

As for proposed policy instruments, the following needs to be initiated:

- Promotion of private-public partnerships at the international, regional and national levels.
- Provision of international negotiation framework for bilateral and/or multilateral cooperation.
- Disseminate information at user level for public awareness on new energy technologies.
- Establishment of a specialized research entity directed towards renewable energies and biotechnology.

B.3 Existing Institutional Arrangements



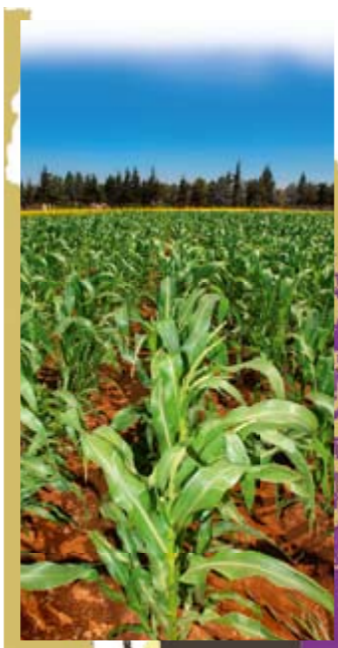
Law 690/2005 and its subsequent decree 2275/2009 have reorganised the Ministry of Environment into seven distinct services of which the Department of Air Quality at the Service of Environmental Technology has been tasked with the responsibility of following up on climate change issues. In a separate effort, also through GEF funding, the Directorate General of Urban Planning was able to develop thermal standards for buildings. Moreover, another GEF funded project was the initiation of the Lebanese Centre for Energy Conservation Project

(LCECP) at the Ministry of Energy and Water which aimed at the cross-sectoral energy efficiency and removal of barriers to Energy Service Companies (ESCO) operation that targets GHG emission reduction resulting from inefficient end-use energy consumption in all sectors of the Lebanese economy.

As for adaptation in the agriculture sector, it is important to note that the Lebanese Agricultural Research Institute (LARI) is currently the only public funded agency involved in agricultural research that focuses on climate change. Furthermore, most universities (public and private) with active agricultural research programs do have the institutional and geographic distribution to allow support of biotech start-ups.

In light of the above mentioned, further efforts with respect to institutional arrangements need to be carried out which include:

- Strengthening the Department of Air Quality at the Ministry of Environment through the provision of adequate technical, human and financial resources.
- Giving climate change the priority on the agenda of all intergovernmental cross-sectoral entities.
- Provision of capacity building to public and private sectors on climate change.



C. Lessons Learned

C.1 Challenges

There are numerous challenges in order to incorporate climate change initiatives into national development plans. These are:

- Investments in concrete mitigation and adaptation projects from government budgets are absent.
- Current laws such as those pertaining to the power generation lack any incentives to encourage people to shift towards renewable energy.
- Since climate change will challenge traditional farming communities' livelihoods, government needs to increase its tax base considerably to accommodate rising rural poverty.

C.2 Opportunities

If smart policies are adopted, opportunities for successfully facing up to climate change in Lebanon exist. These opportunities include:

- Expanding the supply of electricity from renewable energies has several more advantages than conventional power plants could provide. It will help reduce Lebanon's dependency on fuel imports, thus contributing to the diversification of Lebanon's energy mix as well as providing new job opportunities.
- Expanding renewable energy decentralizes production, which can enhance the energy security of supply in times of conflict and, more importantly, spur competition among producers.
- Introduction of the biotech industry into the agricultural sector will provide employment opportunities beyond the sector and will generate revenues that could more than meet those required for the establishment of a social safety net.

C.3 Possible Next Steps

- Mainstreaming climate change policies into national development plans.
- Strengthening the capacity in climate change issues of relevant ministries such as the Ministry of Environment, Ministry of Agriculture, Ministry of Energy and Water, Ministry of Foreign Affairs, Ministry of Public Health, the Council of Development and Reconstruction and other public administrations.
- Increasing the scientific awareness of the general public, decision makers, the media etc. towards climate change issues.

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National Economic, Environment and
Development Study (NEEDS) for Climate Change Project

Country Brief Lebanon

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A. Overview

A.1 National Circumstances

Lebanon is not a major greenhouse gases (GHG) emitter, but there is little doubt that Lebanon will be severely affected by climate change. Climate change has become an accepted reality with existing climate change models predicting an increase in the risk of climatologic disasters. Beirut's minimum temperature has increased by approximately 2.9°C over the last 125 years, with some regions expected to experience a further increase in minimum and maximum temperatures up to 1.5°C and 1.8°C respectively for the period 2036-2045, and a decrease in precipitation of 15-20% over the same time period. Lebanon emitted 18.5 million tonnes (Mt) of CO₂ equivalent in the year 2006 of which 15.1 million tons or nearly 82% were CO₂ emissions. More than 86% of the CO₂ emissions were produced by the energy sectors which include electric power generation, manufacturing and construction, transportation, and other minor sectors. Electric power generation industries accounted for about 42%; the transport sector for 25%; and manufacturing industries and construction for around 13% of the total CO₂ emissions. Agriculture accounted for 81% of the N₂O and solid waste for 93% of the CH₄.

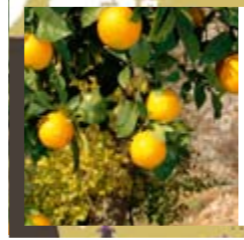
Lebanon has undertaken several steps in its efforts to combat climate change. It has ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and acceded to the Kyoto Protocol in 2006. Several efforts have been carried out by the government of Lebanon and non-governmental organizations to study climate change and help develop adaptation and mitigation efforts and programs, including but not limited to preservation of forests, reforestation, afforestation, and conservation and management of protected areas including key cedar forests.

A.2 Mitigation: Electric Power Sector

In 2006, Electricité du Liban (EDL) emissions amounted to 6.39 MtCO₂. Under the business-as-usual scenario (BS), it is assumed that the current fuel mix of fuel oil (40%), diesel oil (52%), and hydro (8%) remains the same up to the year 2050. Under this scenario CO₂ emissions from the electricity sector are expected to grow to 10.6 MtCO₂ by 2020 and 25.8 MtCO₂ by 2050.

Under the alternative mitigation scenario (MS), the fuel mix changes such that wind provides 35% of the electricity generated in 2050 and the remaining fuels' shares are 26%, 34%, and 5% for fuel oil, diesel oil, and hydro respectively. This mix would cause the CO₂ emissions from the electricity sector to grow from 7 MtCO₂ in 2006 to 9.4 MtCO₂ in 2020 and 16.7 MtCO₂ in 2050, and thus 9 MtCO₂ are avoided compared to the BS.

A cost-benefit analysis using a discount rate of 8% shows that the mitigation scenario has a negative net present value of 2,436 million USD compared to the baseline scenario. Hence, the analyzed mitigation policy can be considered to be a no regrets policy as long as the assumptions underlying the model hold. The mitigation benefit is thus computed to be \$270.6/tCO₂.



A.3 Adaptation: Agriculture Sector

Lebanon's agricultural sector contributes 5% to GDP and employs 20% of the labor force. Although Lebanon has an agricultural productivity deficit and climate change will lead to rising temperatures and declining precipitation, the technical neutralization of either event will not make an economically meaningful contribution to food security. Lebanon's major pressure on food security will come from population growth.

Currently, Lebanon's agricultural sector supports a farming workforce of about 300,000, which operates close to the upper poverty limit. It is estimated that by 2020, about 40,824 agricultural workers will fall below this poverty line. Seventy-seven percent of this increase is explained by population growth and 23% by climate change. By 2050, the number of farm workers living below the poverty line will increase to 182,666, of which climate change and population growth account for 20 and 80%, respectively. Today, Lebanon's food import bill is 5% of GDP. It will increase to 7.7% in 2020 and 10.5% in 2050. Climate change explains less than 0.2 percentage points of this increase. Similarly, the social safety net bill to compensate farming communities falling below the poverty line will be less than 1% of GDP in 2020 and 2050, with climate change being again a negligible factor.

Lebanon is in a paradoxical situation. It will be hit hard by climate change physically, but not food in economical terms, making climate change more of an opportunity than a challenge. Specifically, it can be argued that Lebanon has a tremendous potential to develop a climate change adaptation research industry. Lebanon has coastal, mountainous, and inland agriculture, thus providing a multitude of opportunities for climate change related research. It is estimated that Lebanon could easily create an according biotechnology industry with an employment of 1,832 and total annual sales worth 641 million dollars, exceeding the social cost from climate change by a considerable margin.

In order to promote the settling of a climate change adaptation research industry with the potential to develop new seeds, test new crops, explore new technologies and ultimately conquer new markets, the Lebanese government must play a proactive role. From a cultural perspective, Lebanon is advised to create awareness of the necessity of a transition from traditional to commercial farming, which may collide with traditional values or current inheritance law. From an institutional point of view, biotechnology industries are in need of a modern business climate that guarantees secure intellectual property rights, supports the demand for a highly qualified labor force, and promises access to large markets. Existing intellectual property rights laws and enforcement mechanisms need to be enhanced. Investments in quality public education on the primary and secondary level and in vocational schools will have to be considered. Trade agreements, particularly ones leading to greater intraregional trade, will have to come into force in order to facilitate market access. There are also opportunities for public private partnerships among government (for example, Lebanese Agricultural Research Institute), universities, and industries. The government may also cater to biotechnology industries with special tax incentives and public support services such as the development of venture capital markets to meet the substantial finance and business risk diversification needs.

B. Financial and Policy Instruments

B.1 Existing Financial and Policy Instruments



The mobilization of financial resources is critical to combating climate change; whether through mitigation or adaptation. Currently, the majority of financial resources available to Lebanon are from international organizations. On a multilateral level, the main funding source is the Global Environment Facility (GEF). The majority of resources were directed towards projects that highlight the importance of energy efficiency and enabling activities. Other international existing financial instruments that Lebanon has yet to benefit from are:

- The Climate Investment Funds from the World Bank
- The Adaptation Fund of the Kyoto Protocol
- The Special Climate Change Fund at the GEF
- The Clean Development Mechanism (CDM) under the Kyoto Protocol

B.2 Potential Financial and Policy Instruments

On a multilateral level, negotiations under the UNFCCC are under way and to be concluded at the end of the year 2009. The topic of finance will be one of the key issues for a successful conclusion in Copenhagen. Lebanon expects to play an active role in the formation of a potentially new fund that is being proposed to finance mitigation, adaptation, technology transfer and capacity building. Other instruments include the upcoming GEF-5 in July 2010.

On a regional level, in 2003, the Council of Arab Ministers Responsible for the Environment (CAMRE) at the League of Arab States has initiated the Arab Environment Facility (AEF). The objective of this pan-Arab facility will be to facilitate projects aimed at the promotion and strengthening of sustainable development in the Arab world. Currently, the Ministry of Environment in Lebanon is the founding secretariat of this facility, which once launched will also be located in Lebanon. The AEF could become a facility that attracts funds dedicated to combating climate change among other environmental priority issues.

On a national level, a myriad of financial instruments is needed to advance both mitigation and adaptation to climate change. These instruments include:

- Assess start up costs of renewable energy sources.
- Organize financial instruments at local, national and international levels.
- Provide widespread access to financing small-scale RE systems.
- Channel agricultural public expenditure into research.
- Provision of financial incentives for both mitigation and adaptation (e.g. tax breaks, low interest loans, reduction of import duties, etc.).