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**LEBANON'S FIRST NATIONAL COMMUNICATION
REPORT TO UNFCCC**

by

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**Lebanon's First National
Communication Report to UNFCCC**

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1. INTRODUCTION

Lebanon ratified the United Nations Framework Convention on Climate Change (UNFCCC) on December 15, 1994 and thus became a party of it, a Non Annex I Party; i.e., a developing country as specified by the convention. The ultimate objective of the convention is to achieve "stabilization of green house gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic system", as described in article 2 of the convention. In accordance with decision 10 adopted during the second conference of the parties to the convention in 1996, Lebanon has prepared its First National Communication Report to the UNFCCC. It was developed by a national team of experts under the Climate Change Enabling Activity Project that was funded by UNDP/GEF "United Nations Development Program/ Global Environment Facility". This project was implemented at the Ministry of Environment aimed at building capacity in Lebanon to fulfill its communication obligations to the UNFCCC, and respond to the objectives of the convention on a continuing basis, also to train national experts in Climate Change matters, and enhance awareness and knowledge among policy makers and government planners. Lebanon's First National Communication Report contained a National Inventory of all GHG green house gases developed in accordance to the revised 1996 IPCC guidelines that covered the following sectors: Energy, Industrial Processes, Solvent and other product use, Agriculture, Land use change and Forestry, and Waste. Furthermore, it comprised a National GHG Mitigation Strategy and An Assessment of Lebanon's Vulnerability to Climate Change.

The National Mitigation Strategy assessed and evaluated, in details, the feasible options for GHG reduction in the following sectors: Electricity supply, Building sector, Industrial processes and Energy Use in Industry, Transportation, Forestry and Waste sector.

The Assessment of the Vulnerability of Lebanon's Ecosystems to Climate Change resulting from an increase in global temperature involved the following sectors: assessment of Bioclimatic Change, Water Resources, Agriculture, Terrestrial Ecosystems (Natural Habitats and Wild Life) Coastal System which included physical component and Marine Ecosystem and Socio-economic Impact.

2. NATIONAL MITIGATION STRATEGY:

2.1. Baseline Conditions -Energy Sector:

All energy in Lebanon is derived from imported petroleum products and some coal. Total consumption of petroleum products in Lebanon in 1994 was of 3,830,628 Tons, covering the following types of fuel: gasoline, gas oil, jet kerosine, LPG, fuel oil, bitumen, kerosine for domestic use and lubricants. The energy sector played an important role in the development of the country.

2.1.A. Electricity Supply Sector:

Electricity is supplied through the electric utility EDL (Electricite du Liban), an autonomous state owned-entity under the jurisdiction of Hydraulic and Water Resources (MHWR). The Lebanese power plants are grouped into two categories: Hydraulic plants and thermal plants. The electricity sector is approaching the end of a major rehabilitation program since 1993 which resulted in refurbishing all its physical components and upgrading its generating capacity. In 1994, electricity production was evaluated at 5184 GWh taking into account network losses. The share of electric generation in Lebanon in 1994 was : EDL : 66 %, Domestic and Commercial : 12 % and Industry: 22 %. It is estimated that the Electricity sector might be privatized.

2.1.B. Building Sector- Residential and Commercial :

The residential, commercial and institutional sectors consumed in 1994 (Base year) 30 % of the final energy consumption. The most consuming equipment representing 80 % of the total electricity consumption are :Electric Heaters(for space heating) 31 % , Electric domestic hot water systems 22 %, Air conditioning (A/C) 13 %, Lighting 8.5 %, and Refrigeration 6 %. For the residential sector, the consumption of gas/diesel oil is only spent on space heating. This is estimated at 8 % of gas/diesel oil import based on reference. The use of LPG is estimated at 75.59 % of the total LPG import to the country. The consumption of wood is based on the assumption that 5 % of the existing 800.000 Lebanese families use wood at a rate of 4 Tons per year. For the commercial sector the consumption of gas/diesel oil is only spent on space heating. This is estimated at 7.05 % of total gas/diesel oil import based on reference . The use of LPG is estimated at 9.986 % of the total LPG to the country. In the coastal climatic zone, where currently over half of the building stock is located, the dominant energy requirement is for cooling. Two baseline scenarios have been adopted: low baseline scenario: building growth rate of 2.5 % and energy growth rate of 3 %, high baseline scenario: building growth rate of 2.5 % and an energy growth rate of 4 %. Under both low and high baseline scenarios the greatest share of growth in energy demand for heating and cooling is from electricity.

2.1.C. Transport Sector :

Emissions of Green House Gas from Transport sector are in general related to the Fuel type and its emissions rate, technical status of the vehicle and its fuel consumption, the distance traveled and time needed for every trip. The transport sector of Lebanon constitutes a fleet of over one million registered vehicles that can be characterized as being relatively old and poorly maintained, it lacks a regular vehicle inspection program on a regular basis. In addition to GHG emissions the fleet is causing a serious local air pollution problems especially in major cities and regions of permanent traffic congestion. Only 5 % of the drivers in 1994 used unleaded fuel, 6 % in 1995, 12 % in 1997 and 14 % in 1998. Moreover, the car ownership rate in Lebanon is (3 persons for every car) is amongst the highest in the world.

2.1.D. Industrial Sector :

The inventory has focused on the following relevant industries to GHG emissions in Lebanon: Cement production, Lime Production, Road Paving and Roofing Asphalt, Glass Production, Steel Products, Aluminum Shaping and Extrusion Factories, Paper and Printing, Bakeries and Food Processing. GHG emissions in Lebanon come from energy activities which are responsible for 85 %

of all CO₂ emissions compared to 15 % coming from the industrial processes in Lebanon. The CO₂ emissions from energy use in manufacturing industries and construction represent 24 % of the energy sector's total emissions. The SO₂ emissions from energy use in industry and industrial processes accounted for 33.8 % of the total SO₂ emissions in the country in 1994, while the NO_x emissions from industry accounted for only 14 % of the total NO_x emissions. Lebanese manufacturers accounted for 39.15 million gigajoules of fuel consumption for heat and power generation in 1994, including both fuels used directly and fuel burned remotely to generate electricity used in the sector. In addition to being processed by combustion, CO₂ is generated in the calcinations of carbonates when manufacturing cement, iron and glass. About 42 % of the gas/diesel oil used by the industry goes for power generation. Fuel oil and LPG are mainly used for heating processes in boilers and furnaces. Coal is used mainly in cement industries.

2.2. Mitigation Options:

2.2. A. Electricity Supply Sector:

Two plans have been distinguished: a short term plan extending from 1994 till 2005, and a long term plan from 2005 till 2040. The supply system's projections are closely linked to already announced government policy and priorities. In particular, the announced policy of the government on the following matters: Commitment to fuel restoration of the generation, transmission and distribution networks, and commitment to continuously increase the capacity in the future to meet the expected increase in demand. The mitigation scenarios have been developed under two categories: improving mix of supply through renewable energy and fuel substitution through the use of natural gas. Under category 1, scenarios take into account the use of solar and wind energy in Lebanon. However, EDL have expressed their support to renewable energy in particular for solar energy. There were no real measurements for wind energy. Since renewable energy is unlikely to significantly penetrate the market in the near future, it was assumed that only 5 % of the generated capacity can be satisfied by renewable energy until the year 2010. As natural gas will be available around 2005, category 2 considered it from 2005 till 2040 as a substitution fuel to replace the fuel oil. It can be done for both existing and new power plants. Natural gas in combined-cycle power plants has the highest conversion efficiencies of all fossil fuels: 46 % in the short term and 55 % in the longer term, whereas the natural gas has the lowest CO₂ emissions compared to fuel oil. In conclusion, the best policy was to adopt natural gas with the corresponding combined cycle technology.

2.2. B. Residential and Commercial Sector:

The most important mitigation policies for Lebanon are: solar domestic hot water systems replacing electric boilers, and compact fluorescent lamps (low consumption) replacing incandescent lamps. The mitigation scenarios focus on the promotion and advancement of the adoption and application of the recently developed "Thermal Building guideline". Application of proposed efficiency measures can achieve an estimated 25 % energy reduction in heating and cooling energy demand per building unit. Two mitigation scenarios have been proposed, the first considers that the guideline will remain voluntary throughout the period study, while the second considers that the guideline will remain voluntary until 2015 only, but will become a mandatory building standard

from the date onward. Mitigation scenario 1 can lead to an average 10 % reduction in energy utilization between 2000 and 2040. Mitigation scenario 2 can lead to an average 15 % reduction in energy utilization between 2000 and 2040. The “guideline” is intended as a first step in order to initiate the Lebanese building sector to the possibilities of building envelope energy conservation measures. Three building envelope components have been considered: wall, roof and window. For wall construction: single layer of hollow concrete blocks finished with plaster and paint. Roof terrace consisting of a concrete slab topped by 8 cm of sand and 2 cm of roof fitting. Typical windows used in residential buildings are aluminum framed with single clear 6 mm glazing.

2.2. C. Transport Sector

The corresponding mitigation options are: switching to fuel with lower emission rates, improving the technical status of the fleet, and improving the system’s efficiency. A major breakthrough has been reported recently in the development of hybrid electric vehicles (HEV). Two mitigation scenarios have been developed based on the spread of HEV within the local fleet. The first scenario considered that by the year 2015, HEV would constitute 1 % of the local fleet and this number is expected to double by the year 2040. In the second scenario, a car registration fee waiver is considered leading to an HEV share increase between 5 % and 10 % in 2015 and double that value by 2040. The second scenario would lead to an emission reduction rate of around 10 % and would be profitable in the long run due to savings in fuel consumption. Rail freight systems have the greatest benefit to cost ratio and the greatest relative emissions reduction compared to the HEV options. Deployment of rail systems for freight is the most promising alternative in terms of consumption and emissions reduction.

2.2. D. Industrial Sector :

The mitigation option of replacing old boilers in industrial sector with cleaner and more efficient systems is divided into two main categories. The first category considers improvement in the boilers’ efficiency only where old boilers are replaced with new efficient ones, operating on the same type of fuel. The second category considers replacing inefficient industrial boilers with efficient ones that operate on a cleaner fuel such as LPG or natural gas. For cement Industries mitigation options examine opportunities for increased in the grinding processes and pyro processes in the kiln system, which can save 10 % in fuel energy. Another two mitigation options were considered for motor drive system improvement and replacement of old electric motors with new efficient ones and new efficient motors replace the new standard motors which are added to the industry each year.

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