0**	**0**	**82200**	**57550**	**41100**
50. DIVERS							
53.01 Abonnement Internet, Minitel	-						
59. SOUS TOTAL DIVERS							
99. TOTAL GENERAL	**1970000**	**109868**	**536768**	**385321**	**505638**	**279607**	**152797**

BUDGET CONCERNANT LA CONTRIBUTION DU GOUVERNEMENT TUNISIEN SOUS FORME DE COFINANCEMENT PARALLELE (EN DOLLARS DES E.U.)

Pays : TUNISIE
Numéro : TUN/98/G/32/A/99
Titre : Validation expérimentale des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.

	TOTAL	1999	2000	2001	2002	2003	2004
15. DEPLACEMENTS							
15.04 Déplacements en Tunisie consultants nationaux	62000	4000	15000	15000	10000	10000	8000
15.99 SOUS TOTAL DEPLACEMENTS	**62000**	4000	15000	15000	10000	10000	8000
19. TOTAL PERSONNEL	**62000**	4000	15000	15000	10000	10000	8000
20. SOUS TRAITANCE							
21.01 Surcoûts réalisation secteur tertiaire	340800			85200	85200	85200	85200
21.02 Surcoûts réalisation secteur résidentiel	1230000			307500	307500	307500	307500
29. TOTAL SOUS-TRAITANCE	**1570800**			392700	392700	392700	392700
30. FORMATION							
32.04 Réunions centrales annuelles	60000		15000	15000	15000	15000	
39. SOUS TOTAL FORMATION	**60000**		15000	15000	15000	15000	
99. TOTAL GENERAL	**1692800**	**4000**	**30000**	**422700**	**417700**	**417700**	**400700**

BUDGET CONCERNANT LA CONTRIBUTION DU GOUVERNEMENT TUNISIEN EN NATURE
(EN DINARS TUNISIENS DT)

Pays : TUNISIE
Numéro : TUN/98/G32/A/1G/99
Titre : **Validation expérimentale des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.**

	TOTAL	1999	2000	2001	2002	2003	2004
10. PERSONNEL							
17.62 Unité de projet	233000	7000	47000	47000	47000	47000	38000
Chef de projet	58000	1000	12000	12000	12000	12000	9000
Ingénieur Principal "tertiaire"	115000	3000	23000	23000	23000	23000	20000
Technicien "instrumentation"	60000	2000	12000	12000	12000	12000	10000
17.63 Personnel d'appui	179000	7000	24000	17800	40200	52000	38000
Financier & Comptable	58000	1000	12000	12000	12000	12000	9000
Economiste	23000					12000	11000
Juriste	29000	1000	11000	5800	5800	5400	
Chargé de communication	69000				23000	23000	23000
17.99 SOUS TOTAL	**412000**	**14000**	**71000**	**64800**	**87200**	**99000**	**76000**
19. TOTAL DE L'ELEMENT PERSONNEL	**412000**	**14000**	**71000**	**64800**	**87200**	**99000**	**76000**
99. TOTAL GENERAL	**412000**	**14000**	**71000**	**64800**	**87200**	**99000**	**76000**

Pays : TUNISIE
Numéro : TUN/98/G32/A/1G/99
Titre : **Validation expérimentale** des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.

	TOTAL	1999	2000	2001	2002	2003	2004
20. SOUS TRAITANCE							
21.01 Surcoûts réalisation secteur tertiaire	1704.000			426000	426000	426000	426000
21.02 Surcoûts réalisation secteur résidentiel	960.000			240000	240000	240000	240000
29. TOTAL SOUS-TRAITANCE	2664.000			666000	666000	666000	666000
99. TOTAL GENERAL	**2664.000**			**666000**	**666000**	**666000**	**666000**

BUDGET CONCERNANT LA CONTRIBUTION TOTALE
(EN DOLLARS DES E.U)

Pays : TUNISIE
Numéro : TUN/98/G32/A/1G/99
Titre : **Validation expérimentale des performances thermiques et énergétiques des bâtiments et suppression des barrières à leur introduction au niveau de la réglementation thermique et énergétique des bâtiments neufs.**

	GEF	FFEM	GVT	PRIVE
10. PERSONNEL				
11.50 Consultants internationaux				
11.51 Formulation du projet	61123			
11.52 Surcoûts conception secteur tertiaire	-	123294		
11.53 Surcoûts conception secteur résidentiel	-	221930		
11.54 Suivi thermique général	61123	57537		
11.55 Suivi thermique spécifique	64179	60414		
11.56 Formation aspect institutionnel administration centrale/locale	13098	0		
11.57 Conseiller Technique projet	-	41098		
11.58 Conseiller Financier projet	-	41098		
11.59 Appui technique ponctuel projet	-	16439		
11.60 Préparation documents pédagogiques	87319	82196		
11.61 Elaboration Label		82196		
11.62 Conception guides sectoriels	21393	20138		
11.63 Evaluation Processus PAE	14408	13562		
11.64 Mise à jour des normes	39293	36988		
11.65 Evaluation durabilité processus règlementaire	39293	36988		
11.66 Audit projet	-	82196		
11.99 SOUS TOTAL	**401229**	**916078**	**0**	**0**
15. DEPLACEMENTS				
15.01 Déplacements Consultants internationaux	60381	200477		
15.02 Déplacements à l'étranger Experts nationaux	25322			
15.03 Déplacements équipe nationale projet	39791			
15.04 Déplacement en Tunisie experts nationaux	-		62000	
15.99 SOUS TOTAL	**125494**	**200477**	**14074000**	**0**
16. COUTS DES MISSIONS				
16.01 Appui au siège	126990			
16.99 SOUS TOTAL	**126990**	**0**	**0**	**0**
17.50 CONSULTANTS NATIONAUX				
17.51 Surcoûts conception secteur tertaire		123294		
17.52 Surcoûts conception secteur résidentiel		221930		
17.53 Suivi Thermique général	86882	81785		
17.54 Suivi Thermique spécifique	43441	40893		
17.55 Appui Technique projet	272434			
17.56 Conception document présentation du projet	3493			
17.57 Préparation rapport annuel	10478			
17.58 Conception document pédagogique	41913	39454		
17.59 Formation Formateurs doc.pédagogique	6985	6576		
17.60 Conception Label	-	19727		
17.61 Conception guides sectoriels	12225	11507		
17.99 SOUS TOTAL	**477852**	**545167**	**0**	**0**
19. TOTAL DE L'ELEMENT PERSONNEL	**1131565**	**1661721**	**14074000**	**0**
20. SOUS TRAITANCE				
21.01 Surcoûts réalisation secteur tertiaire	1190329		340800	1704000
21.02 Surcoûts réalisation secteur résidentiel	637427		1230000	960000
22.01 Edition Label	-	24660		
22.02 Edition rapport annuel	39293			
22.03 Edition documents présentation projets	26196			
22.04 Edition guides sectoriels	30562	28769		
29. SOUS TOTAL SOUS-TRAITANCE	**1923806**	**53429**	**1570800**	**2664000**
30. FORMATION				
32.01 Voyages Etudes	81730			
32.02 Formation de groupe équipe projet	26196			
32.03 Formation de groupe pour administration	13098			
32.04 Réunions centrales annuelles	52391		60000	
32.05 Réunions annuelles d'information	130978			
32.06 Séminaire de formation	-	74000		
32.07 Séminaire Clôture du projet	87319			
39. TOTAL FORMATION	**391712**	**74000**	**60000**	**0**
40. MATERIEL				
45.01 Equipements de mesure pour suivi thermique	349275			
45.02 Matériel logistique équipe projet (micro, imprimante)	8732			
45.03 Véhicules roulants	43659			
45.04 Equipement Centre Recherche Bâtiments	497717	180850		
49. TOTAL MATERIEL	**899383**	**180850**	**0**	**0**
50. DIVERS				
53.01 Abonnement Internet, Minitel	13534			
59. SOUS TOTAL DIVERS	**13534**	**0**	**0**	**0**
99. TOTAL GENERAL	**4360000**	**1970000**	**1692800**	**2664000**

PROJECT NUMBER : TUN/98/G32/A/1G/99
PROJECT TITLE : Tunisia
OBJECTIVE: ROLL UP
REVISION CODE: 30-Jul-99
SOURCE OF FUNDS: UNDP
SOURCE OF FUNDS:
EXECUTING AGENT:

BUDGET LINE	LINE DESCRIPTION	PROJECT TOTAL (1997-2001) Wk Mos	$ COST	$DDSMS1	YEAR 1 1999-2000 Wk Mos	$ COST	YEAR 2 2000-01 Wk Mos	$ COST	YEAR 3 2001-02 Wk Mos	$ COST	YEAR 4 2002-03 Wk Mos	$ COST	YEAR 5 2003-04 Wk Mos	$ COST
	PROJECT PERSONNEL													
	11 International personnel													
01 2	Subtotal	21.2	401229		7	132142	3	50791	2	31326	4	82298	6	119875
	13 Administrative Support													
01 4	Subtotal			0										
01 5	Travel													
01 6	Subtotal	0	60381		0	18082	0	3639	0	7100	0	16056	0	17756
	16 Mission costs													
01 7	Subtotal		192101	0		93868		32745		32745		32745		
	17 National Professional Staff													
01 7	Project Staff	180	272434	0	39	60250	39	60250	48	70728	27	40603	27	46500
01 8	Consultants	52.8	205417		10	36132	8	31976	9	36074	17	68654	8	37313
01 8	Subtotal	232.8	477852		49	96382	47	92226	57	106802	44	109258	35	83813
	19 PROJECT PERSONNEL SUBTOTAL	254	1131563		56	340474	50	179400	59	177972	49	240356	41	221444
	SUBCONTRACTS													
	21 Handbook production	0	96051	0		36848		26458		16372		16372		
	21.01 Building design and construction	0	1827755	0				182776		913878		731102		
02 9	SUBCONTRACTS SUBTOTAL		1923806	0		36848		209233		930250		747474		
	TRAINING													
03 1	Fellowships													
03 2	Subtotal													
03 2	Study Tours													
	3,299 Subtotal		81730			18259		18259		20867		12172		13940
03 4	Conference and Meetings													
03 5	Subtotal		309981			32745		76404		56757		56757		100000
03 9	TRAINING SUBTOTAL		391712			51004		94663		77625		68929		113940
	EQUIPMENT & SUPPLIES													
	45 Local Procurement													
04 6	Subtotal		65926	0		65926								
	46 International procurement													
04 7	Subtotal		846991	0		349275				130978		174637		220000
	49 EQUIPMENT & SUPPLIES SUBTOTAL		912917	0		415200				130978		174637		220000
	MISCELLANEOUS													
05 1	Miscellaneous													
05 2	Subtotal	0	0	0										
05 2	Reporting Costs*													
05 3	Subtotal	0	0	0										
05 3	Sundry													
05 4	Subtotal	0	0	0										
	59 MISCELLANEOUS SUBTOTAL	0	0	0										
	PROJECT SUBTOTAL		4360000											
	UNDP Expense (3% of Total)		126990											
	99 Total w/ UNDP/GEF Expenses		4360000											
	102 Cost Sharing -Gvt.		0											
	103 Cost Sharing -GEF		0											
	104 Subtotal, GEF, Gvt.		0											
	109 Component Total Cost Contrib.		4360000											

*Final report and required progress reports are in-kind contribution of GOT

FFEM CONTRIBUTION IN US DOLLARS

BUDGET LINE	DESCRIPTION	PROJECT TOTAL (1997-2001)		YEAR 1 1999-2000		YEAR 2 2000-01		YEAR 3 2001-02		YEAR 4 2002-03		YEAR 5 2003-04	
LINE		Wk Mos	COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST	Wk Mos	$ COST
	PROJECT PERSONNEL												
11	International personnel												
11.99	Subtotal	55.4	$833,881	9	$154,870	19	$268,030	17	$222,649	5	$89,799	6	$98,533
13	Administrative Support												
13.99	Subtotal		$0										
15	Travel												
15.99	Subtotal	0	$200,477	0	$17,735	0	$74,428	0	$76,139	0	$17,580	0	$14,595
16	Mission costs												
16.99	Subtotal		$0		$0		$0		$0		$0		$0
17	National Professional Staff												
17.01	Project Staff	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
17.5	Consultants	133	$545,167	12	$43,942	51	$205,935	49	$203,281	14	$61,339	7	$30,670
17.99	Subtotal	133	$545,167	12	$43,942	51	$205,935	49	$203,281	14	$61,339	7	$30,670
19	PROJECT PERSONNEL SUBTOTAL	188	$1,579,525	21	$216,547	71	$548,392	66	$502,071	19	$168,719	12	$143,800
	SUBCONTRACTS												
21	Handbook and label production	0	$53,428		$35,796		$17,631		$0		$0		$0
21.01	Building Construction	0	$0				$0		$0		$0		$0
29	SUBCONTRACTS SUBTOTAL		$53,428		$35,796		$17,631		$0		$0	0	$0
	TRAINING												
31	Fellowships												
31.99	Subtotal												
32	Study Tours												
3299	Subtotal		$0		$0		$0		$0		$0		$0
34	Conference and Meetings												
34.99	Subtotal		$73,977		$36,988		$36,988						
39	TRAINING SUBTOTAL		$73,977		$36,988		$36,988		$0		$0		$0
	EQUIPMENT & SUPPLIES												
45	Local Procurement												
45.99	Subtotal		$0		$0								
46	International procurement												
46.99	Subtotal		$180,832						$41,098		$73,977		$65,757
49	EQUIPMENT & SUPPLIES SUBTOTAL		$180,832		$0		$0		$41,098		$73,977		$65,757
	MISCELLANEOUS												
51	Miscellaneous												
51.99	Subtotal	0											
52	Reporting Costs		$82,196		$16,439		$16,439		$16,439		$16,439		$16,439
52.99	Subtotal	0	$82,196										
53	Sundry												
53.99	Subtotal	0	$0										
59	MISCELLANEOUS SUBTOTAL	0	$82,196		$16,439		$16,439		$16,439		$16,439		$16,439
	PROJECT SUBTOTAL		$1,970,000										

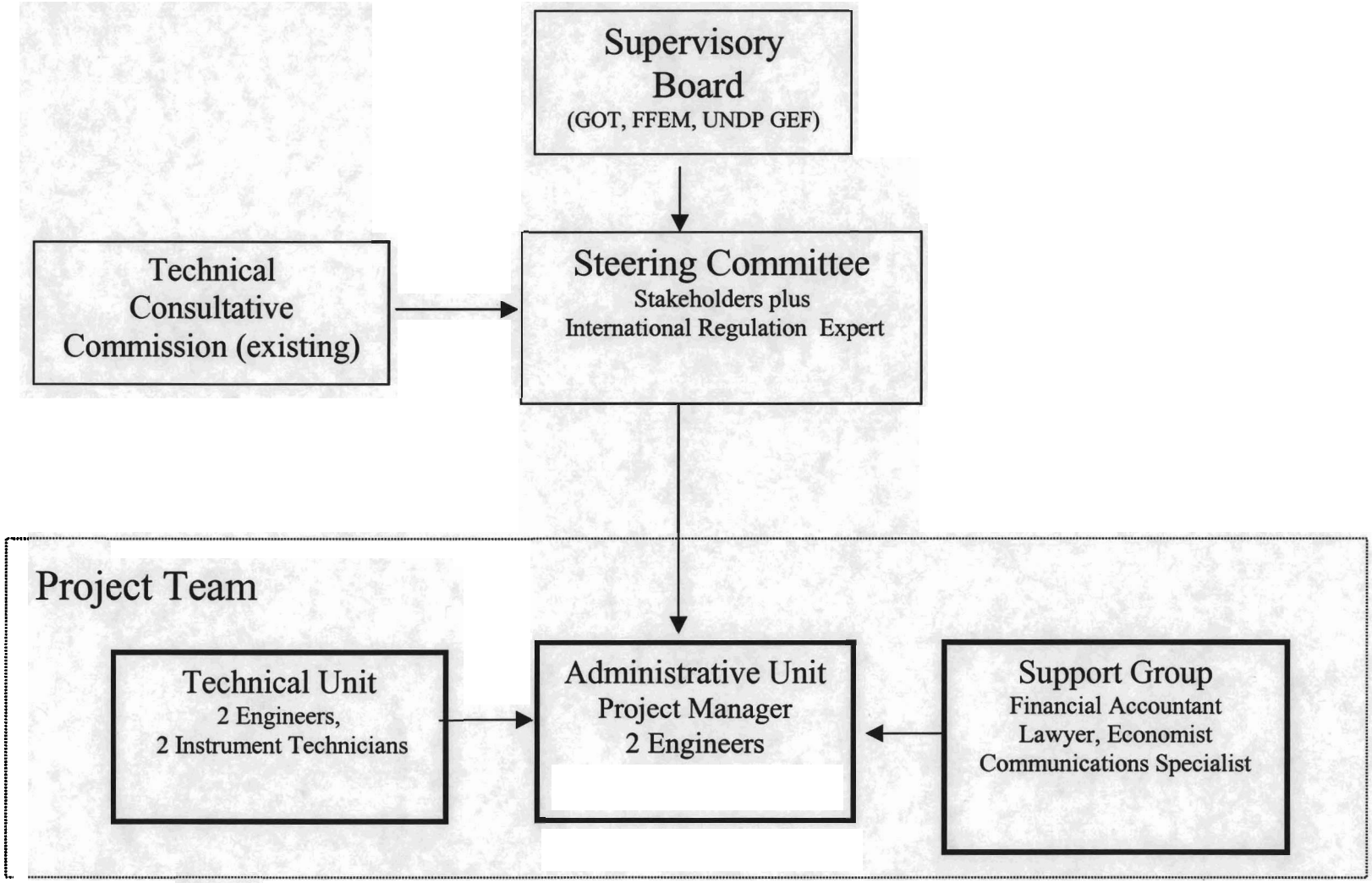
GOVERNMENT OF TUNISIA IN KIND CONTRIBUTION

BUDGET LINE DESCRIPTION		TOTAL BUDGETED COST, ALL YEARS			1999-2000		2000-2001		2001-2002		2002-2003		2003-2004	
LINE		Work Mos	DT/Mo	DT cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost
17	National Professional Staff	243	1,691	411,000	41	69,500	38	63,750	51	86,750	58	98,250	55	92,500
21.01	Building design and construction			1,570,800				157,080		785,400		62,830		
34	Conference and meetings			60,000		15,000		15,000		15,000		15,000		
51	Operating Costs			62,000		10,425		9,563		13,013		14,738		13,875
TOTALS		243	1,691	2,103,800	41	94,925	38	245,393	51	900,163	58	190,818	55	106,375

PRIVATE SECTOR CONTRIBUTION IN US DOLLARS

BUDGET LINE DESCRIPTION		TOTAL BUDGETED COST, ALL YEARS			1999-2000		2000-2001		2001-2002		2002-2003		2003-2004	
LINE		Work Mos	DT/Mo	DT cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost	W.Mos	Cost
21.01	Building design and construction			$2,664,000				$266,400		$1,332,000		$1,065,600		
TOTAL				$2,664,000				$266,400		$1,332,000		$1,065,600		

Annex 1: Organization Chart for UNDP/GEF Project



ANNEX 2

Terms of Reference for Project Positions

OVERSIGHT AND COORDINATION BODIES

Supervisory Board
Project Steering Committee
Technical Consultative Commission

NATIONAL PROJECT PERSONNEL

Project Manager (1)
Principal Service Sector Engineer (2)
Principal Residential Sector Engineer (3)
Second Service Sector Engineer (4)
Second Residential Sector Engineer (5)
First Instrument Technician (6)
Second Instrument Technician (7)
Financial Accountant (8)
Economist (9)
Lawyer (10)
Communications Specialist (11)

INTERNATIONAL CONSULTANTS

Regulation Expert (12)
Financial Expert (13)
Technical Expert (14)
Energy and Comfort Techniques Experts (15)
Building Energy and Comfort Measurement Expert (16)
Building Energy and Comfort Computer Simulation Expert (17)
Building Energy and Comfort Experts (18)
Building Energy and Comfort Regulation Expert (19)
Building Architects and Design Engineers (19A)

NATIONAL CONSULTANTS

Measurement Engineers (20)
Building Energy and Comfort Engineers (21)
Building Architects and Design Engineers (22)

SUPERVISORY BOARD
(Project Oversight)

Job Description

Under the administrative and financial authority of the UNDP and the Global Environmental Facility for Greenhouse Gas Reduction, the Supervisory Board will offer guidance to the Project Manager. This Board should comprise three organizations, represented by the suggested senior level officials.

- Min. of Environment (Minister or First Under secretary, or similar advisor)
- UNDP - Tunis Resident Representative or Deputy Resident Representative
- French GEF designate

The GEF Project Manager will attend and serve as rapporteur.

Responsibilities

Review and comment on each year's proposed work plan and budget.

- Review work progress at meetings that shall be held no less often than quarterly; and identify problems and issues that the PM should address or resolve.
- Provide strategic advice and leadership on actions that must be taken by the GOT to ensure success of the project and implementation of all initiatives.

PROJECT STEERING COMMITTEE
(Project Oversight)

Description

Under the administrative and financial authority of the UNDP and the Global Environmental Facility for Greenhouse Gas Reduction, the Project Steering Committee will report to the Project Manager (PM) and carry out the activities described below. It is envisioned that this Council will comprise approximately 8 individuals, each one chosen for his/her unique expertise within a stakeholder organization, e.g.,

- General Directorate for Housing,
  General Directorate for Pubic Buildings,
  Tunisian National Tourist Office,
- National Order of Architects,
- National Order of Builders,
- Association of Consultant Engineers, and
  Association of Real Estate Promoters.

The Technical Expert (14) will also serve on the steering committee.* There should be no substitution with a subordinate or other delegated person if the Committee member is not available for a meeting or cannot perform an assigned task.

Activities

Advise the PM on technical, policy, and/or strategic issues that can affect the success of the UNDP/GEF project.

- Provide periodic short-term technical review, comment, and guidance on project activities, which must remain consistent with the project document.

Provide advice in each one's area of expertise, together or singly.

Meet as a group at least quarterly.

Qualifications

Extensive and recognized experience as an advisor to GOT Ministers or other high level managers on subjects of public policy pertaining to technical fields.

The composition of the Committee should reflect expertise in most of the following areas: housing, public buildings, tourism, architecture, engineering, and real estate, development and construction.

TECHNICAL CONSULTATIVE COMMISSION
(Project Coordination)

Description

The Technical Consultative Commission was created by Decree N° 94-357 of 10 March 1994 (the Tunisian law on Energy Efficiency). By law its has representation from the following entities:

- Ministry of Industry,
  Ministry of Environment,
  Ministry of Finance,
  Ministry of Economic Development,
- Central Bank of Tunisia, and
- National Renewable Energy Agency (ANER).

The President is the Managing Director of ANER. The role of the Commission is to determine the amount of the financial contribution made available to Tunisian real estate project developers who agree to incorporate energy efficiency measures into their developments. The Commission meets every three months or on an ad hoc basis at the request of the Managing Director of ANER.

Responsibilities

The financial contribution by the GOT to the projects designed and constructed associated with the GEF project will be approved by a Technical Consultative Commission in the context of a framework agreement to be signed between ANER and the different real estate project developers who participate in the EVP. The financial contributions are determined in individual contracts for each real estate operation.

PROJECT MANAGER

(Staff Position -- Project Team/Administrative Unit)

Level of Effort: **50% time for 5 years (30 months)**

Job Description

The Project Manager (PM) is the executive director of the UNDP/GEF project and bears primary responsibility for the successful execution of all project activities. The PM will handle the day-to-day tactical management of this project. He will manage closely all project work activities and will be responsible for ensuring that all work remains consistent with project objectives and the project document. Being assigned half time to the project for five years by ANER, the PM works equally for the GEF Project and for ANER. In carrying out his responsibilities as PM for the project under the administrative and financial authority of the UNDP and the Global Environmental Facility for Greenhouse Gas Reduction, the PM will report to the Supervisory Board, and will carry out the following activities.

Technical Responsibilities

- Provide overall technical leadership for all project activities.
- Identify national consultants to be used on the project.
- Prepare short lists of all international consultants for the project and recommend final selection.
- Review and approve plans for the International Study Tour and related training activities (that will use international instructors).
  Participate in International Study Tour and in post-study tour workshop to impart lessons learned to rest of Project Team.
- Review and approve determinations of the TCC and UNDP/GEF funded subsidies to developers as prepared by Project Staff with assistance by national and international consultants.
- Review and approve all communication and training materials developed in the course of the project.
- Review and approve for distribution all programme reporting and documentation materials, including final report.
- Advise on content and format of meetings, workshops, and conference and give final approval to go ahead with such events

Managerial Responsibilities

- Recruit and hire all staff to be added for the purposes of carrying out the project.
- Select the Project Steering Committee members.
  Establish regular communication procedures with the leaders of all work groups convened for the project.
  Review and approve final TORs for all work activities for the international and national consultants to be hired under the project
  Review and approve all senior staff assignments and consulting agreements (both national and international), and to execute work agreements and contracts for all national project professional and administrative personnel.
- Monitor all expenditures and ensure the project proceeds in compliance with UNDP, GEF, and GOT budget and accounting guidelines.
- Oversee the organization of all organizational, informational, capacity building and dissemination activities and meetings undertaken in the project, approving the selection of teams and

consultants to carry out the activities, including the kick-off meeting, local and central annual review meetings and the final conference.
Oversee the preparation of the evolving communication dossier on the project.
Prepare the annual work plan and budget; oversee annual and final financial audits conducted for the project.

- Prepare required progress reports to UNDP, the Supervisory Board, and the Steering Committee.
- Consult with the Project Technical Experts, individually or as a group, on technical matters.
- Consult with the Steering Committee if it appears that significant changes are required in how any work activities are assigned and accomplished.

Qualifications

The present head of the ANER programme will fill this position. If it becomes necessary to install a new Project Manager, the primary qualifications would be strong managerial capability, extensive knowledge of the Tunisian buildings sector and energy efficiency measures and techniques that apply to that sector. An engineering degree providing a basis in building design for efficiency and comfort would be desirable.

PRINCIPAL SERVICE SECTOR ENGINEER

(Staff Position -- Project Team/Administrative Unit)

Level of Effort: 100% time for 5 years (60 months)

Job Description

The Principal Service Sector Engineer will support the Project Manager, preparing technical and administrative material for the PM's review and conducting day-to-day oversight of Second Service Sector Engineer, Instrument Technician and consultants involved in the Service Sector portion of the project. Under the administrative and financial authority of the UNDP and the Global Environmental Facility for Greenhouse Gas Reduction, the Principal Service Sector Engineer will report to either the Project Manager to carry out the following activities.

Technical Responsibilities

Solicit and review proposals for design and construction of the 10 service sector buildings or complexes (schools, administrative and institutional complexes, a hotel, commercial buildings, a hospital), determine subsidies to be paid to selected developers who meet project requirements and make recommendations to Project Manager on projects to be selected or awarded subsidies according to the number of stars the design or construction will be awarded

Do analysis necessary to support the determinations of the TCC funded subsidies to developers and submit to Project Manager.

- Assist the PM in selecting and oversee the team of experts selected for design and implementation of the generalized and detailed monitoring operations for the service sector buildings constructed in the project.

  Contribute technically on service sector issues to the design and execution of the training and capacity building events and materials developed in the project.
- Prepare and submit to PM as assigned final TORs for all work activities for the international and national consultants to be hired under the project.

Managerial Responsibilities

- Assign and review work performed by the Second Service Sector Engineer.

Qualifications

An ANER staff person will fill this position. If it becomes necessary to replace that person, the desired qualifications would be:

- University degree in electrical or mechanical engineering or equivalent technical specialty; architecture may substitute for engineering
- Five years of Tunisian energy or buildings sector experience, especially in working with energy end-use technologies and techniques relevant to Tunisia
- Knowledge of energy efficiency issues pertaining to building design and energy consumption and equipment design and use, with specialization in service sector building techniques
- Strong knowledge of Tunisian service sector construction techniques and of how to adapt energy efficient building improvements to Tunisian conditions.
- Expertise in technical analysis, including use of relevant software tools (example spreadsheet and data base software).
- Good organizational skills, and a documented record of "follow-up" highly desirable
- Strong written and spoken language skills in Arabic and English or French

PRINCIPAL RESIDENTIAL SECTOR ENGINEER

(Staff Position -- Project Team/Administrative Unit)

Level of Effort: **100% for three years, then 50 % for two years (48 months)**

Job Description

The Principal Residential Sector Engineer will support the Project Manager, preparing technical and administrative material for the PM's review and conducting day-to-day oversight of Second Residential Sector Engineer, Instrument Technician and consultants involved in the Residential Sector portion of the project. Under the administrative and financial authority of the UNDP and the Global Environmental Facility for Greenhouse Gas Reduction, the Principal Residential sector engineer will report to the Project Manager to carry out the following activities.

Technical Responsibilities

- Solicit and review proposals for design and construction of the 36 residential sector buildings or complexes (of the range of housing types represented in the Tunisian market), determine subsidies to be paid to selected developers who meet project requirements and make recommendations to Project Manager on projects to be selected or awarded subsidies according to the number of stars the design or construction will be awarded
- Do analysis necessary to support the determinations of the TCC and GEF funded subsidies to developers for residential sector buildings and complexes and submit to Project Manager.
- Assist the PM in selecting and oversee the team of experts selected for design and implementation of the generalized and detailed monitoring operations for the residential sector buildings constructed in the project.
- Prepare and submit to PM as assigned final TORs for all work activities for the international and national consultants to be hired under the project.
  Contribute technically on residential sector issues to the design and execution of the training and capacity building events and communication and reporting materials developed in the project.

Managerial Responsibilities

Assign and review work of the Second Residential Sector Engineer and the Second Instrument Technician.

Qualifications

University degree in electrical or mechanical engineering or equivalent technical specialty; architecture may substitute for engineering

- Five years of Tunisian energy or buildings sector experience, especially in working with energy end-use technologies and techniques relevant to Tunisia
- Knowledge of energy efficiency issues pertaining to building design and energy consumption and equipment design and use, with specialization in residential building techniques
- Strong knowledge of Tunisian residential sector construction techniques and of how to adapt energy efficient building improvements to Tunisian conditions.
- Expertise in technical analysis, including use of relevant software tools (example spreadsheet and data base software).
- Good organizational skills, and a documented record of "follow-up" highly desirable
- Strong written and spoken language skills in Arabic and English or French

SECOND SERVICE SECTOR ENGINEER

(Staff Position -- Project Team/Technical Unit)

Level of Effort: **100% for three years, then 50 % for two years (48 months)**

Job Description

This is the second service sector engineer on the Project Team. The bulk of the tasks undertaken will be in supporting the technical side of Component 1, especially the design assessment and verification of expected savings and costs and in setting up the general and specific monitoring.

Technical Responsibilities

- Assist the Principal Service Sector Engineer in all phases of the project relating to the Buildings Service Sector.

Managerial Responsibilities

None

Qualifications

- University degree in electrical or mechanical engineering or equivalent technical specialty; architecture may substitute for engineering
  Five years of Tunisian energy or buildings sector experience, especially in working with energy end-use technologies and techniques relevant to Tunisia
  Knowledge of energy efficiency issues pertaining to building design and energy consumption and equipment design and use, with specialization in residential building techniques
  Strong knowledge of Tunisian residential sector construction techniques and of how to adapt energy efficient building improvements to Tunisian conditions.
  Expertise in technical analysis, including use of relevant software tools (example spreadsheet and data base software).
  Good organizational skills, and a documented record of "follow-up" highly desirable
- Strong written and spoken language skills in Arabic and English or French

SECOND RESIDENTIAL SECTOR ENGINEER

(Staff Position -- Project Team/Technical Unit)

Level of Effort: **100% for three years, then 50 % for two years (48 months)**

Job Description

This is the second residential sector engineer on the Project Team. The bulk of the tasks undertaken will be in supporting the technical side of Component 1, especially the design assessment and verification of expected savings and costs and in setting up the general and specific monitoring.

Technical Responsibilities

- Assist the Principal Residential Sector Engineer in all phases of the project relating to the residential buildings sector.

Managerial Responsibilities

None

Qualifications

- University degree in electrical or mechanical engineering or equivalent technical specialty; architecture may substitute for engineering
- Five years of Tunisian energy or buildings sector experience, especially in working with energy end-use technologies and techniques relevant to Tunisia
  Knowledge of energy efficiency issues pertaining to building design and energy consumption and equipment design and use, with specialization in residential building techniques
  Strong knowledge of Tunisian residential sector construction techniques and of how to adapt energy efficient building improvements to Tunisian conditions.
  Expertise in technical analysis, including use of relevant software tools (example spreadsheet and data base software).
  Good organizational skills, and a documented record of "follow-up" highly desirable
  Strong written and spoken language skills in Arabic and English or French

FIRST INSTRUMENT TECHNICIAN

(Staff Position -- Project Team/Technical Unit)

Level of Effort: **100% time for five years (60 months)**

Job Description

This technician implements the instrumentation for the monitoring of buildings constructed under the project and ensures that data is being collected accruately and consistently and stored safely for later analysis.

Technical Responsibilities

- Organize, implement and follow the project monitoring activities with assistance of international experts and national engineers.

Managerial Responsibilities

None

Qualifications

An ANER staff person will fill this position. If it becomes vacant, the qualifications for the replacement would be a technical degree and experience sufficient to handle the monitoring of the buildings in the project and the data collection and treatment.

SECOND INSTRUMENT TECHNICIAN

(Staff Position -- Project Team/Technical Unit)

Level of Effort: **100% time for last three years of project (36 months)**

Job Description

Works with the Principal Instrument Technician in the later stages of the monitoring of the buildings constructed under Component 1. Collects and prepares data for analysis by Building Energy and Comfort Measurement Expert and Building Energy and Comfort Computer Simulation Expert.

Technical Responsibilities

- Data collection and treatment related to the project monitoring of buildings constructed under the project.
- Ensure that monitoring equipment and data recorders are properly functioning.

Managerial Responsibilities

None

Qualifications

Technical degree and experience sufficient to handle the monitoring of the buildings in the project and the data collection and treatment.

FINANCIAL ACCOUNTANT
(Staff Position -- Project Team/Support Group)

Level of Effort: **50% time for five years (30 months)**

Job Description

Financial oversight and management of the project and financial reporting according to the requirements of the funding organizations. Administers the Project Disbursement Mechanism.

Technical Responsibilities

- Conducts all required financial reporting, provides inputs necessary for annual and final financial audits and reviews the results of such audits before finalization for submittal to management and funding authorities.
- Prepares contract and subsidy payment documentation and requests for Accounts Payable
- Prepares requests for Disbursement Mechanism replenishment as needed.

Managerial Responsibilities

None

Qualifications

A Financial Accountant drawn from ANER staff.

ECONOMIST

(Staff Position -- Project Team/Support Group)

Level of Effort: **50% time for last two years of project (12 months)**

Job Description

Provides micro and macro economic analyses for the project.

Technical Responsibilities

- Prepares a macroeconomic analysis of the project, in particular the internal rate of return, both economic and financial, of the technical improvements to the buildings.
- Prepares economic impact studies of the proposed optimal standards in justification for their adoption.

Managerial Responsibilities

None

Qualifications

An Economist drawn from ANER's staff.

LAWYER
(Staff Position -- Project Team/Support Group)

Level of Effort: **50% time first year and 25% time four years (18 months)**

Job Description

Legal control of the project

Technical Responsibilities

Prepares contracts between ANER and developers
Compiles legal files, in particular terms of reference, project specifications, calls for tender, tender procedures, as well as the files for submission to the Technical Consultative Commission and subcontracting agreements.
- Prepares regulatory texts in the context of the overall project.

Managerial Responsibilities

None

Qualifications

A Lawyer drawn from ANER's staff.

COMMUNICATIONS SPECIALIST

(Staff Position -- Project Team/Support Group)

Level of Effort: **100% time for first year and last two years of project (36 months)**

Job Description

Organizes and carries out all public relations and communications about the project.

Technical Responsibilities

- Designs the project presentation documentation and all other documentation necessary to publicize the project
- Responsible for relations with the press and other media as well as the organization of events to popularize and disseminate the results of the project (annual information meetings).

Managerial Responsibilities

None

Qualifications

One or more Communications Specialists drawn from ANER staff.

REGULATION EXPERT 12
(International Consultant/Project Team Support)

Level of Effort: **UNDP/GEF** **1.5 months**
French/GEF 3.0 months

Job Description

Works with the Project Manager to improve the technical soundness of the system for data collection to be used for the project evaluation and helps build capacity of the Project Team and conducts the overall evaluation of the project.

Technical Responsibilities

- Provide permanent assistance and council to the Project Team

  Assist in Project Team capacity building, in particular:
  - Prepare for Project Manager's approval, and participate in, an International Study Tour and in post-study tour workshop to impart lessons learned to rest of Project Team.
  - Organize and conduct one five-day workshop with the Project Team and consultants to reinforce the experience of the Project Team on the study tour and convey it to the others and to ensure a common point of view among the entire Project Team and the key international consultants.
- Conduct overall evaluation of project including the achievements of the project, the behavior and attitudes of participants (ex ante and ex post), the micro and macro economic analyses by the Economist, lessons learned, and recommendations on refinement of the standards.

Managerial Responsibilities

None

Qualifications

Advanced engineering degree and extensive experience in regulation and codes for energy efficient building construction and in evaluation of similar projects.

FINANCIAL EXPERT 13

(International Consultant/Project Team Support)

Level of Effort: **UNDP/GEF 2.0 months**
French/GEF 4.4 months

Job Description

Works with the Project Manager and the rest of the Project Team 1) to structure the project to take advantage of private sector initiative and obtain leverage from the benefits provided by the project to developers, architects and builders and 2) to prepare the ground for sustained activity after the project ends.

Technical Responsibilities

- Provide permanent assistance and council to the Project Team
  Conduct studies on market-based incentives

Managerial Responsibilities

None

Qualifications

Advanced economics degree with extensive experience in conducting studies on market based incentives for energy efficiency.

TECHNICAL EXPERT 14

(International Consultant/Project Team Support)

Level of Effort: **UNDP/GEF 3.5 months**
French/GEF 3.0 months

Job Description

Works with the Project Manager and the rest of the Project Team to improve the technical and institutional soundness of the scheme for efficiency labeling/optimal standards and helps build the technical capacity of the Project Team.

Technical Responsibilities

Serve on the Steering Committee for the project

- Assist the Regulation Expert in providing permanent assistance and council to the Project Team
- Participate in the International Study Tour and in post-study tour workshop to impart lessons learned to rest of Project Team.
- Participate in institutional capacity building, specifically responsible for:
  - Design and implement a workshop of two days for the national (centralized) administration (the key Ministries involved and STEG) who will eventually be taking decisions on implementation of the optimal building code to raise their awareness and improve their participation in the process
  - Design and implement five workshops of one day each for the local construction authorities (Ministry of Housing) and the local construction inspection authorities (Ministry of Interior) to raise their awareness and improve their participation in the process.

Carry out studies and analysis necessary to provide the analytical basis for the refinement of standards and make recommendations based on the analysis on modifications to the standards.

Managerial Responsibilities

None

Qualifications

Advanced engineering or related degree and extensive experience in designing performance-based optimal standards and in energy efficient building design and construction.

BUILDING ENERGY AND COMFORT TECHNIQUES EXPERTS 15

(International Consultant/Monitoring Support)

Level of Effort: **UNDP/GEF 3.4 months**
French/GEF 3.4 months

Job Description

Five different specialists in building energy and comfort techniques will be used: a thermal expert, a solar and windows expert, a HVAC Expert, an air infiltration expert and a lighting expert.

Technical Responsibilities

- Assist in designing and setting up the monitoring of the performance of specific building components (HVAC system, lighting, thermal envelope, solar gain and windows, air infiltration) for the purposes of later analysis of energy efficiency and comfort performance.

Managerial Responsibilities

None

Qualifications

At least 5 years experience in specialty area.

BUILDING ENERGY AND COMFORT MEASUREMENT EXPERT 16

(International Consultant/Monitoring Support)

Level of Effort: **UNDP/GEF 1.4 months**
French/GEF 1.4 months

Job Description

Provides expertise in monitoring equipment, e.g., advice on the best equipment to purchase and the best way to install it to ensure accurate and continuous data.

Technical Responsibilities

- Assist in the purchase and installation of the performance measurement equipment and in setting up the system for the collection of the data from the equipment.

Managerial Responsibilities

None

Qualifications

Expertise in the selection, installation and use of energy efficiency measurement equipment for the full range of items to be monitored in the project.
At least five years experience

BUILDING ENERGY AND COMFORT COMPUTER SIMULATION EXPERT 17

(International Consultant/Monitoring Support)

Level of Effort: **UNDP/GEF 1.8 months**
French/GEF 1.8 months

Job Description

Works with the instrument technicians, sector engineers, the Building Energy and Comfort Techniques Experts (15) and the Building Energy and Comfort Measurement Expert (16) to ensure that simulations done represent Tunisian situation as closely as possible, develops simulation programmes, and performs simulations of performance.

Technical Responsibilities

- Set up and perform the computer simulations needed to predict performance of energy efficiency and comfort measures; analyze actual performance, and compare actual to predicted performance.
- Prepare report with findings and conclusions.

Managerial Responsibilities

None

Qualifications

Specialized expertise in building performance simulation techniques
At least 5 years of experience

BUILDING ENERGY AND COMFORT EXPERTS 18

(International Consultant/Training Support)

Level of Effort:	**UNDP/GEF**	**4.6 months**
	French/GEF	4.6 months

Job Description

This effort requires two building development experts (one each for the service and residential sectors), three building construction experts for the service sector (one each generalist, envelope specialist and equipment specialist) and three building construction experts for the residential sector (one each generalist, envelope specialist and equipment specialist). These experts work with the Building Energy and Comfort Engineers (21) to produce sound technical handbooks.

Technical Responsibilities

- Assist in the production of the two training handbooks in the techniques used to achieve building sector energy efficiency and comfort: one for developers, and one of designers and builders.

Managerial Responsibilities

None

Qualifications

Specialized expertise in the techniques used to achieve building sector energy efficiency and comfort.
At least five years of experience

BUILDING ENERGY AND COMFORT REGULATION EXPERT19

(International Consultant/Labeling Support)

Level of Effort: **UNDP/GEF 1.2 months**
French/GEF 3.7 months

Job Description

Works with the four sector engineers and the Building Energy and Comfort Engineers (21) to produce the CPE label system and assessment method for use in the project as a prototype for the method to be used for optimal standards and the seven sector handbooks that will support the application of the CPE by the trades participating in the project.

Technical Responsibilities

- Develop and produce the Comfort and Energy Performance label. Identify efficiency levels for both energy and comfort; determine acceptable incremental costs for the levels; and produce an assessment calculation method for use in assessing the designs of buildings proposed for inclusion in the programme.
- Assist in the production of the seven sector handbooks.

Managerial Responsibilities

None

Qualifications

Specialized expertise in the techniques used to achieve building sector energy efficiency and comfort.
At least five years of experience

BUILDING ARCHITECTS AND DESIGN ENGINEERS 19A

(International Consultant/Component 1 Support)

Level of Effort: **UNDP/GEF none**
French/GEF 19.3 months

Job Description

This position provides extensive technical assistance on energy efficient building design to the Project Team in all activities related to Component 1 (EVP).

Technical Responsibilities

Provide assistance to Project Team in evaluation of designs submitted for inclusion in the programme.

Managerial Responsibilities

None

Qualifications

Extensive experience in design of energy efficient buildings and their application to climate situations similar to those in Tunisia.

MEASUREMENT ENGINEERS 20
(National Consultant/Monitoring Support)

Level of Effort: **UNDP/GEF 33 months**
French/GEF 34.4 months

Job Description

Provide assistance in monitoring activities.

Technical Responsibilities

- Assist the Project Team and international consultants in installing and collecting data from the general and special monitoring equipment.

Managerial Responsibilities

None

Qualifications

Specialized expertise in the techniques used to achieve building sector energy efficiency and comfort.
At least five years of experience

BUILDING ENERGY AND COMFORT ENGINEERS 21

(National Consultant/Training, Communication and Labeling Support)

Level of Effort: **UNDP/GEF 19.8 months**
French/GEF 21.7 months

Level of effort is divided roughly as follows: 8% for communication documents, 63% for training handbooks and training of trainers, and 29% for efficiency label development.

Job Description

This TOR represents a range of expertise depending on the assigned responsibilities. Developing the training handbook and training the trainers requires building development engineers (one each specializing in residential and service sector), building construction engineers (two generalists and one each specializing in building envelopes for residential and service sector buildings respectively and one each specializing in energy efficient equipment for residential and service sector buildings respectively.

Provide assistance in transferring knowledge of energy efficient building construction techniques.

Technical Responsibilities

- Produce the materials and communication documents required for informing the general public and stakeholders about the project (in the form of the Project Presentation Document) and the annual reports required during the project's duration.
- Assist in the development and production of the two training handbooks for developers and designers and builders.
  Assist in the development and implementation of the Comfort and Energy Performance label. Identify efficiency levels for both energy and comfort; determine acceptable incremental costs for the levels; and produce an assessment calculation method for use in assessing the designs of buildings proposed for inclusion in the programme.
- Assist in the production of the seven sector handbooks (two for buildings sector differentiated by amount of space conditioning planned and five for the service sector differentiated by type of use, e.g., hospitals, offices, schools, hotels and others).

Managerial Responsibilities

None

Qualifications

Specialized expertise in the techniques used to achieve building sector energy efficiency and comfort. At least five years of experience

BUILDING ARCHITECTS AND DESIGN ENGINEERS 22

(National Consultant/Component 1 Support)

Level of Effort: **UNDP/GEF None**
French/GEF 84 months

Job Description

This position provides technical assistance on energy efficient building design to the Project Team in all activities and phases of the EVP.

Technical Responsibilities

Managerial Responsibilities

None

Qualifications

Component 1: Experimental Validation and Demonstration Process

Under component 1, monitoring equipment and associated computers will be purchased for the general and detailed monitoring of the buildings that are constructed under the project. This will require $400,000. The specifications for the equipment will be developed within the first year of the project before any construction of buildings to be monitored by the programme.

Component 2: Accompanying Measures

Description	Qty	Unit Cost	Total Cost
PC Computers and Printers	2	5000	10000
Minitel apparatus and connection fee	1	12000	12000
Internet apparatus and hook up	1	3000	3000
Vehicules	2	25000	50000

Also under component 2, equipment will be purchased to furnish the Technical Building Center. $570,000 of UNDP/GEF funds have been programmed for this equipment. The specific equipment and specifications for it will be provided in the later stages of the project for approval by UNDP/GEF.

TRAINING PROGRAMME

Component 2: Accompanying Measures

OBJECTIVE 1: **MOBILIZE AND ENSURE CAPACITY OF PARTICIPANTS AND STAKEHOLDERS TO SUCCESSFULLY CARRY OUT PROJECT**

Study Tour: International Experience with Optimal Building Codes *(GEF $13,000)*[1]

There will be one study tour to France and the United States for the three principal members of the Project Team and the two principal international experts (Regulation Expert and Technical Expert) providing ongoing Project Team support and assistance. This will help the team to gain quickly first hand knowledge of how optimal building codes were introduced, adopted and implemented in the two countries. Five days are allotted to the entire tour. The Regulation Expert will organize the study tour for approval by the Project Manager.

Travel Supporting Training Activities (GEF $80,600)

These funds support the travel expenses associated with consultants' participation in on-the-job training that will occur during the course of project activities over the five-year period.

Initial Project Team Workshop *(no incremental cost; expenses covered elsewhere)*

There will be a workshop for the entire Project Team with the two principal international experts to impart the knowledge gained on the study tour and to review the proposed activities for the project in light of this knowledge. All aspects of the project will be covered, including particularly the institutional capacity building, the preparation of the bases of the project (i.e., the CPE label, the training and sector handbooks, the communication documents, project management procedures, and evaluation and recommended refinements to the optimal standards). The Regulation Expert will plan this workshop with the Project Manager and will be aided by the Technical Expert in implementing it.

Institutional Capacity Building *(GEF $210,000; GOT $60,000)*

Two levels of institutional capacity building are planned. One would aim at the central administration authorities that will eventually be taking decisions on the implementation of the optimal building code to raise their awareness and to improve their participation in the various stages of the project. This would take the form of a workshop of two days. Participants would be drawn from the ministries implicated in the project (see Section B4) and the electric and gas company. The Regulation Expert will develop the curriculum for the workshop for approval of the Project Manager. The Regulation Expert will also participate in the workshop. The curriculum will provide a basic understanding of the reason that improved energy efficiency is important to Tunisia and how optimal building codes can help to achieve the goal of improved energy efficiency. It will also cover what the Experimental Validation and Demonstration Process is and why it is instrumental in changing the market conditions in which optimal building codes would be introduced. Finally, the entire proposed project timetable and activities would

[1] Costs shown primarily reflect travel costs and direct expenses for training activities, conferences and meetings. Most labor costs for training to be provided on-the-job by project staff or consultants is included in the labor component of the project budget. The only exception is in the case where a specialized training contract will be assigned to an individual who is not otherwise included in the project's regular personnel complement.

be reviewed. The end result would be an informed central administration interested in promoting the project within their areas of responsibility.

The second level of institutional capacity building would be on the local level. This would be a series of one-day workshops held in five different (main) cities in Tunisia and would involve local construction permitting and inspection authorities. The Regulation Expert will develop the curriculum for the workshop for approval of the Project Manager. The Regulation Expert will also participate in the workshop. The curriculum will provide the same material as for the central administration capacity building but would result in local authorities being interested in participating in the management of the project operations in their areas of responsibility.

Training for Building Developers, Designers and Builders *(FFEM $90,000; GEF $45,000)*

This training activity comprises producing two training handbooks; training building sector professionals to be trainers in their field of activity and using those trainers to conduct a series of one-day workshops in different locations in Tunisia (five for developers and five for designers and builders). One of the training handbooks will be for Building Developers and the other for Designers and Builders. The handbooks will cover respectively building development techniques (such as orientation of lots and buildings on lots) and building design and construction techniques for the different types of buildings in the residential and service sectors (such as building envelopes, insulation and windows, and energy efficient equipment).

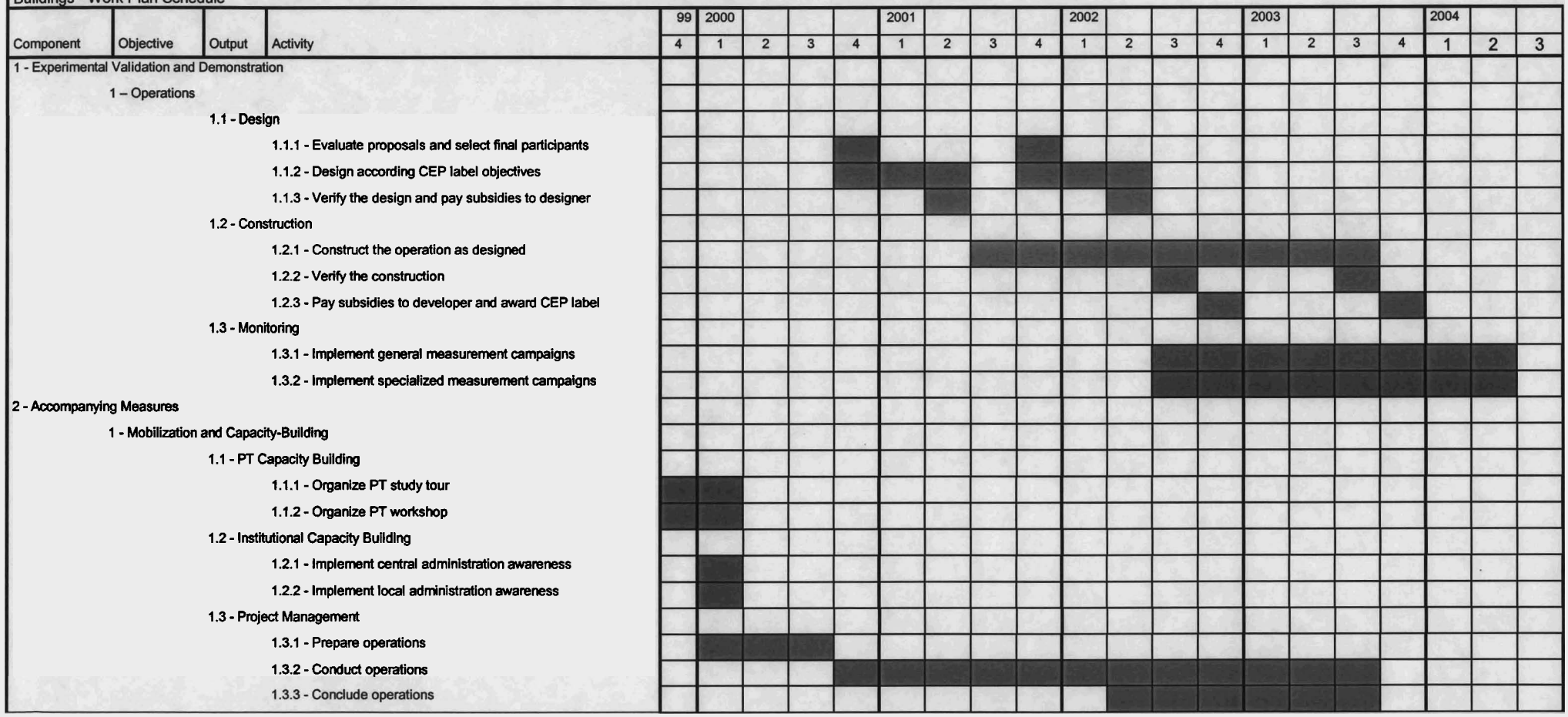
The activity of training the trainers will focus on building their capacity to explain and demonstrate the techniques and information contained in the handbooks. Eight international experts and eight national engineers will be used to develop the handbooks and carry out the training of the trainers. The result of these workshops should be a large base of highly aware and prepared developers, designers and builders, ready for and interested in participation in the project.

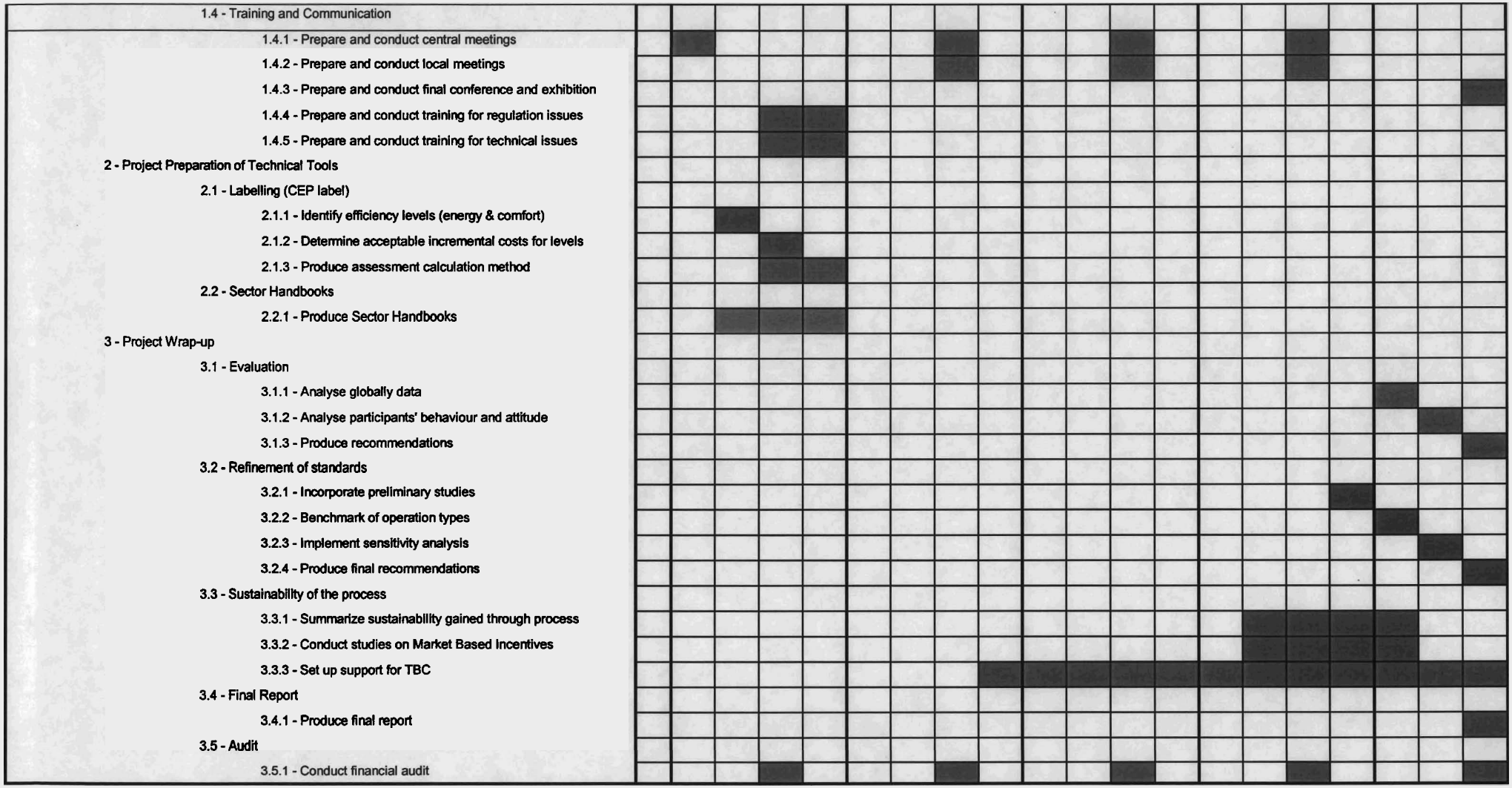
Regional Technical Transfer Conference (GEF $100,000)

A final regional conference will be held at the end of the five years of the project. Other participants in the Maghreb regional project for thermal building standards will be invited to participate. The conference will feature the results of the entire project, in particular highlighting the evaluation, the actual experience with the buildings built under the project, and the specific energy efficiency measures that will be recommended for inclusion in the proposed optimal standards.

ANNEX 5

Tunisia - Experimental Validation of Thermal and Energy Performance of Buildings and Removal of Barriers to Their Introduction in Thermal Regulation for New Buildings - Work Plan Schedule




1.4 - Training and Communication
1.4.1 - Prepare and conduct central meetings
1.4.2 - Prepare and conduct local meetings
1.4.3 - Prepare and conduct final conference and exhibition
1.4.4 - Prepare and conduct training for regulation issues
1.4.5 - Prepare and conduct training for technical issues
2 - Project Preparation of Technical Tools
2.1 - Labelling (CEP label)
2.1.1 - Identify efficiency levels (energy & comfort)
2.1.2 - Determine acceptable incremental costs for levels
2.1.3 - Produce assessment calculation method
2.2 - Sector Handbooks
2.2.1 - Produce Sector Handbooks
3 - Project Wrap-up
3.1 - Evaluation
3.1.1 - Analyse globally data
3.1.2 - Analyse participants' behaviour and attitude
3.1.3 - Produce recommendations
3.2 - Refinement of standards
3.2.1 - Incorporate preliminary studies
3.2.2 - Benchmark of operation types
3.2.3 - Implement sensitivity analysis
3.2.4 - Produce final recommendations
3.3 - Sustainability of the process
3.3.1 - Summarize sustainability gained through process
3.3.2 - Conduct studies on Market Based Incentives
3.3.3 - Set up support for TBC
3.4 - Final Report
3.4.1 - Produce final report
3.5 - Audit
3.5.1 - Conduct financial audit

Annex 6

Experimental Validation of Thermal and Energy Performance of Buildings and Removal of Barriers to Their Introduction in Thermal Regulation for New Buildings - Project Review, Reporting and Evaluation Schedule

		1999	2000				2001				2002				2003				2004			
ID	Activity	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Project Performance Evaluation Reports (PPER's)				Δ				Δ			Δ					Δ					
2	Tripartite Project Reviews					Δ			Δ				Δ									
3	Mid-term Project Evaluation											Δ										
4	Project Terminal Report																	Δ				
5	Terminal Review Meeting																				Δ	

Energy Savings Potential Linked to the Adoption of Regulations Imposing Energy Efficient Building Standards for New Buildings in Tunisia

(based on Experimental Validation Process – EVP)

In the following text, index « b » of « Xb,e » indicates the building to which « Xb,e » is linked, and index « e » indicates the energy concerned by « Xb,e ».

Energy consumption will be expressed in tons of oil equivalent or [toe]

1 - Energy savings per unit

For residential buildings, energy consumption per unit will be that of a housing unit.

For service sector buildings, energy consumption per unit will be that of one square meter of heated and/or air conditioned premises.

1.1. Energy consumption per unit resulting from the non-adoption of the regulations

a) For a building type « b » which is not equipped from the outset with a permanent heating and/or cooling installation:

We will assume that a permanent installation is made in year « JNb »

During « JNb » years, with Jnb>0, no energy consumption will be necessary to obtain a satisfactory level of hygrothermal comfort. Consumption during year « JNb » year is not taken into consideration.

As from year « JNb + 1 », the building's annual consumption will be « CSNb,e ».

b) For a building type « b » equipped from the outset with a permanent heating and/or cooling installation:

As from year 1 the building's annual consumption will be « CANb,e ». In year 1, the building's real consumption will be overestimated.

1.2. - Energy consumption per unit resulting from adoption of the regulations

a) For a building « b » non-equipped from the outset with a permanent heating and/or cooling installation:

We will assume that a permanent installation is made in year « JOb ». Assuming that JOb≥JNb:

During « JOb » years, no energy consumption will be necessary to obtain a satisfactory level of hygrothermal comfort. Consumption during year « JOb » is not taken into account.

As from year « JOb + 1 », the building's annual consumption will be « CSOb,e ».

b) For a building « b », equipped from the outset with a permanent heating and/or cooling installation:

As from year 1 the building's annual consumption will be « CAOb,e ». In year 1, the building's real consumpotion will be overestimated.

1.3. - Energy savings per unit resulting from adoption of the regulations

a) For a building « b » non-equipped from the outset with permanent heating and/or cooling equipment:

For « JNb » years there will be no energy savings : ES1b,e = 0. During this period, the corresponding annual rate of energy savings will be : TES1b,e = 0.

During the period from year « JNb + 1 » up to and including year « JOb », annual energy savings will be:
ES2b,e = CSNb,e = TES2b,e * CSNb,e, where TES2b,e is the corresponding annual rate of energy savings; During this period: TES2b,e = 1.

As from year « JOb + 1 », annual energy savings will be:
ES3b,e = CSNb,e - CSOb,e = TES3b,e * CSNb,e, where TES3b,e is the corresponding annual rate of energy savings. TES3b,e may involve use of another type of energy. In this case the indes « e » will take this difference into consideration.

b) For a building « b », equipped from the outset with a permanent heating and/or cooling installation:

As from year 1, annual energy savings will be:

EAb,e = CANb,e - CAOb,e = TEAb,e * CANb,e, where TEAb,e is the corresponding annual rate of energy savings.

2 - Cumulative energy savings over « N » years by type of building

2.1. Case of a building type « b », non-equipped from the outset with a heating and/or cooling installation

a) $0 < N \leq JNb$

Cumulative energy savings « ESCb,e » will have the value : ESCb,e = 0.

b) $JNb < N \leq JOb$:

Cumulative energy savings will have the value :
ESCb,e = CSNb,e * (N - JNb) * (N - JNb + 1) / 2.

c) $JOb < N$

Cumulative energy savings « ESCb,e » will represent :
ESCb,e = CSNb,e * [(N - JNb) * (N - JNb + 1) - (1 - TES3b,e) * (N - JOb) * (N - JOb + 1)] / 2

d) Hence, whatever the value of N :

Cumulative energy savings « ESCb,e » will have the value :
ESCb,e = CSNb,e * [(N - JNb) * (N - JNb + 1) - (1 - TES3b,e) * (N - JOb) * (N - JOb + 1)] /2,
in which formula :
- if $JNb < N \leq JOb$, we will apply : N - JOb = 0
- if $N \leq JNb$, we will apply : N - JOb = N - JNb = 0

2.2. - Case of a building « b » equipped from the outset with a permanent heating and/or cooling installation.

Cumulative energy savings « EACb,e » will have the value :
EACb,e = TEAb,e * CANbe * N * (N + 1) / 2

3 - Cumulative energy savings over N years for all buildings respecting the regulations

For a building type « b », we will define the total number of units « Ub » concerned by the regulations and a rate of equipment from the outset « TIb » of « Ub ». We will consider that these values are constant over « N » years.

Cumulative energy savings « ECb » will have the value :
$ESCb,e = \Sigma b\ Ub * \{TIb * TEAb,e * CANb,e * N * (N + 1) / 2 + (1 - Tib) * CSNb,e * [(N - JNb) * (N - JNb + 1) - (1 - TES3b,e) * (N - JOb) * (N - JOb + 1)] / 2 \}$,
formula in which:
- if $JNb < N \leq JOb$, we will apply : $N - JOb = 0$
- if $N \leq JNb$, we will apply : $N - JOb = N - JNb = 0$

4 - Preliminary estimate of cumulative energy savings over « N » years for all buildings respecting the regulations

For this estimate we have taken average values respectively for all housing units and all service sector buildings. In the following table:

« b = 1 » means a housing unit
« b = 2 » means 1 square meter of a service sector building

	b = 1	b = 2
Ub	40,000	70,000
TIb	0.1	0.9
N	20	20
CANb	0.6	0.17
TEAb	0.3	0.3
JNb	5	5
JOb	10	10
CSNb	0.6	0.17
TES3b	0.3	0.3
ESCb [Toe]	1,911,600	771,715

Total [Mtoe]	**2.683**

GHG calculations were derived on the basis that 1 Mtoe emits 3.11 tons of CO2, using UNDP sources.

Calculations from Project Brief:

1 -Average Number of Buildings/sq. mt. That will be built each year

Residential Sector	40,000 housing units	***of which*** 10% are equipped from the outset
Service Sector	70,000 sq meters	***of which*** 90% are equipped from the outset

2 - Energy consumption per year

The figures shown below are average figures. However, these do ideed take into consideration the type of buildings in each category and the energy consumption profile of these building types over the 20 year time span being considered. As such, the figures shown below are average figures calculated for the specific forested types of buildings. over the period 2002 - 2022. If needed, more details clarifying the calculation of the figures shown below can be provided.

	Residential 1 housing unit average [toe]	Service 1 square meter average [toe]
No regulations (baseline)	0.369	0.163
Maximum regulations	0.141	0.111
Energy savings	0.228	0.052

3 - Cumulative Energy savings per sector over 20 years (2002-2022)

The figures shown below are calculated based on the average savings figure shown in the table above and are based on the following formula:

For each sector:

Cumulative Savings = (energy savings/unit/sqm) x (number of units/sqms) x (20 x 21 divided by 2)

The formula shown above does indeed take into consideration that the energy savings achieved from the buildings built in year "n" (out of the total number of year "N") only get credited for N-n years of energy savings. For example, energy savings from a building built in year 4 will only be calculated for 16 year.

As such, cumulative savings per sector are:

Residential Sector	:	1.912 [Mtoe]
Service Sector	:	0.772 [Mtoe]
Total	:	2.684 [Mtoe]

4 - Cumulative reductions in CO^2 Emissions over 20 years (2002-2022)

Residential Sector	5.946
Service Sector	2.401
Total	8.347

Incremental Cost Analysis

1. Broad Development Goals

While efficiently meeting the increasing energy demand of its rapidly developing economy, Tunisia is committed to curbing the increasing growth of greenhouse gas emissions associated with this fossil fuel based demand.

The active policy Tunisia has adopted towards energy conservation and energy efficiency since the 1980s is indicative of this commitment. Since its creation in 1986, the Agency for Energy Management - AME - has been responsible for the implementation of such policy. AME has identified the service and residential sectors as the largest growing source of energy demand during the first twenty years of the next century. In anticipation of this sectorial shift in energy demand, AME has been working actively since the early 1990s towards the adoption of regulatory measures to introducing energy efficiency standards in buildings.

Despite the existence of favorable conditions and incentives for energy conservation as a result of the relatively high level of energy pricing currently existing in Tunisia, regulatory measures are to needed to curb the growing demand for energy in the building sector. However, to date, action needed to implement maximum regulatory measures that would limit the growth of energy demand in buildings have not been undertaken due to the existence of a number of barriers that this project proposes to remove.

2. Baseline

In 1996, energy consumption in the Tunisian building sector (residential and service sectors) represented 26 % of the Tunisia's total national consumption. With a forecast average progression in energy demand of 5% per annum, this share is expected to rise to 36 % by the year 2020, thus surpassing both the industrial and transport sectors in consumption. As such, the Tunisian building sector would become the single largest energy consuming sector in Tunisia. In view of Tunisia's limited indigenous resources of energy, such an increase in consumption, unless rationalized, would impose a heavy burden on the Tunisian economy.

Tunisia, however, has a history of successful adoption of regulatory and legislative measures encouraging energy efficiency and conservation. These include initiatives advocating energy audits, providing financial support to energy efficient demonstration projects, as well as adopting legislation that reduces import duties on energy efficient and renewable energy equipment. Following this conviction, in the context of a regional programme known as the Réglementation Thermique Magrébine des Bâtiments - RTMB, Tunisia has since 1991 invested a great deal of time and effort in determining the basis for regulatory measures that would limit the growth of consumption in the Tunisian building sector. These baseline assessments and studies are presented further in Annex 4.

Despite finalizing such baseline assessments and studies during Phase 1 - Preparatory Studies Process - of the RTMB programme, it is on the basis of experimental and operational verification of such regulatory requirements, as well as the removal of a number of other barriers, that the Government of Tunisia will consider their adoption as standards. This will be achieved by Phase 2 of the RTMB programme, the Experimental Validation Process - EVP, which this proposal aims to support.

As an indication of the Government's commitment to this effort and to pave the way for adoption of the proposed regulatory requirements, the Tunisian public and private sectors are committing US $ 95.89 million through this proposed GEF initiative to cover baseline costs of the proposed project.

3. Global Environmental Objective

The global environmental objective being pursued through this project is the reduction of greenhouse gas emissions through limiting growth in energy demand from the residential and service sectors in Tunisia. This will be achieved by targeting all future building activities in these sectors and ensuring that energy efficiency measures and codes of practice are utilized in the design and construction of all new building in these sectors. Specifically, project activities are designed to support the sustainable implementation of a regulatory framework that would ensure more efficient energy use. As such, the project is in line with Operational Programme number 5 *"Removal of Barriers to Energy Efficiency and Energy Conservation"* of the GEF Operational Strategy.

4. GEF Alternative

As described in the project brief, the proposed activities focus on removal of barriers to the adoption and enforcement of regulatory measures introducing energy efficiency standards at a maximum level for all new buildings in Tunisia. The feasibility study conducted during the final stage of Phase 1 of the RTMB programme, concluded that an Experimental Validation and Barrier Removal Process is necessary to ensure sustainability of any effort to adopt the proposed standards.

During Phase 1 of the RTMB programme, a number of main barriers to the adoption of regulatory measures introducing the proposed standards have been identified. The proposed project, through the implementation of two specific components, provides appropriate measures to remove these barriers. The barriers are presented in the project brief.

There are significant global benefits to be achieved as a result of the implementation of this project. Once the project has removed the said barriers and the standards have been adopted, an average annual reduction in CO2 emissions of 1.34 million tons should be attained between 2002 and 2022, resulting in a total of 8.4 million tons of CO2 reduced by the year 2022.

5. System Boundary

Energy savings resulting from the project itself will not be significant since the project itself involves a limited number of demonstration and validation initiatives. However, once the regulatory requirements have been adopted they will impact the long-term energy consumption of all new buildings in the service and residential sector throughout Tunisia.

In the Tunisian context, the scope of the project covers the service and residential building sectors only. The sectors are well defined and as such allocation of energy savings, and associated GHG emission reductions, resulting from the implementation of the project itself and form the follow-up regulatory measures will be essay to attribute to this sector in specific. Furthermore, from a regional perspective, the importance of the successful implementation of the project in the context of the RTMB programme, is no less significant. Lessons learned, and the experience gained with the validation and adoption of the standards will have a marked positive impact on the readiness of the other Maghreb partners of the RTMB programme to embark down the same path of prompt adoption of similar standards.

6. Domestic Benefits

Domestic benefits are measured as the resulting increased levels of awareness and capacity as well as the inherent value of a more structured market for energy efficiency building materials. The systematic need for energy efficient building materials, will result in the development of a structured and competitive market. Resulting price reductions for energy efficient building materials, as well as resulting elimination of initial transaction costs, will make an important contribution to reducing the additional construction costs associated

with an energy efficient building, which, at the present time, represent one of the major barriers to regulatory adoption of energy efficient building standards at maximum level.

The accompanying energy savings are attributable to the baseline committed to the project by local sources. For example, the Tunisia Energy Efficiency Fund (TEEF), has re-directed funds to this project that otherwise would have been committed to other energy efficiency efforts resulting in proportionately similar fuel savings. Furthermore, the AME contribution to local capacity building efforts would most likely also have been committed to similar efforts having a comparable impact on long-term energy consumption in Tunisia.

7. Incremental Cost Matrix

The Incremental Cost Matrix for the proposed project is shown in the following pages:

8. Agreement

Agreement regarding the items to be included in the final project document shall be done through a local project appraisal committee meeting. The PAC meeting will be undertaken to consult all relevant proponents as regards the final framework for items to be financed and project implementation arrangements.

ANNEX 8

INCREMENTAL COST MATRIX

Baseline	Alternative	Increment
Business as Usual	*Proposed Situation*	*New Features*
1. Phase 2 of the RTMB will not be carried out. It will therefore not be possible to validate the standards already developed in Phase 1 (PSP). 2. Barriers critical to the adoption of the standards will not be removed and consequently Government of Tunisia will not endorse maximum standards developed in phase 1 of the RTMB. 3. Minimum standards might be adopted	1. A full representative sample of validation and demonstration projects in the service and residential sectors are carried out to validate the standards. 2. An extensive awareness and promotion campaign is undertaken to prepare local stakeholders and counterparts for the adoption of maximum standards 3. A full capacity building and institutional strengthening programme to ensure availability of know-how to implement, enforce, monitor and update energy efficiency standards for buildings.	The project will remove main barriers presently existing to the adoption and implementation of energy efficiency building standards at maximum levels.
Domestic Benefits	*Domestic Benefits*	*Domestic Benefits*
1. AME continues limited awareness and capacity building activities using exiting internal resources and resources from TEEF; 2. Very limited fuel savings will result over the long-term; 3. GoT will not be able to achieve energy savings targets set; 4. Local environmental and social benefits will be very limited;	1. An extensive verification programme is carried out to validate the standards proposed for adoption. 2. Result disseminated to all proponents 3. Adoption of maximum regulatory measures to ensure that energy efficiency practices and codes are used in building design and construction. 4. Local market for energy efficient building materials is developed. Local capacity is created and awareness raised on issues pertaining to energy efficiency in building	Adoption of maximum regulatory measures to ensure that energy efficiency practices and codes are used in building design and construction
Global Benefits	*Global Benefits*	Global Benefits
1. Negligible global benefits (in terms of GHG emission reduction) corresponding to energy savings achieved through internal Tunisian energy efficiency efforts	1. After 2002, annual reduction in CO2 emissions equaling 0.42 million tons for at least 20 years. 2. Results reached in Tunisia will contribute to the adoption of similar regulation in Algeria and Morocco in the wider context of the RTMB programme.	Increased levels of GHG emission reductions from Tunisia and eventually other Maghreb countries.
Baseline Cost	*Alternative Cost*	*Incremental Cost*
1. AME : US $0.44 million 2. TEEF: US $1.37 million 3. Local US $ 1.91 million 4. Value of Baseline Buildings: US $92.174 million Total: US $95.894 million	US $102.2 million	1. FFEM: US $ 1.97 million 2. GEF : US $ 4.36 million Total: US $ 6.33 million

PROJET DE 1ERE REGLEMENTATION THERMIQUE ET ENERGETIQUE
des bâtiments neufs en Tunisie

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Texte T1

(Version n°2 du 19-12-97)

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Article 1er - Les dispositions de la présente réglementation s'appliquent aux projets de construction de bâtiments et de parties nouvelles de bâtiments, à usage résidentiel ou à usages non résidentiel de bureaux ou d'hôtellerie.

Article 2 - L'objectif de la présente réglementation est de construire des bâtiments ou des parties nouvelles de bâtiments avec le souci de l'amélioration de leur qualité afin qu'ils soient plus confortables et économes en énergie, et ce pour participer de manière efficace à l'amélioration du cadre de vie en Tunisie et à la protection de l'environnement.

Article 3 – La conception des bâtiments ou des parties nouvelles de bâtiments Lorsque les bâtiments et parties de bâtiments auxquels s'appliquent les dispositions de la présente réglementation sont équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction, et ce parce que le niveau de confort hygrothermique nécessité par l'usage ou voulu par l'usager ne peut être assuré sans recourir à un tel équipement, ils doivent être construits et aménagés de sorte que les consommations d'énergie pour le chauffage et/ou le refroidissement, pour la production d'eau chaude sanitaire et pour l'éclairage puissent être aussi réduites que possible, tout en assurant un confort hygrothermique satisfaisant.

Article 4 - Lorsque les bâtiments et parties de bâtiments auxquelles s'appliquent les dispositions de la présente réglementation ne sont pas équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction, ils doivent être construits et aménagés de sorte que :
- dans l'immédiat, des conditions de confort hygrothermique acceptables soient créées dans les locaux, et les consommations d'énergie pour la production d'eau chaude sanitaire et pour l'éclairage puissent être aussi réduites que possible,
- ultérieurement, l'éventuelle installation d'équipements fixes de chauffage et/ou de refroidissement, pour faire passer le niveau de confort hygrothermique d'acceptable à satisfaisant, entraînerait des consommations d'énergie aussi réduites que possible.

Article 5 - Pour atteindre les objectifs des articles 3 et 4, le texte T2 précise les caractéristiques minimales requises de l'enveloppe des bâtiments et parties de bâtiments, quelque en soit le type. Les textes T3.1 à T3.4 précisent les caractéristiques minimales requises du système de ventilation, du système de chauffage et/ou de refroidissement selon le type de bâtiment ou de partie de bâtiment, du système de production d'eau chaude sanitaire, du système d'éclairage. Le texte T3.1 est relatif aux bâtiments et parties de bâtiments à usage résidentiel non équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction. Le texte T3.2 est relatif aux bâtiments et parties de bâtiments à usage résidentiel équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction. Le texte T3.3 est relatif aux bâtiments et parties de bâtiments à usage de bureaux. Le texte T3.4 est relatif aux bâtiments et parties de bâtiments à usage d'hôtellerie.

Article 7 - Les textes T2, T3.1 à T3.4 prévus à l'article 6 sont applicables 6 mois après leur publication aux projets de construction des bâtiments et des parties de bâtiments qu'ils concernent et qui font l'objet d'une demande de permis de construire, d'une demande de prorogation de permis de construire. Ils sont également applicables aux constructions faisant l'objet d'une déclaration d'achèvement de travaux intervenant après un délai de trois ans et six mois à compter de leur publication, quelle que soit la date de la demande du permis de construire.

Article 8 - Plusieurs textes complémentaires précisent les modalités d'application des textes T2, T3.1 à T3.4, et définissent notamment :
- le "Mode de calcul des transmissions thermiques des parois",
- les "Solutions techniques concernant l'enveloppe",
- les "Données climatiques de base pour la Tunisie", pour dimensionner les systèmes de chauffage et/ou de refroidissement.

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PROJET DE 1ERE REGLEMENTATION THERMIQUE ET ENERGETIQUE
des bâtiments neufs en Tunisie

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Texte T2

(Version n°2 du 19-12-97)

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Article 1er - Les dispositions du présent texte s'appliquent à la construction de tous les bâtiments et parties de bâtiments visés par le texte T1. Il précise les caractéristiques requises de leur enveloppe, en matière :
- d'isolation thermique (chapitre 1), pour le confort hygrothermique et l'économie d'énergie,
- d'étanchéité à l'air (chapitre 2), pour la maîtrise de la ventilation,
- de vitrage (chapitre 3), pour le confort visuel et l'économie d'énergie.

Article 2 - Pour les bâtiments ou parties de bâtiments à usage résidentiel, on distingue deux types de logements : les maisons individuelles (MI) qui peuvent être indépendantes ou accolées, et les appartements en immeubles collectifs (IC), celui-ci étant défini par le fait que les logements y sont superposés.

Article 3 - Pour les maisons individuelles, l'application de "solutions techniques concernant l'enveloppe", définies dans un texte complémentaire, est suffisante pour être en conformité avec les dispositions du présent texte.

Chapitre 1 - Isolation thermique de l'enveloppe.

Article 4 - Les articles de ce chapitre ne s'appliquent qu'aux locaux dont la durée d'occupation est suffisamment significative, à savoir au moins une heure continue de manière périodique, pour que ses occupants souhaitent que leurs conditions d'ambiance hygrothermiques soient acceptables. Ces locaux sont dits "occupés", les autres étant dits "non occupés".

Dans les articles de ce chapitre, en utilisera les définitions suivantes :
- L'ensemble des locaux "occupés" d'un bâtiment ou d'une partie nouvelle de bâtiment constitue sont volume intérieur "occupé".
- Par extérieur du volume intérieur "occupé" on entend l'espace extérieur, les vides sanitaires, le sol, et les locaux adjacents "non occupé".
- L'enveloppe du volume intérieur "occupé" d'un bâtiment ou d'une partie nouvelle de bâtiment est composée de toutes les parois en contact avec l'extérieur de ce volume. La surface de cette enveloppe est celle de ce volume.

Article 5 - Pour tout bâtiment ou partie nouvelle de bâtiment, il est fait application d'un coefficient surfacique moyen de transmission thermique par l'enveloppe de son volume intérieur "occupé", ce coefficient est appelé "coefficient U".

Le coefficient U d'un bâtiment ou d'une partie nouvelle de bâtiment est égal à la somme des transmissions thermiques par les parois composant l'enveloppe de son volume "occupé", pour un degré d'écart de température entre l'intérieur et l'extérieur, divisées par la surface de cette enveloppe. Le coefficient U est exprimé en watts par mètre carré et par degré Celsius [$W.m^{-2}.°C^{-1}$].

Le « Mode de calcul des transmissions thermiques par les parois » est fourni dans un texte complémentaire.

La température est supposée uniforme dans tout le volume intérieur "occupé" du bâtiment ou de la partie nouvelle de bâtiment.

En ce qui concerne les bâtiment auquel on ajoute une partie nouvelle et les bâtiments adjacents :
- leurs locaux "occupés" sont réputés être à la même température que le bâtiment ou la partie nouvelle de bâtiment.
- leurs locaux "non occupés" sont considérés comme n'étant le siège d'aucune production de froid.

Article 6 - Le coefficient U d'un bâtiment ou d'une partie de bâtiment ne doit pas dépasser la valeur U max, donnée par la formule :
Umax = (a * S1 + b * S2 + c * S3 + d * P + e * S4)/(S1+S2+S3+S4+S5) + f
dans laquelle :
- S1 est la surface des parois opaques verticales ou faisant avec le plan horizontal un angle supérieur à 60 degrés [°], en contact avec l'extérieur, non compris celles qui sont enterrées, exprimée en mètres carrés [m^2],
- S2 est la surface des parois opaques horizontales ou faisant avec le plan horizontal un angle inférieur à 60 [°], supérieures et en contact avec l'extérieur, exprimée en [m^2],
- S3 est la surface des parois opaques horizontales ou faisant avec le plan horizontal un angle inférieur à 60 [°], inférieures et en contact avec l'extérieur, non compris celles qui sont sur terre-plein, exprimée en [m^2],
- P est le pourtour extérieur des locaux "occupés", sur terre-plein ou enterrés, exprimé en mètres [m],
- S4 est la surface des parois transparentes ou translucides en contact avec l'extérieur, comptée en tableau, exprimée en [m^2],
- S5 est la surface des parois sur terre-plein ou enterrés, exprimé en mètres [m^2],
- a, b, c, d, e, f sont des coefficients, dont les valeurs sont données dans le tableau suivant, en fonction de la finalité de la construction, à savoir son usage et sa configuration :

Finalité de la construction	a	b	c	d	e	f
Résidentiel (MI)	0.80	0.60	2.00	1.75	5.00	0.08
Résidentiel (IC)						
Bureaux						
Hôtellerie (chambre)						
Hôtellerie (partie communes)						

On définit la proportion de vitrage (PV) des parois en contact avec l'extérieur comme le rapport de S4 à la somme des surfaces des parois en contact avec l'extérieur qui sont partiellement vitrées. Cette somme-ci sera désigné par Spv, exprimée en [m²].

Si PV supérieur à 30%, on remplace le produit (e * S4) dans la formule donnant Umax par :
e * 0.3 * Spv + 2.5 * (S4 – Spv).

Article 7 - Umax peut être augmentée de la quantité ΔUmax donnée par le tableau suivant en fonction de leur indice solaire (IS) et de leur inertie thermique :

	Indice solaire		
Inertie	IS<IS1	IS1≤IS<IS2	IS ≥ IS2
Faible			
Moyenne			
Forte			

La définition et le mode de calcul de l'indice solaire et de la classe d'inertie thermique sont fournies dans l'annexe 1 du présent texte.

Chapitre 2 - Etanchéité à l'air de l'enveloppe.

Article 8 - Les bâtiments et parties nouvelles de bâtiments doivent être pourvus de "dispositifs spécifiques de ventilation", qui sont les dispositifs mécaniques et les conduits à tirage naturel ainsi que les orifices d'amenée naturelle d'air éventuellement associés. Ces dispositifs permettent un "renouvellement d'air spécifique".

Toutes les dispositions utiles, concernant la perméabilité à l'air de l'enveloppe des bâtiments et parties de bâtiments seront prises afin que le renouvellement d'air non spécifique (dit "supplémentaire") ne dépasse pas de plus de 20 % le renouvellement d'air spécifique.

Chapitre 3 - Vitrage de l'enveloppe.

Article 9 - Pour les bâtiments ou parties de bâtiments à usage résidentiel, les pièces principales (pièces de séjour, chambres), les cuisines doivent être pourvues de fenêtres ou portes-fenêtres. Les salles d'eau doivent être si possible pourvues de vitrage ou de fenêtres. L'éclairage naturel au centre des pièces principales doit être suffisant pour permettre, par temps clair, l'exercice des activités normales de l'habitation sans le recours de l'éclairage artificiel.

Le taux de vitrage (TV) d'un logement, défini comme le rapport de la somme des surfaces transparentes ou translucides, comptées en tableau, à la surface habitable, doit être au moins égale à 10 %.

Article 10 - Pour les bâtiments ou parties de bâtiments à usage non résidentiel de bureaux, les bureaux et si possible les salles de conférences doivent avoir un indice de vitrage corrigé (IVC), dont la définition et le mode de calcul sont donnés en annexe I du présent texte T2, égal ou supérieur à 15 %.

Article 11 - Pour les bâtiments ou parties de bâtiments à usage d'hôtellerie, les chambres et les salles de restauration doivent avoir un indice de vitrage corrigé (IVC), dont la définition et le mode de calcul sont donnés en annexe I du présent texte T2, égal ou supérieur à 15 %.

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PROJET DE 1ERE REGLEMENTATION THERMIQUE ET ENERGETIQUE
des bâtiments neufs en Tunisie
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Texte T3.1
(Version n°2 du 19-12-97)
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Article 1er - Les dispositions du présent texte T3.1 s'appliquent à la construction des bâtiments et parties de bâtiments à usage résidentiel non équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction. Ces bâtiments et parties de bâtiments, visés par le texte T1, doivent également respecter les dispositions du texte T2.

Ces dispositions concernent :
- le système de ventilation, définies dans le chapitre Ier,
- le système de production d'eau chaude sanitaire, définies dans le chapitre II,
- le système d'éclairage, définies dans le chapitre III,
- la possibilité d'installation ultérieure d'un système de chauffage et/ou de refroidissement, définies dans le chapitre IV.

Chapitre Ier - Le système de ventilation.

Article 2 - Le système de ventilation, ou "dispositif spécifique de ventilation", doit comporter :
- des entrées d'air dans toutes les pièces principales (salles de séjour et chambres), réalisées par des orifices en façades, des conduits à fonctionnement naturel ou des dispositifs mécaniques.
- des sorties d'air dans les pièces de service, au moins dans les cuisines, les salles d'eau (salles de bains ou de douches) et les cabinets d'aisances, réalisées par des conduits verticaux à tirage naturel ou des dispositifs mécaniques. Pour les maisons individuelles, les pièces de services autres que la cuisine, les sorties d'air peuvent être des ouvertures extérieures obturables. En installation collective de ventilation, si une pièce de service possède une sortie d'air mécanique, toutes les autres pièces de service doivent en posséder une.

L'air doit pouvoir circuler librement des pièces principales vers les pièces de service. Une pièce à la fois principale et de service, telle qu'une chambre ayant un équipement de cuisine, doit comporter une entrée et une sortie d'air, réalisées comme indiqué ci-dessus.

Article 3 - Le système de ventilation doit pouvoir permettre, dans chaque pièce de service, les débits d'extraction donnés dans le tableau suivant, exprimés en mètres cubes par heure [$m^3.h^{-1}$], en fonction du nombre de pièces principales du logement :

Les entrées d'air, complétées par la perméabilité des ouvrants, doivent permettre d'obtenir les débits définis ci-dessus.

Article 4 - Lorsque le logement est équipé d'un système de ventilation forcée (à dispositifs mécaniques), un dispositif de modulation du débit d'air extrait en cuisine peut être utilisé, s'il permet les débits minimaux d'extraction donnés dans le tableau suivant, exprimés en [m3.h-1] :

Article 5 - Le système de ventilation doit comporter un dispositif de surventilation forcée dans la cuisine, à commande manuelle, pour assurer un rafraîchissement nocturne du logement en période d'été.

Lorsque le logement est équipé d'un système de ventilation naturelle (à tirage naturel), le dispositif de surventilation doit être disposé en parallèle du conduit de tirage naturel de sortie d'air.

Le dispositif de surventilation doit assurer un débit d'extraction d'au moins 3 volumes par heure, des fenêtres devant être ouvertes durant l'utilisation du dispositif.

Chapitre II - Le système de production d'eau chaude sanitaire.

Article 6 - Le système de production d'eau chaude sanitaire est un système avec ou sans boucle de recyclage. Le recours à une boucle de recyclage (ou collectif) n'est possible que si d'une part le point de puisage le plus éloigné se trouve à plus de 15 mètres [m] du point de production, et d'autre part les déperditions thermiques de la boucle de recyclage sont faibles par rapport aux besoins satisfaits aux puisages.

Si le système est sans boucle de recyclage, la production et le réseau de distribution sont totalement dans le volume "occupé".

Si le système est avec boucle de recyclage, le réseau de distribution est dans le volume "occupé", à l'exception de son raccordement à la boucle de recyclage.

Les éléments de stockage éventuels sont revêtus d'un isolant de résistance thermique égale ou supérieure à 1 [m2.°C.W-1].

Article 7 - Toute maison individuelle est équipée d'un chauffe-eau solaire muni d'un appoint par une énergie disponible en permanence. Une dérogation à l'installation d'un chauffe-eau solaire peut être donnée si un masque existant durable de voisinage la rend inefficace.

Chapitre III - Le système d'éclairage.

Article 8 - Le système d'éclairage a deux composantes : l'éclairage naturel et l'éclairage artificiel. L'éclairage naturel de chaque pièce dépend du positionnement et du dimensionnement de ses parois vitrées, des protections solaires fixes ou mobiles de celles-ci, de la nature des vitrages, toutes ces caractéristiques étant soumises aux dispositions du texte T2. L'éclairage artificiel doit être satisfaisant en l'absence d'éclairage naturel.

Le réseau électrique doit comporter un sous-réseau "Eclairage" alimentant des points d'éclairage artificiel qui doivent être prévus pour pouvoir éclairer correctement les différents espaces intérieurs.

Chapitre IV - La possibilité d'installation ultérieure d'un système de chauffage et/ou de refroidissement.

Article 9 - Des dispositions doivent être prises au moment de la construction des bâtiments et parties de bâtiments pour permettre l'installation ultérieure d'un système de chauffage et/ou de refroidissement.

Le réseau électrique doit comporter au moins un sous-réseau "Refroidissement" desservant les salles de séjour et dimensionné pour alimenter les éventuels climatiseurs individuels dont la puissance électrique doit permettre d'assurer une température d'air de 26 [°C] dans ces pièces en période d'été.

De plus, un aménagement du logement doit permettre l'installation ultérieure d'un système de chauffage utilisant l'électricité ou un combustible gazeux ou liquide. Le système pourra être :
- divisé (composé d'appareils de production et d'émission de chaleur, fixes ou mobiles),
- ou central (composé d'un générateur de chaleur, d'un réseau de distribution de chaleur et d'émetteurs de chaleur) et individuel (pour un logement).

Il y a donc trois options d'aménagement :

- 1ère option : On prépare la possibilité d'installation d'un système de chauffage divisé utilisant le gaz de pétrole liquéfié ou le pétrole lampant. Il suffit de dimensionner les pièces principales pour pouvoir y disposer le ou les appareils, et le système de ventilation pour assurer l'extraction des gaz de combustion.

- 2ème option : On prépare la possibilité d'installation d'un système de chauffage électrique. Le réseau électrique doit alors comporter un sous-réseau "Chauffage" desservant les pièces principales et dimensionné pour alimenter les éventuels terminaux de chauffage électrique, dont la puissance doit permettre d'assurer une température d'air de 20 [°C] dans ces pièces en période d'hiver.- 3ème option : On prépare la possibilité d'installation d'un système de chauffage central individuel, utilisant le gaz naturel. Il faut prévoir l'emplacement d'un générateur de chauffage ou d'un générateur mixte (chauffage et production d'eau chaude sanitaire), installer le réseau de distribution de chaleur desservant les pièces principales, et prévoir l'emplacement des émetteurs dans ces pièces.

Pour le dimensionnement des sous-réseaux électriques "Refroidissement" et "Chauffage", on utilise les "données climatiques de base", définies dans le texte complémentaire cité dans le texte T1.

Projet de 1ère réglementation thermique et énergétique des bâtiments neufs en Tunisie

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Texte T3.2

(Version n°2 du 19-12-97)

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Article 1er - Les dispositions du présent texte T3.2 s'appliquent à la construction des bâtiments et parties de bâtiments à usage résidentiel équipés d'installations fixes de chauffage et/ou de refroidissement au moment de leur construction. Ces bâtiments et parties de bâtiments, visés par le texte T1, doivent également respecter les dispositions du texte T2.

Ces dispositions concernent :
- le système de ventilation, définies dans le chapitre Ier,
- le système de chauffage et/ou de refroidissement, définies dans le chapitre II,
- le système de production d'eau chaude sanitaire, définies dans le chapitre III,
- le système d'éclairage, définies dans le chapitre IV.

Chapitre Ier - Le système de ventilation.

Article 2 - On appelle :
- "dispositifs spécifiques de ventilation" les dispositifs mécaniques et les conduits à tirage naturel ainsi que les orifices d'amenée naturelle d'air éventuellement associés,
- et "renouvellement d'air spécifique" le renouvellement d'air, par apport d'air neuf pris à l'extérieur, au moyen de ces dispositifs.

Le système de ventilation est assuré :
- soit par un dispositif spécifique de ventilation,
- soit, lorsqu'il y a un système de refroidissement à air, en partie par un dispositif spécifique de ventilation et en partie par le système de refroidissement.

Le dispositif spécifique de ventilation, doit comporter :
- des entrées d'air dans toutes les pièces principales (salles de séjour et chambres), réalisées par des orifices en façades, des conduits à fonctionnement naturel ou des dispositifs mécaniques.- des sorties d'air dans les pièces de service, au moins dans les cuisines, les salles d'eau (salles de bains ou de douches) et les cabinets d'aisances, réalisées par des conduits verticaux à tirage naturel ou des dispositifs mécaniques. Pour les maisons individuelles, les pièces de services autres que la cuisine, les sorties d'air peuvent être des ouvertures extérieures obturables. En installation collective de ventilation, si une pièce de service possède une sortie d'air mécanique, toutes les autres pièces de service doivent en posséder une.

L'air doit pouvoir circuler librement des pièces principales vers les pièces de service. Une pièce à la fois principale et de service, telle qu'une chambre ayant un équipement de cuisine, doit comporter une entrée et une sortie d'air, réalisées comme indiqué ci-dessus.

Article 3 - Le système de ventilation doit pouvoir permettre, dans chaque pièce de service, les débits d'extraction donnés dans le tableau suivant, exprimés en mètres cubes par heure [m3.h-1], en fonction du nombre de pièces principales du logement :

Les entrées d'air, complétées par la perméabilité des ouvrants, doivent permettre d'obtenir les débits définis ci-dessus.

Article 4 - Lorsque le logement est équipé d'un système de ventilation forcée (à dispositifs mécaniques), un dispositif de modulation du débit d'air extrait en cuisine peut être utilisé, s'il permet les débits minimaux d'extraction donnés dans le tableau suivant, exprimés en [m3.h-1] :

Article 5 - Le système de ventilation doit comporter un dispositif de surventilation forcée dans la cuisine, à commande manuelle, pour assurer un rafraîchissement nocturne du logement en période d'été.

Lorsque logement est équipé d'un système de ventilation naturelle (à tirage naturel), le dispositif de surventilation doit être disposé en parallèle du conduit de tirage naturel.

Le dispositif de surventilation doit assurer un débit d'extraction d'au moins 3 volumes par heure, des fenêtres devant être ouvertes durant l'utilisation du dispositif.

Chapitre II - Le système de chauffage et/ou de refroidissement.

Article 6 - Le système de chauffage doit être dimensionné pour assurer une température d'air de 20 [°C] dans les pièces principales en période d'hiver. Pour son dimensionnement, on utilise les "données climatiques de base", définies dans le texte complémentaire cité dans le texte T1.

Pour les systèmes utilisant l'électricité, le réseau électrique doit comporter un sous-réseau "Chauffage". Les pièces desservies sont équipés de convecteurs munis de dispositifs d'arrêt et de régulation en fonction de la température intérieure, les deux fonctions pouvant être assurées par le même dispositif. Pour les systèmes utilisant un combustible gazeux ou liquide, le système peut être :

- divisé (composé d'un appareil de production et d'émission de chaleur),
- ou central (composé d'un générateur de chaleur, d'un réseau de distribution de chaleur et d'émetteurs de chaleur).

Les performances des générateurs de chaleur d'un système de chauffage central doivent être telles que pour une température moyenne d'eau dans la chaudière de 70 [°C], le rendement à puissance nominale (Pn), exprimé en pourcentage, est au moins égal à 84 + 2 * log Pn.

Les systèmes de chauffage central doivent être munis de dispositifs centraux d'arrêt et de régulation en fonction de la température intérieure.

L'ensemble du réseau de distribution situé hors des volumes chauffés est revêtu d'un isolant de résistance thermique égale ou supérieure à 0,5 [m2.°C.W-1], pour réduire les pertes thermiques.

Article 7 - Le système de refroidissement doit être dimensionné pour assurer une température d'air de 26 [°C] dans les pièces principales en période d'été. Pour son dimensionnement, on utilise les "données climatiques de base", définies dans le texte complémentaire cité dans le texte T1.

Le système est individuel (pour un logement), soit divisé (composés de climatiseurs individuels), soit central (unité centrale de production de froid).

Les systèmes de refroidissement central doivent être munis de dispositifs d'arrêt et de régulation en fonction de la température intérieure.

Le réseau électrique doit comporter un sous-réseau "Refroidissement" alimentant un ou plusieurs climatiseurs individuels ou l'unité centrale de production de froid.

Chapitre III - Le système de production d'eau chaude sanitaire.

Article 8 - Le système de production d'eau chaude sanitaire est un système avec ou sans boucle de recyclage. Le recours à une boucle de recyclage (ou collectif) n'est possible que si d'une part le point de puisage le plus éloigné se trouve à plus de 15 mètres [m] du point de production, et d'autre part l'émission de la boucle de recyclage est faible par rapport aux besoins satisfaits aux puisages.

Si le système est sans boucle de recyclage, la production et le réseau de distribution sont totalement dans le volume "occupé".

Si le système est avec boucle de recyclage, le réseau de distribution est dans le volume "occupé", à l'exception de son raccordement à la boucle de recyclage.

Les éléments de stockage éventuels sont revêtus d'un isolant de résistance thermique au moins égale à 1 [m2.°C.W-1].

Article 9 - Toute maison individuelle est équipée d'un chauffe-eau solaire muni d'un appoint par une énergie disponible en permanence. Une dérogation à l'installation d'un chauffe-eau solaire peut être donnée si un masque existant durable de voisinage la rend inefficace.

Chapitre IV - Le système d'éclairage.

Article 10 - Le système d'éclairage a deux composantes : l'éclairage naturel et l'éclairage artificiel. L'éclairage naturel de chaque pièce dépend du positionnement et du dimensionnement de ses parois vitrées, des protections solaires fixes ou mobiles de celles-ci, de la nature des vitrages, toutes ces caractéristiques étant soumises aux dispositions du texte T2. L'éclairage artificiel doit être satisfaisant en l'absence d'éclairage naturel.

Le réseau électrique doit comporter un sous-réseau "Eclairage" alimentant des points d'éclairage artificiel qui doivent être prévus pour pouvoir éclairer correctement les différents espaces intérieurs.

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PROJET DE 1ERE REGLEMENTATION THERMIQUE ET ENERGETIQUE
des bâtiments neufs en Tunisie
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Texte T3.3
(Version n°2 du 19-12-97)
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Article 1er - Les dispositions du présent texte T3.3 s'appliquent à la construction des bâtiments et parties de bâtiments à usage non résidentiel de bureaux. Ces bâtiments et parties de bâtiments, visés par le texte T1, doivent également respecter les dispositions du texte T2.

Ces dispositions concernent :
- le système de ventilation, définies dans le chapitre Ier,
- le système de chauffage et de refroidissement, définies dans le chapitre II.
- le système de production d'eau chaude sanitaire, définies dans le chapitre III,
- le système d'éclairage, définies dans le chapitre IV.

Chapitre Ier - Le système de ventilation.

Article 2 - Les dispositions de ce chapitre s'appliquent à l'équipement des bâtiments. Elles s'appliquent à l'équipement des parties de bâtiments, uniquement si ces parties correspondent à des surélévations ou d'additions à des bâtiments existants, lorsque leur surface est supérieure à 150 [m2] ou, si leur hauteur sous plafond excède 3 [m], lorsque leur volume est supérieure à 400 [m3].

Les dispositions de ce chapitre ne s'appliquent qu'aux locaux dont la durée d'occupation est suffisamment significative, à savoir au moins une heure, pour que ses occupants souhaitent que leurs conditions d'ambiance hygrothermiques soient acceptables. Ces locaux sont dits "occupés", les autres étant dits "non occupés".

On appelle :
- "dispositifs spécifiques de ventilation" les dispositifs mécaniques et les conduits à tirage naturel ainsi que les orifices d'amenée naturelle d'air éventuellement associés,
- et "renouvellement d'air spécifique" le renouvellement d'air, par apport d'air neuf pris à l'extérieur, au moyen de ces dispositifs.

Le système de ventilation est assuré par des dispositifs spécifiques de ventilation ou par le système de chauffage et/ou de refroidissement.

Le système de ventilation doit être tel que, chaque fois que les règlements pris en matière de santé, de salubrité, d'hygiène et de sécurité l'autorisent :
- le même air extérieur serve à ventiler successivement plusieurs locaux (balayage), dans la mesure toutefois où ceux-ci sont contigus ou séparés uniquement par des circulations,
- la ventilation puisse être arrêtée en cas de non-occupation et de non-pollution des locaux.

Article 3 - Le système doit être tel que le débit de renouvellement d'air spécifique d'un local n'excède pas 1,4 fois le minimum imposé par les règlements pris en matière de santé, de salubrité, d'hygiène et de sécurité. En l'absence de minimum imposé par ces règlements, le débit de renouvellement d'air spécifique d'un local n'excède pas 1,4 fois les recommandations

de l'Organisation Mondiale de la Santé en matière de débit minimum, soit 18 mètres cubes par heure et par personne [m3.h-1.p-1].

Si le même air extérieur sert à ventiler successivement plusieurs locaux, le débit limite de renouvellement d'air spécifique est égal au débit limite le plus élevé parmi ceux calculés pour les locaux concernés.

Article 4 - La ventilation de locaux ou de groupes de locaux ayant des horaires d'occupation nettement différents doit être assurée par des systèmes de ventilation indépendants.

Article 5 - Pour un local ou un groupe de locaux à pollution non spécifique desservis par un même système de ventilation, si le taux d'occupation est susceptible d'être inférieur au quart du taux normal pendant plus de 50 % du temps d'occupation, le débit d'air doit pouvoir être réduit d'au moins 50 %.

Pour les locaux où des personnes peuvent se rassembler, le débit d'air neuf doit pouvoir être modulé en fonction du taux d'occupation.

Article 6 - Un dispositif permettant de suivre les consommations d'énergie dues au système de ventilation doit être prévu sur chaque centrale de ventilation dont le ou les moteurs ont une puissance totale égale ou supérieure à 4 [kW].

Chapitre II - Le système de chauffage et/ou de refroidissement.

Article 7 - Les dispositions de ce chapitre s'appliquent à l'équipement des bâtiments. Elles s'appliquent à l'équipement des parties de bâtiments, uniquement si ces parties correspondent à des surélévations ou d'additions à des bâtiments existants, lorsque leur surface est supérieure à 150 [m2] ou, si leur hauteur sous plafond excède 3 [m], lorsque leur volume est supérieure à 400 [m3].

Article 8 - Le système de chauffage et/ou de refroidissement doit être dimensionné pour assurer dans les locaux "occupés" une température d'air de 20 [°C] en période d'hiver et de 26 [°C] en période d'été. Pour son dimensionnement, on utilise les "données climatiques de base", définies dans le texte complémentaire cité dans le texte T1.

Si le système comporte un système à traitement d'air central :
- il fonctionne en monozone ou multizone, à température d'air variable (débit d'air traité constant) ou à volume d'air variable (débit d'air traité variable à température constante),
- il est muni d'un dispositif central de régulation en fonction de la température extérieure et de données locales (température, humidité éventuellement, occupation éventuellement si le traitement d'air est destiné à un seul local),
- le réseau de distribution d'air est à gaine unique, l'air étant soufflé dans les locaux "occupés", puis repris dans un réseau de reprise d'air.

Si le système comporte une production centrale d'eau chaude et d'eau glacée :
- il est muni d'un dispositif de régulation de la production d'eau chaude en fonction de la température extérieure,
- les canalisations de distribution d'eau chaude sont revêtues d'un isolant de résistance thermique au moins égale à 0,5 [m2.°C.W-1], pour limiter les déperditions thermiques,
- les canalisations de distribution d'eau glacée sont revêtues d'un isolant de résistance thermique au moins égale à 1 [m2.°C.W-1], pour éviter les condensations.

Les unités terminales ou individuelles de traitement d'air doivent être munis de dispositifs d'arrêt et de régulation en fonction de la température intérieure, avec une amplitude de régulation inférieure à 2 [°C]. La zone morte (écart entre la valeur maximale de température intérieure pour laquelle il peut y avoir fourniture de chaud et la valeur minimale de température pour laquelle il peut y avoir fourniture de froid) est égale à 4 [°C].

Article 9 - Les dispositions supplémentaires suivantes doivent être prises :
- le réseau électrique doit comporter un ou plusieurs sous-réseaux "Chauffage et/ou refroidissement" alimentant les unités constitutives du système.
- le système doit être muni d'un dispositif de programmation hebdomadaire,
- le système doit être muni d'un dispositif de comptage des consommations des machines frigorifiques lorsque les organes assurant la production de froid ont une puissance frigorifique totale égale ou supérieure à 50 [kW],
- les portes d'accès à un bâtiment ou une partie de bâtiment chauffés et/ou refroidis doivent être équipées d'un dispositif limitant la durée de leur ouverture sur des espaces intérieurs non chauffés et/ou refroidis ou sur l'extérieur,
- des portes extérieure d'accès à un bâtiment ou une partie de bâtiment chauffés et/ou refroidis doivent être équipées d'un dispositif annulant toute relation directe entre l'espace intérieur et l'extérieur.

Chapitre III - Le système de production d'eau chaude sanitaire.

Article 10 - Le système de production d'eau chaude sanitaire est un système avec ou sans boucle de recyclage. Le recours à une boucle de recyclage (ou collectif) n'est possible que si d'une part le point de puisage le plus éloigné se trouve à plus de 15 mètres [m] du point de production, et d'autre part l'émission de la boucle de recyclage est faible par rapport aux besoins satisfaits aux puisages.

Si le système est sans boucle de recyclage, la production et le réseau de distribution sont totalement dans le volume "occupé".

Si le système est avec boucle de recyclage, le réseau de distribution dans le volume "occupé", à l'exception de son raccordement à la boucle de recyclage.

Les éléments de stockage éventuels sont revêtus d'un isolant de résistance thermique au moins égale à 1 [m2.°C.W-1].

Chapitre IV - Le système d'éclairage.

Article 11 - Le système d'éclairage de référence a deux composantes : l'éclairage naturel et l'éclairage artificiel. L'éclairage naturel de chaque local dépend du positionnement et du dimensionnement de ses parois vitrées, des protections solaires fixes ou mobiles de celles-ci, de la nature des vitrages, toutes ces caractéristiques étant soumises aux dispositions du texte T2. L'éclairage artificiel doit être satisfaisant en l'absence d'éclairage naturel.
Le système d'éclairage artificiel concerne l'éclairage général des bâtiments ou parties de bâtiments, c'est-à-dire l'éclairage d'ambiance des espaces constitutifs de ceux-ci, sans tenir compte des besoins particuliers en certains lieux déterminés. Ne sont pas concernés l'éclairage de secours, l'éclairage local (ou éclairage d'appoint) destiné à éclairer une tache visuelle de façon particulière.
Article 12 - Les luminaires doivent être équipés de lampes dont l'indice de rendu des couleurs ou IRC est supérieur ou égal à 80 et dont l'efficacité lumineuse est au moins égale à 40 lumens par Watt [lm.W-1].

Le réseau électrique doit comporter un sous-réseau "Eclairage" alimentant chaque zone du bâtiment ou partie de bâtiment concerné ayant une activité et une occupation bien déterminé, afin d'en rendre la commande possible par un dispositif de conduite et de gestion.

La structure du système d'éclairage artificiel et la commande des points d'éclairage de chaque local pouvant bénéficier de l'éclairage naturel doivent permettre de n'utiliser l'éclairage artificiel qu'en appoint, et ce soit par un dispositif de régulation, soit par un dispositif de modulation permettant plusieurs niveaux effectifs d'éclairage artificiel. Le nombre de niveaux est donné dans le tableau suivant, en fonction de l'indice de vitrage corrigé (IVC) et de l'indice de profondeur (IP) du local concerné :

L'indice de vitrage corrigé d'un local est donné par la formule :
IVC = IO * RCT * FT
dans laquelle :
- IO est l'indice d'ouverture en tableau (surface des percements divisée par la surface au sol du local),
- RCT est le rapport de la surface en clair des parois transparentes ou translucides à leur surface en tableau,

- FT est le facteur de transmission des produits transparents ou translucides en incidence diffuse.

L'indice de profondeur d'un local est le rapport de la profondeur du local par la hauteur sous linteau.

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PROJET DE 1ERE REGLEMENTATION THERMIQUE ET ENERGETIQUE
des bâtiments neufs en Tunisie

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Texte T3.4
(Version n°2 du 19-12-97)

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Article 1er - Les dispositions du présent texte T3.4 s'appliquent à la construction des bâtiments et parties de bâtiments à usage non résidentiel d'hôtellerie. Ces bâtiments et parties de bâtiments, visés par le texte T1, doivent également respecter les dispositions du texte T2.

Ces dispositions concernent :
- le système de ventilation, définies dans le chapitre Ier,
- le système de chauffage et de refroidissement, définies dans le chapitre II.
- le système de production d'eau chaude sanitaire, définies dans le chapitre III,
- le système d'éclairage, définies dans le chapitre IV.

Chapitre Ier - Le système de ventilation.

Article 2 - Les dispositions de ce chapitre s'appliquent à l'équipement des bâtiments. Elles s'appliquent à l'équipement des parties de bâtiments, uniquement si ces parties correspondent à des surélévations ou d'additions à des bâtiments existants, lorsque leur surface est supérieure à 150 [m2] ou, si leur hauteur sous plafond excède 3 [m], lorsque leur volume est supérieure à 400 [m3].

Les dispositions de ce chapitre ne s'appliquent qu'aux locaux dont la durée d'occupation est suffisamment significative, à savoir au moins une heure, pour que ses occupants souhaitent que leurs conditions d'ambiance hygrothermiques soient acceptables. Ces locaux sont dits "occupés", les autres étant dits "non occupés".

On appelle :
- "dispositifs spécifiques de ventilation" les dispositifs mécaniques et les conduits à tirage naturel ainsi que les orifices d'amenée naturelle d'air éventuellement associés,
- "renouvellement d'air spécifique" le renouvellement d'air, par apport d'air neuf pris à l'extérieur, au moyen de ces dispositifs.

Le système de ventilation est assuré par des dispositifs spécifiques de ventilation ou par le système de chauffage et/ou de refroidissement.

Le système de ventilation doit être tel que, chaque fois que les règlements pris en matière de santé, de salubrité, d'hygiène et de sécurité l'autorisent :
- le même air extérieur serve à ventiler successivement plusieurs locaux (balayage), dans la mesure toutefois ou ceux-ci sont contigus ou séparés uniquement par des circulations,
- la ventilation puisse être arrêtée en cas de non-occupation et de non-pollution des locaux.

Article 3 - Le système doit être tel que le débit de renouvellement d'air spécifique d'un local n'excède pas 1,4 fois le minimum imposé par les règlements pris en matière de santé, de salubrité, d'hygiène et de sécurité. En l'absence de minimum imposé par ces règlements, le débit de renouvellement d'air spécifique d'un local n'excède pas 1,4 fois les recommandations

de l'Organisation Mondiale de la Santé en matière de débit minimum, soit 18 mètres cubes par heure et par personne [m3.h-1.p-1].

Si le même air extérieur sert à ventiler successivement plusieurs locaux, le débit limite de renouvellement d'air spécifique est égal au débit limite le plus élevé parmi ceux calculés pour les locaux concernés.

Article 4 - La ventilation de locaux ou de groupes de locaux ayant des horaires d'occupation nettement différents doit être assurée par des systèmes de ventilation indépendants.

Article 5 - Pour un local ou un groupe de locaux à pollution non spécifique desservis par un même système de ventilation, si le taux d'occupation est susceptible d'être inférieur au quart du taux normal pendant plus de 50 % du temps d'occupation, le débit d'air doit pouvoir être réduit d'au moins 50 %.

Pour les locaux où des personnes peuvent se rassembler, le débit d'air neuf doit pouvoir être modulé en fonction du taux d'occupation.

Article 6 - Un dispositif permettant de suivre les consommations d'énergie dues au système de ventilation doit être prévu sur chaque centrale de ventilation dont le ou les moteurs ont une puissance totale égale ou supérieure à 4 [kW].

Chapitre II - Le système de chauffage et de refroidissement.

Article 7 - Les dispositions de ce chapitre s'appliquent à l'équipement des bâtiments. Elles s'appliquent à l'équipement des parties de bâtiments, uniquement si ces parties correspondent à des surélévations ou d'additions à des bâtiments existants, lorsque leur surface est supérieure à 150 [m2] ou, si leur hauteur sous plafond excède 3 [m], lorsque leur volume est supérieure à 400 [m3].

Article 8 - Le système de chauffage et/ou de refroidissement doit être dimensionné pour assurer dans les locaux "occupés" une température d'air de 20 [°C] en période d'hiver et de 26 [°C] en période d'été. Pour son dimensionnement, on utilise les "données climatiques de base", définies dans le texte complémentaire cité dans le texte T1.

Si le système comporte un système à traitement d'air central :
- il fonctionne en monozone ou multizone, à température d'air variable (débit d'air traité constant) ou à volume d'air variable (débit d'air traité variable à température constante),
- il est muni d'un dispositif central de régulation en fonction de la température extérieure et de données locales (température, humidité éventuellement, occupation éventuellement si le traitement d'air est destiné à un seul local),
- le réseau de distribution d'air est à gaine unique, l'air étant soufflé dans les locaux "occupés", puis repris dans un réseau de reprise d'air.

Si le système comporte une production centrale d'eau chaude et d'eau glacée :
- il est muni d'un dispositif de régulation de la production d'eau chaude en fonction de la température extérieure,
- les canalisations de distribution d'eau chaude sont revêtues d'un isolant de résistance thermique au moins égale à 0,5 [m2.°C.W-1], pour limiter les déperditions thermiques,

- les canalisations de distribution d'eau glacée sont revêtues d'un isolant de résistance thermique au moins égale à 1 [m2.°C.W-1], pour éviter les condensations.

Les unités terminales ou individuelles de traitement d'air doivent être munis de dispositifs d'arrêt et de régulation en fonction de la température intérieure, avec une amplitude de régulation inférieure à 2 [°C]. La zone morte (écart entre la valeur maximale de température intérieure pour laquelle il peut y avoir fourniture de chaud et la valeur minimale de température pour laquelle il peut y avoir fourniture de froid) est égale à 4 [°C].

Article 9 - Les dispositions supplémentaires suivantes doivent être prises :
- le réseau électrique doit comporter un ou plusieurs sous-réseaux "Chauffage et/ou refroidissement" alimentant les unités constitutives du système.
- le système doit être muni d'un dispositif de programmation hebdomadaire,
- le système doit être muni d'un dispositif de comptage des consommations des machines frigorifiques lorsque les organes assurant la production de froid ont une puissance frigorifique totale égale ou supérieure à 50 [kW],
- les portes d'accès à un bâtiment ou une partie de bâtiment chauffés et/ou refroidis doivent être équipées d'un dispositif limitant la durée de leur ouverture sur des espaces intérieurs non chauffés et/ou refroidis ou sur l'extérieur,
- des portes extérieure d'accès à un bâtiment ou une partie de bâtiment chauffés et/ou refroidis doivent être équipées d'un dispositif annulant toute relation directe entre l'espace intérieur et l'extérieur.

Chapitre III - Le système de production d'eau chaude sanitaire.

Article 10 - Le système de production d'eau chaude sanitaire est un système avec ou sans boucle de recyclage. Le recours à une boucle de recyclage (ou collectif) n'est possible que si d'une part le point de puisage le plus éloigné se trouve à plus de 15 mètres [m] du point de production, et d'autre part l'émission de la boucle de recyclage est faible par rapport aux besoins satisfaits aux puisages.

Si le système est sans boucle de recyclage, la production et le réseau de distribution sont totalement dans le volume "occupé".

Si le système est avec boucle de recyclage, le réseau de distribution est dans le volume "occupé", à l'exception de son raccordement à la boucle de recyclage.

Les éléments de stockage éventuels sont revêtus d'un isolant de résistance thermique au moins égale à 1 [m2.°C.W-1].

Chapitre IV - Le système d'éclairage.

Article 11 - Le système d'éclairage a deux composantes : l'éclairage naturel et l'éclairage artificiel. L'éclairage naturel de chaque local dépend du positionnement et du dimensionnement de ses parois vitrées, des protections solaires fixes ou mobiles de celles-ci, de la nature des vitrages, toutes ces caractéristiques étant soumises aux dispositions du texte T2. L'éclairage artificiel doit être satisfaisant en l'absence d'éclairage naturel.
Le système d'éclairage artificiel concerne l'éclairage général des bâtiments et parties de bâtiments visés par ce présent texte T3.4, c'est-à-dire l'éclairage d'ambiance des espaces constitutifs de ceux-ci, sans tenir compte des besoins particuliers en certains lieux déterminés.

Ne sont pas concernés l'éclairage de secours, l'éclairage local (ou éclairage d'appoint) destiné à éclairer une tache visuelle de façon particulière.
Article 12 - Les luminaires doivent être équipés de lampes dont l'indice de rendu des couleurs ou IRC est supérieur ou égal à 80 et dont l'efficacité lumineuse est au moins égale à 40 lumens par Watt [lm.W-1].

Le réseau électrique doit comporter un sous-réseau "Eclairage" alimentant chaque zone du bâtiment ou partie de bâtiment concerné ayant une activité et une occupation bien déterminé, afin d'en rendre la commande possible par un dispositif de conduite et de gestion.

La structure du système d'éclairage artificiel et la commande des points d'éclairage de chaque local pouvant bénéficier de l'éclairage naturel doivent permettre de n'utiliser l'éclairage artificiel qu'en appoint, et ce soit par un dispositif de régulation, soit par un dispositif de modulation permettant plusieurs niveaux effectifs d'éclairage artificiel. Le nombre de niveaux est donné dans le tableau suivant, en fonction de l'indice de vitrage corrigé (IVC) et de l'indice de profondeur (IP) du local concerné :

L'indice de vitrage corrigé d'un local est donné par la formule :
IVC = IO * RCT * FT
dans laquelle :
- IO est l'indice d'ouverture en tableau (surface des percements divisée par la surface au sol du local),
- RCT est le rapport de la surface en clair des parois transparentes ou translucides à leur surface en tableau,
- FT est le facteur de transmission des produits transparents ou translucides en incidence diffuse.

L'indice de profondeur d'un local est le rapport de la profondeur du local par la hauteur sous linteau.

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