

**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:** August 2000

<b>Summary of UNDP Financing</b>	
UNDP/GEF	USD 4,360,000
<b>Parallel financing</b>	
Private sector	USD 2,664,000
French FFEM	USD 1,970,000 <sup>1</sup>
<b>Government inputs (parallel financing)</b>	
In kind (in DT)	412,000
In cash	USD 1,692,800

**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**

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Signature

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Date

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Name/Title (Please type)

**On behalf of  
UNDP**

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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**

<b>Numéro et Titre :</b>	<b>TUN/98/G32/A/1G/99</b> 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.
<b>Durée :</b>	5 ans
<b>Site du projet :</b>	Siège à Tunis : projets à être développés sur tout le territoire tunisien
<b>Secteur ACC/UNDP:</b>	035 Energie
<b>Secteur Gouvernemental :</b>	Energie
<b>Agent Gouvernemental (de mise en œuvre) :</b>	Ministère de l'Environnement et de l'Aménagement du Territoire.
<b>Agence d'Exécution :</b>	Agence Nationale des Énergies Renouvelables (ANER)
<b>Date approximative de démarrage :</b>	Août 2000
<b>Contribution du Gouvernement</b>	1.692.800 \$ sous forme de cofinancement parallèle 412.000 DT en nature (appui administratif, logistique, opération et maintenance).
<b>Contribution du Secteur privé :</b>	2.664.000 \$
<b>Contribution du FEM Français :</b>	1.970.000 \$
<b>Contribution du PNUD/FEM :</b>	4.360.000 \$

<b>Financement du PNUD</b> PNUD/FEM : 4.360.000 \$
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**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'Énergie)
ANER	National Renewable Energy Agency (L'Agence Nationale des Énergies R enouvelables)
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 Énergétique)
DT	Tunisian Dinar (Dinar Tunisien)
EVP	Experimental Validation and Demonstration Process
FA	Financial Accountant
FFEM	French Global Fund for the Environment (Fonds Français 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 (Ministère de l' Environnement et de l'Amenagement du Territoire)
MEH	Ministry of Housing and Public Buildings (Ministère de l'Équipement 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'Électricité 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 Députés). 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 biodiversity, 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**

Energy Source	Production	
	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
<b>Total</b>	<b>6,069</b>	<b>100.0</b>
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**

<b>Forecast of the Evolution of Energy Consumption by Sector 1985 –2020</b>					
	<b>1985</b>	<b>1990</b>	<b>1996</b>	<b>2010</b>	<b>2020</b>
<b>Total Energy Consumption</b>	<b>Mtoe</b>	<b>Mtoe</b>	<b>Mtoe</b>	<b>(*est.) Mtoe</b>	<b>(*est.) Mtoe</b>
	2.9	3.5	4.3	9.3	14.2
<b>Share by Sector</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>
Industry	40.6	40.9	35.1	29.5	28.1
Transport	32.3	30.2	31.8	29.5	28.1
<b>Residential/Tertiary</b>	<b>21.1</b>	<b>22.3</b>	<b>25.4</b>	<b>32.0</b>	<b>35.6</b>
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 – <i>Energie 21 : Analyse de la Demande et Maîtrise de l'Energie</i> , 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
<b>Total Specified</b>			<b>3,513.4</b>		

#### 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. Phase 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'Aménagement du Territoire or MEAT) where ANER is housed, the Ministry of Housing and Public Buildings (Le Ministère de l'Équipement 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 Property (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'Environnement 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'Énergie 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’énergie 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.

The funds committed by the GOT to the project will be provided under the Law on Energy Efficiency. This provides for a financial contribution through the Tunisian Energy Efficiency Fund (TEEF) to be made to Tunisian real estate project developers who agree to incorporate energy efficiency measures into their construction. The financial contribution associated with EVP (component 1) projects will be approved by the 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 programme contracts signed for each real estate operation (Law 90-62 of 24 July 1990).

## **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),<sup>2</sup> 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<sub>2</sub>. Over the period from 2004 to 2024, a total of 8.4 million tons of CO<sub>2</sub> 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

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<sup>2</sup> 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 Comfort 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**

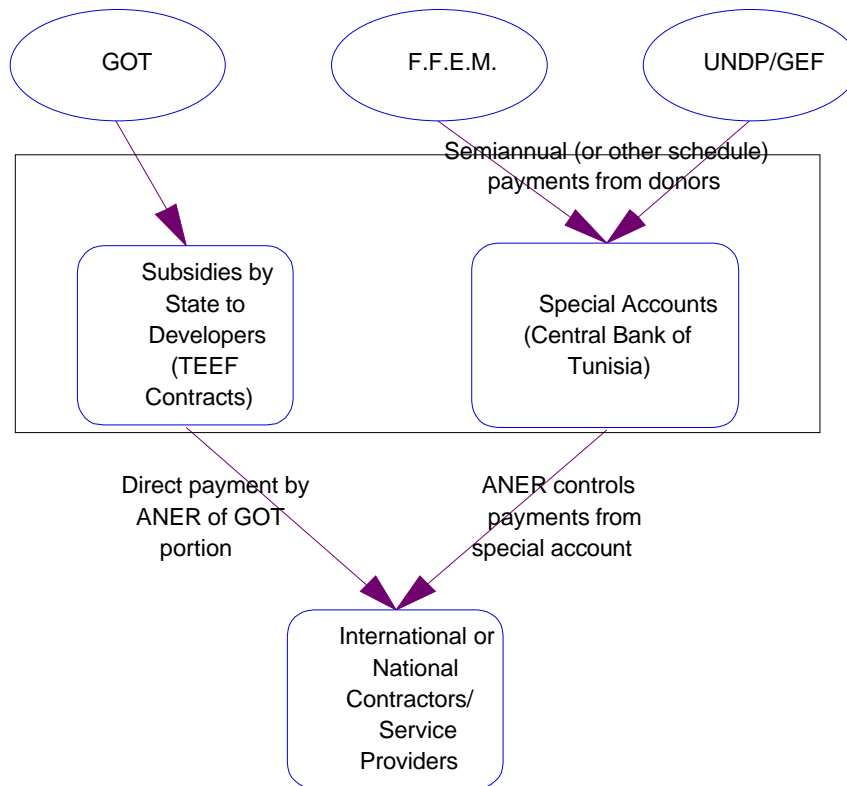
Separate disbursement procedures will be followed according to the source of the funds. The national executing agency will open a distinct account in the project's name which will be credited with advances

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 facilitate sound project management substantively and financially.

## METHOD OF FINANCIAL CONTROL



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<sub>2</sub>/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.<sup>3</sup> This assessment also included the expected energy savings resulting from compliance with the optimal energy efficient building standards

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<sup>3</sup> See “Reglementation pour l’amelioration du confort...” op. cit. and UNDP Project Brief for this project.

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<sub>2</sub> 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<sub>2</sub> 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.

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, *inter alia*, 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'Énergie – 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.

### **Component 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

### **Output 2.1 Preparation of the Tunisian CPE Label for Application in the EVP process**

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
<b>Total</b>	<b>243</b>	<b>412,000</b>

#### 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\$)
<i>International Consultants</i>		
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
<b>Subtotal International Experts</b>	<b>21.2</b>	<b>401,230</b>
<b>National Consultants</b>		
Buildings Energy and Comfort Engineers (21)	19.8	75,094
Measurement Engineers (20)	33	130,323
<b>Subtotal National Consultants</b>	<b>52.8</b>	<b>205,417</b>
<i>National Project Staff</i>		
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
<b>Subtotal National Project Staff</b>	<b>180</b>	<b>272,434</b>
<b>Total Personnel</b>	<b>254</b>	<b>882,079</b>

#### 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
<b>Total</b>	<b>391,712</b>

## Equipment and Supplies

See details in Annex 3.

Item	Cost \$
<i>National Procurement</i>	
Computers/Printers/Access to Internet and Minitel and Vehicles (2)	65,926
<i>International Procurement</i>	
Monitoring Equipment Purchase*	349,275
Technical Building Center Equipment*	497,717
<b>Total Equipment and Supplies</b>	<b>912,918</b>
* 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 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 \$)
<b><i>International Consultants</i></b>		
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
<b><i>Subtotal</i></b>	<b><i>44.6</i></b>	<b><i>833,881</i></b>
<b><i>National Consultants</i></b>		
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
<b><i>Subtotal</i></b>	<b><i>140.1</i></b>	<b><i>545,167</i></b>
<b>Total FFEM Personnel</b>	<b>184.6</b>	<b>1,379,048</b>

## 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 subordinate 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. Despite 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 International 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 25<sup>th</sup> 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.