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Draft Regional Report on Efficient Lighting in the Middle East and North Africa

Draft

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Sept. 2011

UNEP

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Executive Summary

Energy-efficient lighting technologies are economical, commercially viable and technologically available, but due to several barriers, they have not reached their market penetration potential. Therefore, it is necessary to promote a certain degree of market intervention at both national and international levels. A growing number of countries in the region have already taken action by providing information and sharing experiences with other countries.

Replacing incandescent lamps in the residential sector is one of the most obvious and easiest methods to achieve energy-efficiency in the region. The transition to efficient lighting can occur at a very low cost with existing technology and provide immediate results. The UNEP/GEF en.lighten initiative, developed estimates for 100 countries with the objective of calculating the potential electricity savings, CO2 emission reductions and the economic benefits that could be realized from phasing out inefficient lighting and replacing them with compact fluorescent lamps (CFLs).[1] Out of the 100 countries analyzed, 19 were from the region. Eliminating inefficient lighting in the region would save nearly 31.8 Twh of electricity and slash 19.9 Mt of CO2. This is equivalent to removing about 5 million vehicles off the road. The cost for the region to transition to efficient lighting, is around 2,8 billion USD, with a simple payback of 1.7 years. Potential energy savings and CO_2 emission reduction varies between different countries based on their pattern of energy demand, fuel mix of electricity generation, and energy efficiency.

Some countries in the region have already begun initiatives to transition to efficient lighting.. These national programs are in various stages of development. To support the transition, countries have formulated different policies and measures and, in most cases the preferred approach has been the implementation of fiscal incentives to reduce the initial cost of the CFLs. Six countries (Egypt, Lebanon, Iran, Turkey, Morocco, and UAE) have already distributed around 99 million CFLs in total. Additionally, some countries like Egypt, Tunisia, Morocco, and Lebanon have announced that they will ban the sale of all incandescent bulbs by specific target years. Bulk distribution of CFLs is a positive first step forward in the market development of efficient lighting. It highlights of the benefits of CFLs such as economic viability, reliability, and efficiency. It also serves to; educate the public on the availability of this technology, overcome the barrier of initial high cost of CFLs, increase the demand for CFLs to encourage suppliers to enter the market, and, helps to achieve quick and impactful load reduction of the power systems. However, bulk distribution programs are not sufficient to secure sustainable transformation to efficient lighting. These programs should be implemented within a broader and integrated policy framework.

A group of international lighting experts from all sectors and geographical areas, in conjunction with the UNEP/GEF en.lighten initiative, recommends that countries implement an *Integrated Approach*, to ensure an effective transition to

[1] http://www.enlighten-initiative.org/CountryLightingAssessments/test/tabid/29417/Default.aspx

more efficient lighting. Key elements of this approach include: the development of Minimum Energy Performance Standards (MEPS), ' supporting policies to help restrict supply of inefficient lighting and promote demand of MEPS-compliant products; Monitoring Verification and Enforcement (MVE) mechanisms; and, environmentally sound waste management of CFLs at the end of their life.

While many countries in the region such as Turkey, Morocco, Jordan, Egypt, Iran, Tunisia and Syria have already established integrated energy-efficiency strategies, targets or legislation into their national energy policy frameworks, these steps are yet to be taken in other countries like the Gulf States. Here, heavy energy price subsidies and the abundance of fossil fuels have hindered investment in energy efficiency. In order to achieve success, the benefits of energy efficiency and efficient lighting need to be communicated to decision-makers and the public in those countries.

The report provides case studies of four major electricity-consuming countries (Egypt, Iran, Turkey and Saudi Arabia) as well as Lebanon, Morocco and Tunisia, who have a very aggressive current program to promote CFLs. The country case studies reveal significant similarities with regard to policies implemented for the switch to efficient lighting in the region. In almost all the countries examined, they have formulated a comprehensive policy package that; contains energy price reform, strengthens the legislative and institutional framework, provide fiscal incentives, develops standards and labeling schemes, and raises public awareness. Furthermore, almost all of countries in the region have been conducting public awareness campaigns to promote energy efficiency and efficient lighting, even if they don't currently have any programs in place for switching to CFLs. In these cases, the effectiveness of such campaigns in changing consumer opinion and buying habits needs to be measured.

The information used to develop this report originates from a wide range of official sources, articles, publications and contacts from Ministries and pertinent agencies in the region. Every effort has been made to include the latest information however, the report may include potential gaps concerning the status of activities in some countries. These potential variances shall be updated in the final version of the report, to be developed by the last quarter of 2011, based on the comments and contributions received from countries and organizations.

List of Abbreviations

A/C	air conditioning
ADEREE	National Agency for the Development of Renewable Energy and Energy Efficiency (Morocco)
CDM	Clean Development Mechanism
CFLs	compact fluorescent lamps
CLASP	Collaborative Labeling and Appliance Standards Program
CO2	carbon dioxide
EE	energy efficiency
EEHC	Egyptian Electricity Holding Company (formerly EEA, Egyptian Electricity Authority)
ESCO	Energy Service Company
ESCWA	Economic and Social Commission for Western Asia
EU	European Union
FDI	foreign direct investment
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	greenhouse gases
GoM	Government of Morocco
GWh	gigawatt-hour (= 109 watt-hour)
ILs	Incandescent Lamps
kWh	kilowatt-hour
LEED	Leadership in Energy and Environmental Design
MDG	Millennium Development Goals
MEPS	Minimum Energy Performance Standards
MOEE	Ministry of Electricity and Energy
Mtoe	million tons of oil-equivalent
MWh	megawatt-hour (= 106 watt-hour)
NABs	national accreditation bodies
NGO	non-governmental organization
NPPA	National Plan of Priority Actions (Morocco).
NSBs	national standardization bodies
ONE	National Electricity Utility
RCREEE	Regional center for renewable energy and energy efficiency
RE	Renewable Energy
S&L	Standards and Labels
SME	small and medium-sized enterprises
t	ton
toe	Ton Oil Equivalent
TPF	third party financing
TWh	terawatt-hour (= 1012 watt-hour)
UNDP	United Nations Development Programme
UNDESA	United Nations Department of Economic and Social Affairs
USAID	United States Agency for International development
USD	US dollar
WWF	Worldwide Fund for Nature

1 Introduction

Electricity for lighting is responsible for 19% of total end-use electrical consumption and for 6% of global greenhouse gas (GHG) emissions. This equals the total emissions from Germany and Japan combined. Over the next 20 years, global electricity consumption for lighting is expected to increase by 60%.[2]

Shifting to efficient lighting technologies around the world would cut the amount of electricity used for lighting from 19% to 7%. This would save enough electricity to eliminate 705 of the world's 2,670 coal-fired plants.[3] In addition, it could save countries and end-users a considerable amount of money in reduced electricity bills, making these resources available for other human needs. Few actions can cut carbon emissions more effortlessly than the phase-out of inefficient lighting, making it one of the most effective and economically advantageous means to combat climate change.

Activities aimed at phasing out inefficient technologies have been increasingly introduced in recent years, yet market forces on their own have proven insufficient to achieve rapid lighting market transformation, especially in light of the urgent need to reduce emissions posed by climate change. Experiences throughout the world point to the need to coordinate global efforts and provide technical support to assist countries in introducing efficient lighting transformation programs.

UNEP and the GEF, in collaboration with the private sector launched the en.lighten initiative to accelerate the transition to efficient lighting worldwide in 2009. The main goal of the initiative is to transform the global market to efficient lighting through promoting high performance, energy efficient lighting technologies and phasing out inefficient, incandescent light sources.

In this context, en.lighten, in conjunction with the UNEP Regional Office for West Asia and the Islamic Educational, Scientific and Cultural Organization (ISESCO), are organizing a regional workshop on Technology Transfer in Energy and Efficient Lighting to Combat Climate Change that will occur from September 28-30, 2011 in Beirut, Lebanon during the Beirut Energy Forum. The main objective of this meeting is to share with government officials and stakeholders the potential for efficient lighting in terms of energy, financial and CO2 savings, and to engage in discussions on how to best promote the phase-out of inefficient lighting in the Middle East and North Africa.

The Regional Report on Efficient Lighting in the Middle East and North Africa was created in anticipation of this event in order to present up-to-date information concerning the current status of efficient lighting in the region, to demonstrate the possible outcome of a transition, and to deliver

[2] "Light's Labour's Lost: Policies for Energy-efficient Lighting, in Support of the G8 Plan of Action". International Energy Agency, OECD, 2006.
[3] "Plan B 4.0: Mobilizing to Save Civilization," Lester R. Brown, Earth Policy Institute, 2009.

recommendations to facilitate such a conversion. There is a specific focus in the domestic sector for the replacement incandescent lamps). It draws heavily on data and information published by governments, the private sector, international organizations, and researchers. A short questionnaire was initially distributed to appropriate experts/institutions in different countries (Appendix 1). The country response rate was relatively limited however, it is envisioned that the current gap in data would be remedied during the upcoming meeting in Beirut. Based on available information, this report concludes with recommended policies to remove a number of barriers and encourage market transformation.

2 Obstacles impeding the promotion of efficient lighting

Energy saving compact fluorescent lamps (CFLs) are highly efficient and financially attractive based on the savings they produce. World estimates calculate that the average payback on investment for a CFL is of about one year.[4] However, there are several obstacles hindering the wide adoption of this technology. Some of these impediments are referred to in this section.

3.1.1. Need to implement product quality systems

Many countries have experienced negative experiences with low quality CFL bulbs which, in many cases, have flooded their markets and created disappoint with the technology among customers. A study developed by USAID and ECO-Asia in 2007 reported that approximately half of the CFLs produced in Asia could be considered of questionable quality (for 2006 and 2007)[5]. In 2010, this amount decreased to one third (USAID, ECO-Asia, April 2010)[6]. Low quality CFLs can create negative experiences for consumers and thus, affect the success of governmental efforts to implement efficient lighting policies and projects. Developing or harmonizing minimum efficiency and quality standards, and ensuring the quality of CFLs through appropriate testing and certification mechanisms can greatly assist in building trust among consumers to overcome this obstacle.

3.1.2. Misinformation concerning the real price of CFLs

The lack of awareness about energy and financial savings of efficient lamps is a key deterrent to the penetration of these products in many developing countries. Most customers are unaware of the high operating costs of incandescent bulbs which are not shown on their electricity bills, and they are therefore, unlikely to invest in more efficient alternatives. . This, compounded with their high initial

[4] Country Lighting Assessments, UNEP/GEF en.lighten initiative (2010) Consulted in: http://www.enlighteninitiative.org/CountryLightingAssessments/tabid/29601/Default.aspx
[5] Confidence in Quality: Harmonization of CFLs to Help Asia Address Climate Change. USAID Asia. October 2007.
[6] Quality Control and Market Supervision of Compact Fluorescent Lamps in China. USAID Asia. April 2010

cost when compared with inefficient technologies (ILs), creates a barrier hampering the market penetration of CFLs in many developing countries. Public campaigns, information and awareness raising activities, fiscal policies, subsidies and promotional mechanisms can act as effective tools to address this hurdle.

3.1.3. Split incentives

Those who make purchase decisions about lighting equipment may not necessarily be the ones who pay directly for the system's energy use. Owners will attempt to minimize the purchase costs for a lighting system while residents seek to reduce the cost of their electricity bills. Thus, there is a general lack of incentive to invest in energy efficiency equipment which would benefit the resident or renter. In addition, purchasers responsible for choosing and maintaining public lighting are not always responsible for making purchase decisions. The high initial construction or renovation costs needed to install efficient lighting solutions can be a deterrent to public authorities with limited budgets, even if the environmental and economic benefits have been understood.[7]

3.1.4. Risk perception over CFLs

Concerns about the risk caused by the mercury content of CFLs with regard to health and the environment, are widespread. However, a CFL has an average mercury content of 4 - 5 milligrams, much less than the content produced by the carbon combustion needed to light a single incandescent lamp. It is important to limit the content of mercury in lamps to the very minimum allowable dose. The European RoHS Directive[8] provides a best practice example, setting limits for the amount of mercury in CFLs to 2.5mg. There is no reason not to reduce the mercury amount in CFLs to this minimum standard. Some manufacturers are even able to produce CFLs with less.

In addition, it is important to share information and guidance on what steps to take in case of breakage of a CFL. The US EPA[9] and many manufacturers, as well as regional and national authorities, have developed helpful materials to inform consumers about how to react.

A growing number of countries have already, or are planning to implement collection and recycling programs for the recovery and sound end-of-life treatment of these lamps, to ensure that the mercury is not released into the environment (European Union, South Africa, Philippines, Colombia, India, etc). A number of concerns have been raised regarding the effectiveness of these

7 European Lam Companies Federation, 2007. Make the Switch. The ELC Road Map for Deploying Energy Efficient Lighting Technology Across Europe

8 Directive 2002/95/EC: Restriction of the use of Hazardous Substances. Consulted in http://www.rohs.eu/english/legislation/docs/launchers/launch-2002-95-EC.html

9 United States Environmental Protection Agency, 2011. Consulted on http://www.epa.gov/cfl/cflcleanup.pdf.

approaches for example, in the European Union, where the collection rates vary significantly between Scandinavian and Mediterranean countries. This also applies to other hazardous waste and should not necessarily be a deterrent to the introduction of these systems. In light of the global efforts to develop a legally binding treaty to limit mercury[10], countries should explore the implementation of appropriate systems which meet their national contexts and respond to their needs. The presence of highly expensive rare earths in bulbs turns recycling into a financially viable activity for the recovery sector, offering the possibility to generate new economic activity and employment opportunities.

In conclusion, energy-efficient lamps are economical, commercially viable and technologically available, but due to several barriers, they have not reached their market penetration potential. It is therefore, necessary to promote a certain degree of market intervention at both national and international levels. An increasing number of countries have already taken action which can deliver a wealth of information for other countries interested in promoting efficient lighting. There is no reason to repeat the mistakes made by pioneering countries, as information is readily available and is thorough enough for countries interested in phasing-out inefficient lighting to understand how to act effectively and successfully.

3 Global initiatives for the promotion of efficient lighting

Several international and regional initiatives are being designed or have already been implemented in order to promote efficient lighting and related transition schemes. The European Union and most OECD countries – including the United States, Canada, Australia or Korea, have already established a gradual approach to ban inefficient lighting through mandatory frameworks. In some instances, additional voluntary measures have been adopted to support the transition. Many developing and emerging economies have also applied regulatory measures to phase-out incandescent lamps, such as Cuba(2005), Argentina(2010), Ecuador (2010), Russia (2010), Senegal (2011), Brazil, Mexico and Colombia (2012). Additional countries are in the midst of preparing phase-out strategies (China).

In the majority of these countries, the preferred approach to a phase-out has been to restrict the supply of inefficient lamps through the implementation of minimum energy performance standards. Through these standards, lamps which do not comply with established criteria are not allowed into the market. Cuba followed a different path and issued an absolute ban on incandescent technologies.

A large number of emerging and developing countries including; China, Indonesia, Vietnam, India, South Africa, Thailand and the Philippines, have

[10]http://www.unep.org/hazardoussubstances/MercuryNot/MercuryNegotiations/tabid/3320/language/en-US/Default.aspx10

implemented promotional programs that have included free or extremely lost-cost CFL distribution programs (i.e. India). Many of these countries are currently in the process of legislating the phase-out of incandescent lamps through the establishment of minimum requirements in order to guarantee the effectiveness of previously implemented promotional programs (i.e.: China, South Africa, the Philippines, Vietnam). Sri Lanka, Taiwan and Malaysia have banned the sale of incandescent lamps through legislation.

4 The en.lighten initiative: objectives and scope

In 2009, the GEF launched the UNEP en.lighten initiative, in collaboration with private sector partners to provide industrial knowledge (Philips and Osram), as well as the participation of UNDP, UNIDO, the World Bank and the Chinese National Lighting Test Center (NLTC). The main objective of the initiative is to hasten the global transition towards more efficient lighting, on the basis of its benefits for climate change mitigation, energy savings and financial savings.

The en.lighten initiative gathered best international practices of countries which have undertaken initiatives towards efficient lighting. On the basis of these lessons learned, a global roadmap will be presented to the international community in order to achieve this transition in the shortest time possible. This roadmap shall be based on the key experiences of transition programs developed successfully in different parts of the world. It will include the knowledge and experience of renowned professionals from public and private institutions, as well as international organizations specialized in the key aspects of the topic in the form of four international expert Taskforces.

Due to the broad reach that efficient lighting has, encompassing residential, commercial and public lighting, the first generation of the roadmap will be focused on the replacement of incandescent lamps. This is due to the high savings and emission reduction potential that can be achieved by the elimination of this inefficient technology.

In September 2010, the en.lighten initiative established four international expert Taskforces. Based on their input, en.lighten is now including their recommendations in important areas such as policy development and regulations and standards improvements, to encourage countries to transition to efficient lighting. An *Efficient Lighting Toolkit* will be available in the last quarter of 2011 and will act as a practical reference manual for policy makers and other interested stakeholders by outlining many of the essential elements that need to be considered before and after inefficient lighting phase-out schemes have been initiated. The content of the toolkit will be presented in practical, action-oriented, web-based format and will be utilized primarily by those responsible for drafting policies – environment, energy or health departments or agencies – but also by public utilities, private sector and civil society organizations.

In addition to the *Efficient Lighting Toolkit*, en.lighten will also release *the en.lighten Roadmap to Efficient Lighting* which aims to provide the impetus for

action for the global deployment of efficient lighting technologies. It includes a global agenda, work plan and a set of recommendations for governments of developing countries and other stakeholders to initiate policies to phase out inefficient lighting and to provide the experience and additional insight from those who already have made the transition.

The en.lighten Global Efficient Lighting Partnership Program

A key objective of the en.lighten initiative is to assist interested developing and emerging countries to initiate and effectively implement their own market transformation programs towards efficient lighting. In this context, en.lighten has established the the Global Efficient Lighting Partnership Program as an opportunity to work with en.lighten and other countries within a specific region to achieve a coordinated transition to efficient lighting. UNEP and its partners will support interested countries to design and implement National Efficient Lighting Strategies, including relevant policies that will enable their country to make the transition to energy-efficient lighting quickly and cost-effectively.

Emphasis is placed on an *integrated approach* for designing policy measures so that the transition can be effectively sustained by the domestic market without continued external support. In addition, the approach ensures that all relevant policy areas concerning efficient lighting are effectively addressed.

The integrated approach to efficient lighting

To ensure that the transition to efficient lighting is effective and self-sustaining, countries should implement a cohesive set of actions, including:

***Minimum Energy Performance Standards (MEPs)* -** establishing basic parameters to ensure the efficiency and quality of products. MEPs constitute the cornerstone of a successful and effective transition.

***Supporting Policies and Mechanisms* -** helping restrict the supply of inefficient lighting and promote the demand for MEPS- compliant products. These mechanisms, developed in accordance with a country's existing situation and requirements, include:

- Regulations
- Economic and market-based mechanisms
- Fiscal mechanisms and incentives
- Information, communication and voluntary actions

***Monitoring, Verification and Enforcement (MVE)* -** discouraging the distribution of non-compliant products through: inspections, product testing, accreditation, fines and/or other relevant means.

***Environmental Sustainability* -** including: setting maximum hazardous content limits to safeguard health and the environment; guidelines on the use of lighting products; as well as, plans for the collection

5 Estimated benefits of the phase-out of incandescent lamps

In 2010, the en.lighten initiative calculated the potential electricity savings, CO2 emission reductions and the resulting economic benefits accrued from phasing out inefficient lighting (ILs) and replacing them with compact fluorescent lamps (CFLs) for 100 countries. Out of the countries analyzed, 19 were from the Middle East and North Africa. The results obtained from these calculations in 2009 are provided in Table (1).

The 19 countries analyzed have annual electricity consumption of 925.6 Twh producing about 1,994.4 million tons of CO2 per year. Phasing out inefficient lighting in the region would save nearly 31.8 Twh of electricity and slash 19.9 Mt of CO2. This is equivalent to removing about 5 million vehicles off the road. The cost for the region to transition to efficient lighting would be 2,8 billion USD, with a simple payback of 1.7 years.

Potential energy saving and CO2 emission reduction varies between different countries based on their pattern of energy demand, fuel mix of electricity generation, and energy efficiency. Egypt, Iran, Saudi Arabia, and Turkey are the largest consumers of electricity with Saudi Arabia ranked first. These four countries consume about 88% of the region's total electricity consumption. Phasing out inefficient lighting in these countries would reduce electricity consumption by 15.1 Twh per year, representing almost 48% of the region's total electricity consumption. The corresponding reductions of CO2 emissions would be equal to 8.7 Mt. Percentage-wise, Algeria would have the largest potential for annual energy saving if there was a switch to efficient lighting. The country would save nearly 14 % of its total electricity consumption, worth 335 million USD per annum.

There is still a great deal of potential if inefficient lighting is phased out from other sectors, such as public lighting and the commercial or industrial sectors, or through the use of light sensors controls, and other efficient lighting components.

Table 1: Estimated benefits of transition in the region (IL phase-out and substitution with CFLs)

Country	Energy Savings (TWh/year)	Total electricity consumption (TWh)	% energy Savings	CO2 emissions savings (Mt/year)	Total CO2 emissions (Mt/year)	% Reduction CO2 emissions	annual Financial savings (million USD/year)	Cost of transition (million USD)	Medium-sized cars off the road (1000)	Payback (years)
Algeria	4.2	30	14	2.5	86	2.9	335	334.24	625	1
Bahrain	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comoros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Djibouti	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Egypt	4.7	111	4.2	2.6	169	1.5	331	379.92	650	1.1
Iran	4.6	164	2.8	2.5	466	0.5	184	369	625	2
Iraq	2.4	36	6.7	1.9	91.5	2.1	120	194.28	475	1.6
Jordan	0.9	11.6	7.8	0.5	19.2	2.6	104	70.16	125	0.7
Kuwait	0.3	45.7	0.6	0.2	82	0.2	18	20.4	39	1.1
Lebanon	0.7	9.5	7.4	0.5	11.4	4.4	65	55.6	125	0.9
Libya	1.2	18.3	6.6	1	43.2	2.3	36	95.64	250	2.7
Mauritania	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Morocco	1.8	21.7	8.3	1.3	40.8	3.2	263	191	325	0.7
Oman	0.3	13.3	2.3	0.2	35.8	0.6	36	22.84	50	0.6
Palestine	0.2	4.4	4.5	0.1	2.3	4.3	17	13.9	29	0.8
Qatar	0.2	18.2	1.1	0.1	78.5	0.1	6	19.2	25	3.3
Saudi Arabia	3.2	170	1.9	2.4	358	0.7	127	253.16	600	2
Somalia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sudan	0.3	3.9	7.7	0.1	10.9	0.9	28	59.24	25	2.1
Syria	2.2	26.6	8.3	1.3	53.8	2.4	44	176.72	325	4
Tunisia	0.9	13	6.9	0.5	22.4	2.2	45	121.12	125	2.7
Turkey	2.6	154	1.7	1.2	265	0.5	425	344.08	300	0.8
UAE	0.6	70	0.9	0.7	131	0.5	13	51.96	175	4
Yemen	0.5	4.4	11.4	0.4	20.6	1.9	55	38.4	100	0.7
Total	31.8	925.6	5.5	20	1,994.4	1.8	2,252	2,810.86	4,993	1.7

Source: *Country Lighting Assessment*, UNEP/GEF en.lighten initiative (2010)

6 National initiatives to achieve the transition to efficient lighting

A number of countries in the region have already started initiatives to transition to efficient lighting. These national programs are in different stages of development. To support the transition, countries have formulated different policies and activities that are currently being implemented or planned for the near future. These include both mandatory and voluntary components.

In most cases, the preferred approach to the phase-out of inefficient lighting systems in the region has been the provision of fiscal incentives to reduce the cost of CFLs. This is to address the barrier of heavy subsidies for electricity prices prevalent in most countries in the region, as well as the high initial cost of CFLs. To date, none of these countries have banned incandescent lamps, though three countries have announced target dates to do so (Table 4). A number of countries, specifically Egypt, Lebanon, Iran, Morocco, UAE, and Turkey have implemented promotional programs and in some cases, have distributed CFLs at a considerably lower price. Countries have developed varying policies to promote energy efficient lighting. In this report, the discussions will be limited to policies and measures aimed at promoting efficient lighting systems (Table 2).

Table 2: Policies and measures to promote efficient lighting in the region

M: Mandatory, V: Voluntary, P: Planned, SL: Soft Loans, S: Subsidies, FL: Fluorescent Lamp, EB: Electronic Ballasts, MB: Magnetic Ballasts, L: Lamps, B: Buildings

Country	MEPS (M)	MEPS (V)	Labels (M)	Energy Performance Testing Standards	Supporting Policies						Recycling Facility	National Lighting Testing Laboratory
					Energy Efficiency Building Code	Subsidies / Soft Loans	Tax Credits/Tax Reduction	Voluntary Agreements	Bulk Distribution	Awareness Campaigns		
Algeria	**FL/B**		**P**		**M**	**SL**				**X**		
Bahrain					**M**					**X**		
Comoros												
Djibouti												
Egypt	**HID sodium L with EB/ CFLs (50-125 watt)**		**CFLs**	**CFLs**	**V**	**S**			**X**	**X**	**P**	**X**
Iran			**FL**		**M**	**S**			**X**	**X**		**X**
Iraq												
Jordan			**P**		**M**	**SL**	**X**			**X**		
Kuwait					**M**					**X**		
Lebanon		**CFLs/B**			**P**	**S**			**X**	**X**		

Libya												
Mauritania												
Morocco	**P**		**P**	**P**	**P**	**S**			**X**	**X**	**P**	**P**
Oman												
Palestine					**M**					**X**		
Qatar												
Saudi Arabia	**L (Mercury-vapor)**		**P**							**X**		
Somalia												
Sudan												
Syria	**B**				**M**	**SL**	**X**			**X**		
Tunisia	**B**		**P**		**M**	**SL**	**X**			**X**		
Turkey	**L/B**		**FL**	**FL (Double-capped)/MB**	**M**	**S**			**X**			**X**
UAE					**M**				**X**			**X**
Yemen		**L**	**P**				**X**			**X**		

M: Mandatory, V: Voluntary, P: Planned, SL: Soft Loans, S: Subsidies, FL: Fluorescent Lamp, EB: Electronic Ballasts, MB: Magnetic Ballasts, L: Lamps, B: Buildings

6.1 Regulatory Mechanisms

Regulatory methods are widely used to reduce the energy consumption of electric appliances and equipment including lighting systems. Regulations are primarily used in the residential and commercial sectors. They are more effective than market-based incentives especially when those markets may be distorted from things like subsidized energy prices. Using the regulatory approach, some countries in the region, like Egypt, Tunisia, and Lebanon, have announced that they would ban the sale of all incandescent bulbs by specific target years (Table 3).

Table 3: Target dates of phasing out ILs in the region

Country	Target date for phasing out ILs
Egypt	2020
Lebanon	2012
Tunisia	2013

In general, regulations can be classified into two main categories:

- Minimum energy efficiency standards (MEPS) for new appliances and new buildings.
- Mandatory labeling for new appliances and buildings

6.1.1. Minimum energy performance standards (MEPS)

The aim of performance standards is to improve the energy efficiency of appliances by imposing a minimum energy efficiency level in order to remove the least efficient products from the market and encourage producers to develop more efficient appliances. Performance standards are the most effective instruments, and enable authorities to obtain energy savings at a low-cost for the public budget, allow consumers to spend less on electricity and encourage manufacturers to improve their products and become more competitive.

Though MEPS are one of the basic components of the comprehensive policy package promoted by en.lighten initiative,(table 2), the use of this policy tool for efficient lighting technologies is absent in the region except for high voltage CFLs (50-125 W) for commercial applications in Egypt.[11]

6.1.2. Mandatory labeling and certification

Appropriate labeling encourages consumers to purchase more efficient appliances and manufacturers to remove inefficient products from the market.

[11] Mandatory minimum energy performance standards exist in Turkey for magnetic ballasts, in Saudi Arabia for Mercury vapor lamps, and in Algeria for fluorescent lamps. Voluntary efficiency standards exist in Lebanon and Yemen. Few countries (Tunisia, Syria, Egypt and Algeria) are enforcing minimum energy performance standards for buildings. The same is planned for Lebanon.

Labeling programs are designed to provide consumers with information, which enables them to compare the energy efficiency of the different appliances at the point of sale. Labels can affect the buying behavior of consumers by drawing their attention to the energy consumption of household appliances. Labeling also acts as an incentive for manufacturers to differentiate themselves from their competitors and stimulates the introduction of new, more efficient models. Thus, labeling can drive technological innovation. Labels in some countries, address the energy efficiency performance (or CO2 emissions)of products ranging from new electrical appliances to cars and buildings however, they are limited in this region to electrical appliances

To curb the trend towards electricity consumption of households, many Middle Eastern and North African countries have introduced labeling programs and minimum energy performance standards for a selection of electrical appliances. Table (2) indicates that mandatory labels for fluorescent lamps exist in two countries, namely Iran and Turkey. Potential labeling programs were reported in Jordan, Yemen, Algeria, Morocco, and Tunisia. Mandatory labels for CFLs exist only in Egypt.

6.1.3. Energy codes for buildings

Building standards can be classified into four basic categories:1) maximum heat transfer through individual building components (e.g. walls, roof, windows) (k or U values in terms of W/m2);2) control of the overall heat transfer through the building envelope;3) limitation of heating/cooling demand (taking into account the contribution from ventilation losses, passive solar gains and internal heat sources) (maximum demand per m3 or m2);4) energy performance standards.

Some countries have recently established mandatory or voluntary standards for commercial and residential buildings (Table 2). Similar standards are planned in Lebanon and Morocco. A thermal energy standard for buildings in Morocco is currently under development with the support of the ADEME of France. The Lebanese construction law is also providing economic incentives for voluntary thermal insulation of buildings. The Egyptian Green Building Council, established in 2009, is currently in the process of developing its Green Pyramids Rating System. As part of the Jordanian national energy efficiency strategy, an Energy Efficiency Code is currently being prepared and released in 2011. .. The Jordan Green Building Council to promote appropriate green building concepts and practices in the Jordanian building and construction sector was established in 2009. Based on the Jordanian Energy Code, the Buildings Energy Code for Palestine was developed and adapted to reflect Palestinian climatic conditions. In Kuwait, where air-conditioning accounts for approximately 50% of buildings energy demand, a code of practice for energy conservation was developed to set limits for the electrical consumption of air-conditioning systems for buildings. Bahrain as well, has issued and enforced building insulation code since 1999. Additionally, a code of practice of thermal insulation for buildings is being developed in Syria.

The Government of Abu Dhabi has launched the ESTIDAMA Program and the Pearls green building rating system, which would become integrated into the

building, as well as the Emirates Green Buildings Council. In Dubai, the Dubai Electricity and Water Authority issued the second phase of its Green Building Regulations in April 2010 aimed at reducing energy demands of new buildings by up to 40%. It is clear that building codes are evolving in the region, and although efficient lighting is the easiest and most cost effective measure to improve building energy efficiency, it has not been given the attention it deserves in such codes. Countries in the region should revise building codes to include efficient lighting measures.

6.2 Economic/ market-based instruments

The basic rationale for economic instruments is that environmental aspects like clean air and a stable climate were traditionally unaccounted for in the marketplace. These market failures lead to incorrect pricing of scarce natural resources, essentially distorting the real cost of consumption and production. Economic instruments aim to correct this by requiring the polluter to carry the burden of pollution costs.

6.2.1. Energy service performance contracting

Energy service performance contracting is usually offered through third party financing (TPF). Energy Service Companies (ESCOs) can be defined as companies that offer integrated services (technical and financial) for the implementation of energy efficiency projects. They provide a guarantee that the energy savings generated by the project will be sufficient to reimburse all the implementation cost over a certain period of time.

The concept of the ESCO has been implemented in some countries within the region such as in Egypt, UAE, Jordan and Tunisia. Through support from USAID and UNDP, at least thirteen Egyptian ESCOs have been established with the objective of investing in energy efficient (EE) technologies including efficient lighting in the commercial sector, such as in hotels, resorts, and hospitals. A national association for ESCOs has also been established, though it is not that active. However, most of these companies have been facing many difficulties in the marketplace. Currently, Tunisia has at least 10 operating ESCOs. In Lebanon, the Ministry of Energy and Water (MEW) has planned to set-up the National Energy efficiency and Renewable Energy Action (NEEREA) as a financial mechanism to develop the ESCO business. The Central Bank of Lebanon, in cooperation with the EU and the UNDP, are developing the NEEREA with a fund of 15 million EURO from the EU. The ESCO concept can be an effective mechanism to promote efficient lighting technologies in the industrial and commercial sectors. The residential sector is the least important for ESCOs in most countries due to low profits, possible legal complications, as well as the existence of a large number of stakeholders which affects the decision-making process

6.3 Fiscal Instruments and Incentives

Fiscal incentives are those actions that reduce the cost of energy efficiency investment indirectly through the taxation system. Generally, they are available to all who qualify according to the terms of the exemption - there is no application and award process. They can be managed through the normal tax compliance regime.

6.3.1. Tax incentives

State tax incentives encourage private investments in energy efficiency by reducing the amount of taxes to be paid by consumers and businesses. The term tax incentives refers to either:

1 A tax deduction which allows a portion of the expense to be subtracted from a taxpayer's adjusted gross income; or
2 A tax credit, which allows a taxpayer to subtract a certain portion of the cost, dollar-for-dollar, from the amount of taxes owed.

The main benefit of successful tax incentive policies is the reduction of total energy efficiency investments costs to make them viable. Taxes incentives help introduce new technologies into the marketplace by lowering the cost for consumers and promoting new technology. As shown in Table 2, tax incentives are offered in Jordan, Tunisia, Yemen, and Syria for energy efficiency and renewable energy projects. They could also be extended to efficient lighting projects in the residential, commercial and industrial sectors. For example, the Government of Jordan has exempted CFLs from all custom duties and sales taxes.

6.3.2. Subsidies

Direct subsidies may be provided to lower the cost of energy efficiency equipment. This is taking place in several countries throughout the region. To promote energy savings, Tunisia has implemented a financing mechanism through the Fonds National de Maîtrise de l'Energie (National Energy Savings Fund) to subsidize up to 20 % of the cost of energy efficiency projects. This fund is replenished by a duty levied on the first registration of private cars and an import duty or local production duty.

The General Directorate of Electric Power Resources, Survey and Development Administration (EIE) of Turkey provide investment support for energy efficiency projects with a maximum payback period of five years. The investment support covers 20 percent of project costs up to a maximum of 500,000 Turkish lira (approximately US$325 000). Similarly, the Turkish energy efficiency agency EIE can subsidize up to 20 percent of the project costs of industrial establishments investing in energy efficiency. It is interesting to note that most countries that have implemented bulk distribution programs of CFLs have used direct subsidies to encourage wide dissemination.

6.3.3. Grants and rebates

Rebates, another form of subsidy, provide an up-front payment to purchasers of energy efficiency equipment or systems, often covering between 20% and 50% of project costs. Rebate programs can establish specific criteria for eligibility, such as system size, performance standards and approved installers. . Levels are based ideally on the market cost of a technology and the desired support of that

technology, and can be adjusted downward as the cost of the technology declines. Subsidies, such as rebates, require explicit funding.. It is not clear whether this methodology has been used in the region to promote efficient lighting.

6.4 Bulk distribution of CFLs

Incandescent lamps (ILs) are already being replaced by CFLs in several countries in the region. The total number of CFLs distributed in six countries is estimated at nearly 99 million lamps. However, the process is still in the early stages of development (Table 4). It should be emphasized that bulk distribution of CFLs is a good initial step in the development of the market for efficient lighting. The multifaceted objectives are: 1) to demonstrate the economic viability, reliability, and efficiency of the CFLs 2) to educate the public on the availability of these technologies in the marketplace, 3):to overcome the initial high cost of CFLs 4) to increase the demand for CFLs and encourage suppliers to enter the market, and, 5) to achieve rapid and less expensive load reduction of the power systems. These bulk distribution programs however, are not sufficient to secure sustainable transformation to efficient lighting. It is advisable that these programs be implemented within an integrated policy framework that will be discussed later in this report.

As stated earlier, direct subsidies and grants are used in the six instances of CFL distribution in the region and those countries are subsidizing up to 100% of the cost of CFLs to consumers.

In Egypt, the Ministry of Electricity and Energy (MOEE) began an ambitious program for the dispersal of CFLs through the state owned electricity distribution companies whereby 9.5 million lamps (20 watt) were sold. Each customer received one lamp free with every one purchased which meant a cost reduction of 50% that was paid by the electricity distribution companies. Furthermore, the customer was allowed to pay for the lamps through installments collected with the electricity bill payment over a period of one year. The MOEE has already assigned 18 million Egyptian pounds to support the sale of 3-4 million additional lamps with a subsidy that will reach 50% of the average retail price of good quality CFLs.

In Iran, the Ministry of Energy has developed 20 different strategic goals, including the distribution of 93 million high efficiency lamps for 21 million households. Using various distribution methods, about 65 million CFLs have been distributed to households up until the year 2009. This had resulted in a reduction of 1750 MW of peak load, annual electricity saving of 3.8 Twh, and the reduction of 2.7 Mt of CO_2

In Lebanon, the government has committed to spend 7 million USD to replace 3 million incandescent lamps with CFLs. The Lebanese Center for Energy Conservation (LCEC) has already commenced the project in coordination with municipalities, EDL, and civil society.

In Turkey, through the "National Energy Efficiency Movement," a plan to initiate the "Hand-in-Hand for Energy Efficiency (ENVER) Movement" across all provinces started in December 2008. Under this program, energy-efficient lamps were dispensed at primary schools, and were accompanied by awareness-raising activities. About 6.6 million lamps were distributed in 43 provinces.

In the UAE, a pioneering voluntary initiative entitled "Make The Switch" aims to increase awareness and promote the benefits of energy efficiency. The main goal of the initiative is to encourage the use of CFLs in the residential and commercial sector. The program was launched by a UAE-based clean technology company (Ecobility) with the assistance of corporate partners and supporters. The campaign aims to introduce one million CFLs to households and commercial buildings. It makes the lamps available at an exceptionally low price thanks to contributions made by another company (UAE major real estate; Nakheel). So far, the campaign has successfully managed to sell more than 900,000 CFLSs leading to electricity saving of nearly 0.5 Twh, and carbon reduction of about 0.3 Mt. This unique initiative demonstrates the leading role that socially responsible corporations can play to raise public awareness and facilitate market transformation

Table 4: Distribution of CFLSs in selected countries of the region

Country	Government commitment (million USD)	Number of CFLs replaced (million)
Egypt	18	17
Lebanon	7	3
Iran	NA	65
Turkey	NA	6.6
Morocco	46.5	6
UAE	NA	1
Total		98.6

NA: not available

6.5 Information, Communication and Voluntary Action

This policy vehicle aims to facilitate information flow within the market, raise public awareness, and enhance capacity building.

6.5.1 Education, training, and public awareness

Over the long term, developing and maintaining energy-efficient strategies requires that citizens, professionals and government officials all share a basic understanding of how energy is used; the economic, environmental, and social costs of energy production and usage; and, the main opportunities to improve energy efficiency. This basic "energy literacy" must begin with elementary and secondary schooling and continue as part of professional and technical training for those whose jobs will involve energy-related decisions. Consumers need

access to information about how energy is used in their daily life, what energy-saving opportunities are available, and which products are energy-efficient and cost-effective choices.

According to the Arab Strategy on Sustainable Consumption and Production, the Arab world has the largest share of youth among developing regions thus, they are a critical stakeholder in the region's economy and the main player for the achievement of the MDGs. Involving young people in the efforts to realize energy efficiency and the phase-out inefficient incandescent lamps will greatly help in assuring future sustainability. The habits that the youth develop now will play a decisive role in future consumption patterns and lifestyles.

Most, if not all, countries in the region are implementing public awareness campaigns to promote CFLs using varying approaches. Campaign materials are usually distributed nationwide to maximize the outreach to consumers in both urban and rural areas, even if the country has no activities to disseminate CFLs. However, field surveys should be conducted to evaluate the effectiveness of these campaigns.

The UAE's Heroes campaign, jointly developed by The Emirates Wildlife Society in association with the Worldwide Fund for Nature (EWS-WWF) and several UAE government agencies and MASDAR, aims to alert the UAE to the fact that drastic action must be taken now to curb energy consumption. It also points out that straightforward and practical solutions are readily available to ensure success.

In Turkey, 2008 was declared as Energy Efficiency Year and since then, the nationwide campaigns on energy efficiency and efficient lighting has Intensified.

Leading efficient lighting producers have also initiated activities to raise public awareness on benefits of switching to efficient lighting systems. For example, Philips Lighting has launched a campaign in Egypt to promote the significant benefits of a general move to energy efficient technology. The campaign will target both consumers and the business sector, with a message that switching from older inefficient lighting to new technologies will allow immediate energy savings and fast payback on electricity bills. One of the key issues that the campaigns intends to highlight is the fact that the current transition rate to efficient lighting in Egypt as throughout the region, is very slow and needs to increase.

6.5.2 Public leadership and reference projects

Reference projects are designed to test the validity of various technologies within the targeted sectors, while showcasing the benefits of energy efficient designs. These projects will need to have high visibility in order to be able to influence decision-making. They should be documented to highlight the benefits of energy efficient designs. The results of pilot projects could also be shared with industry professionals through their trade associations, trade conferences and the media.

At the regional level, Regional Center for Renewable Energy and Energy Efficiency (RCREEE) supports the development of new technologies in the field

of renewable energies and energy efficiency through demonstrating innovative technologies.

Multilateral and bilateral development agencies have also supported energy efficiency activities in many countries in an effort to move from purely technical assistance activities to reference and pilot projects that move these investments into the mainstream. The Energy Efficiency Improvement &. Greenhouse Gas Reduction Project (EEIGGR) project in Egypt promotes the use of efficient lighting systems. Many reference applications have been executed at different locations such as; street lighting in Cairo and Alexandria, headquarter offices of the Egyptian Electricity Holding Company (EEHC), and some power plants. Similarly, the LCEC are implementing a number of reference projects for efficient street lighting systems as part of the NEEAP of Lebanon. A Government Circular in Turkey in 2008 mandated that all public institutions replace incandescents with energy-efficient bulbs within a period of one month. This has led to the replacement of more than 1.8 million incandescent bulbs with CFLs. Masdar Institute's building At Abu Dhabi's Masdar City, the carbon neutral city, has already incorporated efficient lighting, appliances and fixtures in cooperation with Siemens and General Electric. These demonstration activities showcase the economic benefits of efficient lighting, promote learning by doing, and raise public awareness.

7 Environmental sustainability and end-of-life treatment of used lamps

With regard to toxic emissions, the mercury content of CFLs is a topic of increasing importance as public health concerns have been raised recently that question the true environmental benefits of this technology. Many manufacturers make competitively priced CFLs with a mercury content of 2-3.5 mg. Moreover, several models of ENERGY STAR-rated CFLs have mercury content levels in the 1-2 mg range. By contrast, mercury thermometers contained nearly 500 milligrams of mercury—equivalent to the amount in more than 100 CFLs combined. On a lifecycle basis, CFLs emit less mercury to the environment than do incandescent bulbs, because they require less electricity to operate and, therefore, eliminate much of the mercury emitted by power production from coal.

According to the European legislation governing the collection and recycling of waste, electrical and electronic equipment (WEEE), mercury should be removed from spent lamps through treatment, and their recycling should meet an 80 percent minimum target. Once consumers learn that they have to take back their burned-out CFLs to collection points, just as they do with batteries, the mercury content will be recycled and not released to the environment. These practices rarely exist in the region and management of electronic was is in its infancy stage.

Available data reveals that the second phase of the EEIGGR GEF funded project in Egypt is considering an initiative for end- of-life of CFLs. As stated earlier, a study

of waste management and recycling of lamps that have reached their end-of-life will be implemented. For limiting the mercury content of the lamps, the related EU standards (the European limit has a maximum of 2.5 mg of mercury per lamp) will be followed. Another initiative will be implemented in Morocco within the framework of a newly approved law for the waste management. The Department of Environment planning to establish a regulatory framework and guidelines for recycling and safe disposal of discarded CFLs at the end of their operational life. This initiative will be also supported by the GEF funded project.

During planning for phasing out ILs and the widespread use of CFLs in the region, careful design of a program to manage CFLs at their end of life must be considered. Environmental regulatory instruments, such as collection and recycling schemes for CFLs, in collaboration with local and international manufacturers needs to be developed. A list of designated collection facilities, which take back CFLs should be identified and communicated to consumers. Retailers also have a responsibility to tell their customers where they can take spent CFLs. The producer responsibility requirements should be part of those regulatory instruments.

8 Monitoring Verification and Enforcement

The aim of Monitoring Verification and Enforcement (MVE) activities is to protect the market from products failing to perform as stated to ensure consumer satisfaction and to guarantee that policy makers, government regulators, programme administrators, etc. meet the objectives of their programs. The same activities also protect suppliers by guaranteeing that they are all subject to the same program entry conditions. Without the support of on-going compliance programs, non-compliant products can compromise the effectiveness of some standards and labelling programs.

It is critical that policy makers and program implementers integrate robust MVE activities into every aspect of their lighting program. They encompass a wide range of actions:[12]

- **Monitoring** is a measurement process that any party can use to check product efficiency. It involves measuring efficiency claims against an established standard in a consistent manner, using accurate instrumentation applied by qualified staff in controlled conditions. It also is the process by which the success of an energy efficiency program can be measured.

- **Verification** is the measurement process whereby declarations of performance by lighting suppliers are confirmed, often by independent third parties. This action can be commissioned by the supplier (to confirm

[12] *Monitoring, Verification and Enforcement: Improving compliance within equipment energy efficiency programmes.* International Energy Agency, Paris 2010.

claims), but may be taken by other parties, such as competitors or regulators, to challenge assertions.

- E**nforcement** is the action taken by program administrators or other responsible parties against suppliers of non-compliant products, as a result of finding fault through either monitoring or verification. Enforcement requires rigorous and transparent monitoring and verification processes.

MVE is an administrative process, sometimes written in law, which requires coordination and monitoring by government officials responsible for MVE lighting programs.

Testing capacities

MVE activities can require significant investments in testing, especially for a commodity product such as lamps, which require frequent testing of a wide range of products. A government operating standard and labeling program must have a facility that can perform reliable and unbiased energy tests. This independent facility can be either private or government -operated. A testing facility for a national energy efficiency and labeling program is where the energy tests are randomly performed. Almost every appliance has unique requirements for energy efficiency tests. Regardless of who actually performs the assessments, the government must establish a procedure for monitoring compliance against the label or standard. The process must indicate how appliances to be tested are to be selected, from factory inventory or off a retail shelf, the number of units to be tested, and who will pay for the tests. An aggressive policy is advisable from the outset so that the manufacturers take the procedures seriously.

The majority of countries within the region (20 out of 24) have national standardization bodies who are ISO members. These national bodies, of varying capacities, are generally responsible for; developing national standards for products, testing methods, measuring units, and calibration and verification of measuring instruments. Moreover, they provide the necessary measures for quality control of products to conform to national standards through the verification of quality, enforcement of legislation and application of the national quality mark schemes. Additionally, they can accept and adopt as appropriate, the standards, technical regulations, guidelines, and recommendations from regional and international organizations. They also work on harmonizing national standards within regional and international standards. They may also recommend the certification of testing facilities and laboratories for testing, inspection, analysis and calibration, inspection bodies, and qualifying compliance certificate providers and follow up on their performance. In most cases, these bodies are involved in the standards and labeling schemes in different countries.

National accreditation bodies exist in six countries. They are the:

(a) Egyptian National Accreditation Council (EGAC)
(b) Accreditation Unit, Jordan Institution for Standardization and Metrology (JISM);

(c) Quality Assurance Department, Saudi Arabia Standards Organization (SESO);
(d) Tunisian Accreditation Council (TUNAC).
(e) National Accreditation Center of Iran (NACI)
(f) Turkey Accreditation Board (TurKAK)

As for the laboratory accreditation, it is generally made with reference to ISO 17020 and/or ISO/IEC 17025 standards, which stipulates requirements for laboratory testing and calibration. National institutions in at least eight countries, have the authority to accredit laboratories, they are the:
(a) National Laboratories Accreditation Bureau (NLAB) of Egypt;
(b) Accreditation Unit (AU), Jordan Institution for Standardization and Metrology (JISM);
(c) Accreditation Service (SCAC), Ministry responsible for industry of Morocco (MCI);
(d) Palestinian Council for Laboratory Accreditation, Palestine Standards Institution, Ministry of Industry;
(e) Quality Assurance Department, Saudi Arabia Standards Organization (SESO);
(f) Tunisian Accreditation Council (TUNAC).
(g) National Accreditation Center of Iran (NACI)
(h) Turkey Accreditation Board (TurKAK)

It should be noted that the number and capacity of accreditation bodies in the region remains limited. This is due to several constraints including; limited technical capacity at the national level to perform accreditation audits in all fields; human resource issues affecting the full-time staff allocated to the management of accreditation programs; inadequate financial resources, which impact the scope of accreditation services; limited existing demand for accreditation services at the national level; and, only a small degree of awareness among the public regarding the role and purpose of accreditation.

Few countries have qualified testing facilities for the quality control of lighting systems. In Egypt, accredited energy efficiency testing laboratories have been established at the New and Renewable Energy Authority (NREA) and other entities. These include: a Photometric Testing Laboratory, heat resistant test, and insulation and humidity tests for efficient lighting equipment. In Iran, a certified laboratory specialized in lamps is using advanced and calibrated equipments to test incandescents and CFLs. In addition, an operational test facility was also established in Lebanon. Some international service providers exist in most countries in the region and provide testing services for lighting systems.

National frameworks for monitoring, verification, and enforcement, as mentioned earlier, offer a solid foundation for similar activities to occur in the lighting sector in different countries within the region should a policy framework be required. All that is required is to build on the existing capabilities for standard and labels and to expand them to cover efficient lighting products. The international lighting manufacturers can play an instrumental role in encouraging this specialized technical capacity at national and regional levels.

9 Manufacturing of lamps

The region has a limited capacity for the manufacturing of CFLs. In addition to the major energy-consuming countries, the UAE, Tunisia, and Lebanon also have limited lighting manufacturing facilities. When they exist, it is usually in collaboration with international lamp manufacturers such as Philips, Osram, and others. Furthermore, as shown in the national case studies below, activities to support market transformation by multilateral organizations may require donor funded projects to encourage the local manufacturing of CFLs.

10 National Case Studies

This section includes case studies from within the region and aims to1) assess the current situation and potential for the widespread dissemination of CFLs in some selected countries and 2) draw lessons learned from the experiences of these countries. The list of countries assessed includes the four major electricity-consuming countries (Egypt, Iran, Turkey, and Saudi Arabia) in addition to Lebanon, Morocco and Tunisia. Lebanon and Morocco have very aggressive ongoing programs to promote CFLs. On the other hand, Tunisia though has a fairly developed institutional and legislative framework for promoting energy efficiency, yet it limits the promotion of efficient lighting to street lighting and does not have bulk distribution program for consumers.

10.1 Egypt

The energy sector plays a vital role in the socio-economic development of Egypt with 94% of the population dependent on oil and gas. Electricity consumption has increased rapidly to reach over 111 TWh in 2008/2009. With a current growth rate of more than 7% per year, Egypt would need to double its existing power generation capacity of 23,502 MW13 by 2020. The energy-related GHG emissions of Egypt were estimated at 168.7 Mt of CO_2 in 2007. Thus, any successful energy efficiency market transformation activities in Egypt will also have a significant impact in reducing GHG emissions in the global context.

The energy prices in Egypt have had a long history of heavy subsidies which have encouraged inefficient energy consumption practices. However, this situation is being rectified as the Government has been gradually increasing electricity tariffs. This policy aims to achieve improved energy efficiency while still taking the social aspect into consideration. While the original plan was to phase-out subsidies for electricity by 2014, the global financial crisis that emerged in 2008-2009 has slowed down this process.

Among the challenges facing the energy sector in Egypt are subsidized energy prices, which remain a burden to the state budget. The total cost of energy subsidies has been estimated at nearly US$11.5 billion in 2009, which is about

67% of the estimated total cost of subsidies of US$17.1 billion. To address these challenges, the government has begun to take steps to reform energy prices to better reflect the real cost of supply.

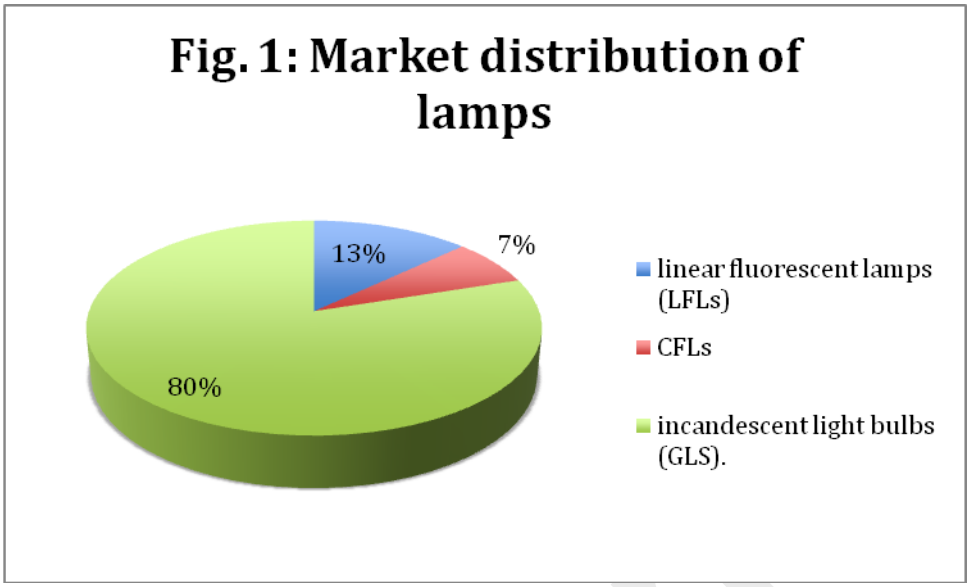
Lighting accounts for 23.5 % of Egypt's total electricity consumption. The contribution of lighting to the total electricity demand in different sectors is shown in Table (5)

Table 3: contribution of lighting to electricity demand in Egypt

Sector	Percent of the total electricity consumption	Percent of lighting out of sector electricity consumption	Percent of Lighting out of the total electricity consumption
Residential buildings	**39.2**	**25**	**9.3**
Commercial buildings	**7.8**	**25**	**1.8**
Industrial buildings	**35**	**10**	**3.5**
Government buildings	**5.6**	**38**	**2.1**
Street Lighting	**6.8**	**100**	**6.8**
Total			**23.5**

Source: Yassin (2010)

Based on a recent market assessment, it is estimated that about 260 million lamps will be sold in Egypt in 2010 (excluding street lighting). Fig. 1 shows the market segmentation for different lamp categories. Of these categories, 80% is primarily incandescent lamps.



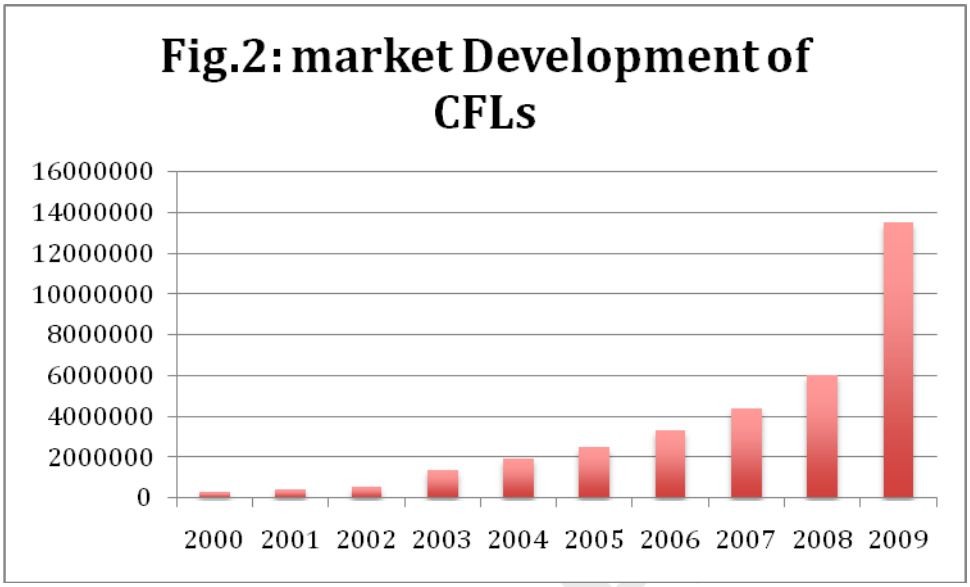
The current annual growth rate for new electricity subscribers is about 5%, which reflects the annual growth of the total lighting market. However, the replacement rate for new lighting products such as CFLs is typically considerably lower than that of incandescent light bulbs.

The UNDP/GEF "Energy Efficiency Improvement & Greenhouse Gas Reduction" (EEIGGR) project began in 1999, has already demonstrated the technical and financial feasibility of using both CFLs and electronic ballasts by being utilized in reference applications in offices of the Ministry of Electricity and Energy (MOEE), in some distribution companies and in public lighting applications. Additional actions have encouraged the support of local manufacturing and the establishment of the initial market for CFLs, which by the end of 2010, is expected to reach 17 million units sold annually.

To capitalize on the EEIGGR project success, the Ministry of Electricity and Energy began an ambitious program for the dispersal of CFLs through electricity distribution companies with 6.5 million 20-watt lamps sold to customers. Customers received one free lamp with every lamp purchased which meant a cost reduction of 50%, paid by the electricity distribution companies. Furthermore, the customer was allowed to pay for the lamps through installments collected with the electricity bills, over a period of one year. During the second phase, 3 million lamps have been sold utilizing the same process.

Energy consumption for street lighting in Egypt reached 6.9 TWh in 2008/2009, representing 6.2% of the total electricity consumption. With recommendations from the Supreme Council of Energy, an energy efficiency street lighting program is currently being implemented jointly by the Ministry of Finance, Ministry of Local Development and Ministry of Electricity and Energy. The objective of the program is to replace sodium and mercury lamps with CFLs and to restrict the use of mercury vapor lamps.

According to project reports, the development of the CFL market in Egypt is represented in Fig.2. The market has developed exponentially during the last decade to total about 13.5 million in 2009, and is continuing its rapid growth.



Source: Yassin (2010)

The main barriers to increasing market penetration of energy efficient lighting in Egypt are: 1 low awareness by consumers and, to some extent, retailers concerning the benefits of energy efficient lighting 2) lack of experience and in some cases, trust, of consumers regarding the performance and quality of new lighting products and, 3) usually higher upfront costs for CFLs compared lower efficiency alternatives.

By building upon the groundwork of the UNDP/GEF EEIGGR project, a new GEF supported initiative will focus on two areas that have already demonstrated signs of success, namely energy efficient lighting and appliance standards and labels. While the EEIGGR project introduced CFL support and appliance standards and labeling schemes for the Egyptian market, it did not have the resources to facilitate a more comprehensive market transformation. For the lighting component, there is a need to expand the activities of the previous project to overcome barriers of market expansion by 1) building consumer confidence for the quality and cost saving opportunities of CFLs and other energy efficient lighting products (including street lighting) 2) supporting the government of Egypt in strengthening the legal and/or regulatory framework for promoting energy efficient lighting 3)) ensuring that the performance and quality of these products meet consumers expectations and, 4) continuing the development and implementation of attractive schemes to overcome financing barriers. Ultimately, energy efficiency requirements for lighting systems sold in the Egyptian market will be fully aligned with the requirements established in the EU market.

One of the key results of the new GEF supported project would be the accelerated growth of the EE lighting market in Egypt. The target is that energy

efficient lighting products such as CFLs, will become the first choice for residential, commercial, administrative buildings, and street lighting. This corresponds with the target of gradually phasing out the most inefficient lighting products, such as incandescent light bulbs, by 2020.

In addition to establishing new minimum energy performance standards for different lighting products, the new project strategy aims to accelerate the market transformation in the residential sector by selling high-quality CFLs at subsidized prices. This project will be done in conjunction with the Ministry of Electricity and Energy by building on the success of the 6.2 million lamp program initiated in the first phase of the GEF-funded EEIGGR project. The MOEE has already assigned 18 million Egyptian pounds to support the sale of 3-4 million additional lamps with a subsidy that can reach to 50% of the normal retail price of good-quality CFLs lamps. A second target group will be administrative buildings and those used for public services such as schools, universities and public hospitals. The project will work to support transformation of government buildings with energy efficient lighting systems in compliance with the decision of the Supreme Energy Council.

In the area of street lighting, the new project will support the government investment program to phase-out all inefficient street lighting by 2020. A study and the preparation of a proposal for the waste management and recycling of the components for the lamps at end-of-life will be implemented as a parallel activity to the above.

10.2 Lebanon

The current installed capacity of thermal power plants in Lebanon is 2038 MW, and the peak demand was 2450 MW. Thus, Lebanon is suffering from a power shortage of nearly 400 MW. The total energy demand in 2009 was 15,000 GWh (7% increase from 2008) whereas, the total production and purchases was 11,522 GWh (6% increase from 2008), which resulted in energy shortage of 3,478 GWh (23%). The current tariff structure is not equitable because it subsidizes all customers and penalizes smaller consumers with very large fixed charges. Challenges facing the electricity sector in Lebanon include: lack of investment; high fuel costs; inefficient, older power plants; high technical and commercial transmission and distribution losses; distorted tariff structure; and, management problems at the Électricité Du Liban (EDL).

To address these challenges, a recent strategy to reduce 5% of the total electricity demand was developed. A commitment to energy efficiency and demand side management is a major component of this strategy and it is supported by the Energy Conservation Law, the establishment of the Lebanese Center for Energy Conservation (LCEC), and, the launch of a national plan for energy conservation in 2010. A large component of the new energy conservation plan which begun last year, is to increase the use of CFLs. The goal is to phase-out inefficient systems in the future and encourage the use of energy efficient

public lighting. The government has earmarked 25 million USD to establish the LCEC and to promote CFLs and solar water heaters.

The National Energy Efficiency Action Plan for Lebanon (2011-2015) contains 14 different initiatives, among which includes banning the import of incandescent lamps to Lebanon by the end of 2012. This will be implemented primarily through the implementation of a project involving 3 million CFLs. The government of Lebanon has committed to spend 7 million USD to replace 3 million incandescent lamps with CFLs. The LCEC has already commenced the project in coordination with municipalities, EDL, and civil society. The LCEC has also developed a voluntary energy efficiency standard for CFLs in cooperation with the Lebanese Standards Institutions (Libnor). The Ministry of Energy and Water (MEW) launched a nationwide public awareness campaign in October 2010 on the CFL project and its benefits.. The Industrial Research Institute (IRI) has already set up an operational testing facility for CFLs. A CDM project is currently underway which is expected to result in earnings of about 6 Million USD. The distribution of 3 million CFLs is expected to reduce electricity demand by a minimum of 160 MW, to save around 76 million USD annually for a period of 4 years, and to reduce annual carbon emissions by nearly 245,000 Mt of CO_2.

Another initiative of the National Energy Efficiency Action Plan for Lebanon (NEEAP) targets the design and implementation of a national strategy for public street lighting in order to provide safe and energy efficient street lighting, with intelligent monitoring, control, and maintenance procedures. The government of Lebanon has committed to spend 500,000 USD to implement that initiative through the LCEC. The center has already started a technical and economic assessment of various public lighting technologies. Several street lighting reference projects are currently underway to test the feasibility of different street lighting technology options in several geographic areas of Lebanon.

10.3 Turkey

In 2008, the total electricity consumption of Turkey was 154 Twh, 80% of which was thermally produced (natural gas and coal), resulting in the emission of 265 Mt of CO2. Between 1990 and 2008, the annual average rate of growth in primary energy demand was 4.3%. Among other OECD countries, Turkey has had the highest rate of energy demand increase over the past decade. About 20% of the electricity consumed in Turkey is used for lighting purposes. The transition to energy efficient lighting systems would translate into a yearly energy saving of 2.6 Twh, and an annual reduction of 1.2 Mt of CO_2.

The Energy Strategy Plan sets a 20 % primary energy reduction target for 2023 compared to 2008 levels. The energy-savings potential is 30% for buildings, 20% for industry, and 15% in the transportation sector. To achieve these targets, the Energy Efficiency Law of 2007 was enacted with related regulations in 2008. Circular No. 2008/2 dated 15/02/2008, from the Office of the Prime Minister, defines measures for the efficient use of energy within public institutions. This

circular kicked off the "National Energy Efficiency Movement," and proclaimed 2008 as "Energy Efficiency Year."

Priority was given to the replacement of incandescent bulbs with CFLs in public buildings. Circular No. 2008/19 dated 13/08/2008 obligated all public institutions, municipalities and professional chambers of a public nature, to replace incandescent bulbs with energy-efficient bulbs within a period of one month. This has led to the replacement of more than 1.8 million incandescent bulbs with efficient lamps. The payback period of this initiative was only 101 days.

On the other hand, and within the "National Energy Efficiency Movement," the "Hand-in-Hand for Energy Efficiency (ENVER) Movement" initiative commenced across all provinces starting in December 2008. Under this movement, energy-efficient lamps were dispensed at primary schools with accompanying awareness-raising activities. 4.8 million lamps were distributed in 43 provinces from December 2008 to April 2009.

Public education campaigns played a primary role in raising public awareness. The transition to efficient public lighting received great deal of coverage in the various media. Next to public awareness campaigns, the fact that in 2008 electricity prices were increased for the first time since 2003, also amplified consumer sensitivity to energy efficiency. All of these factors positively contributed to public awareness for efficient lighting, which is now reflected by demonstrated consumer preference in the marketplace.

10.4 Saudi Arabia

Saudi Arabia's primary energy consumption per capita is four times higher than the world average, at 6.8 toe in 2009 compared with the world average of 1.8 toe. Total energy consumption is growing steadily, at an average rate of 5.8 percent / year since 1990, and has tripled between 1990 and 2009.

The electricity sector has been recently restructured with the goal of improving economic efficiency and encouraging private sector participation. Initiatives also include gradual steps to reform electricity prices to reflect actual costs and to promote energy efficiency.

The country's electricity consumption has been growing rapidly since 1990 at an average rate of about 10 per cent per year. This surge was propelled by demand in the consumer, services and agriculture sector which reached 82 percent of total electricity consumption of about 170 Twh (in 2008). Saudi Arabia is one hundred per cent dependent on fossil fuels thus, electricity consumption is emitting an annual amount of 358 Mt of CO_2.

The Saudi Center for Energy Efficiency (SCEE) is developing energy efficiency labels and standards for air conditioners, electric motors and lighting, and working to establish am "Energy Efficiency Information & Awareness Center" that intends to raise public awareness on energy issues.

Phasing out inefficient lighting systems in Saudi Arabia would reduce annual electricity consumption by 3.2 Twh and CO_2 emissions by 2.4 Mt. To date; there have been no programs to distribute CFLs in Saudi Arabia, though some public education activities, including the dissemination of awareness material about CFLs, have been conducted. Given that Saudi Arabia has the largest economy in the region, is the largest electricity consumer, and has a major carbon intensive economy, it is evident that Saudi Arabia needs to consider transition to efficient lighting (especially in the residential and commercial sectors). This could be achieved in a short period of time as Saudi Arabia already has sufficient resources in place to do so.

10.5 Iran

Iran, one of OPEC's founding members, holds the world's third-largest existing oil reserves and the world's second-largest natural gas reserves. The building sector is one of the largest contributors to CO_2 emissions in the country. Its share of energy consumption amounts to 40% of total primary energy supply. This is due to the low price of energy, population growth, economic growth, and the existence of older, inefficient products. Iran's total electricity consumption amounted to 164 Twh in 2008, producing 466 Mt of CO_2. Phasing out inefficient lamps would reduce annual electricity consumption by 4.6 Twh, and carbon dioxide emissions by 2.5 Mt.

The government is expected to improve energy efficiency within the second five-year plan of socio-economic development. To realize this objective, it has established the Iran Energy Efficiency organization (IEEO) (SABA), which began its functions in 1996. In parallel, the government of Iran started to reform energy prices in order to reduce energy intensity and improve energy efficiency. Within the same policy framework, the Ministry of Energy developed 20 different strategic goals, most of which are related to energy management and energy efficiency in generation, transmission and distribution. Among those strategic objectives are: reducing specific electric energy consumption by 10 % by 2020; distributing 93 million high efficiency lamps to 21 million households; creating a mechanism to promote and support the energy service companies (ESCOs); and, developing energy efficiency labels for electricity consuming appliances. Furthermore, Iran is enforcing mandatory energy efficiency labels for fluorescent lamps.

Through various distribution methods, about 65 million CFLs have been provided to households to the end of 2009. This had resulted in reduction of 1750 MW of peak load, annual electricity saving of 3.8 Twh, and reductions of 2.7 Mt of CO_2. This high market penetration volume led to reduced costs and improved quality of locally manufactured lamps and an increase in consumer satisfaction. SABA is further planning to distribute, 10 million CFLs free annually until the year 2020.

Iran has the largest bulk distribution program of CFLs in the region. However, it needs to adopt a comprehensive approach to secure sustainable transition to

efficient lighting.

10.6 Tunisia

Tunisia is more than ninety nine per cent dependent on oil and gas. The total primary energy consumption in 2007 was 7.7 Mtoe, of which 14% was imported. The total electricity consumption was about 13 TWh in 2008, producing 22.4 Mt of CO2. Tunisia's electricity production is heavily based on natural gas (95%) with a share of less than 1% (in 2008) from renewable energy sources (mainly hydro and wind power).

Buildings constitute the third largest energy-consuming sector in Tunisia. The Quadrennial program has identified major savings (400,000 toe / year by 2011) to be achieved by improved lighting, better thermal performance and the introduction of efficiency standards for appliances.

The institutional framework for the support of energy efficiency in Tunisia is well developed. It is supported by the National Agency for Energy Conservation (ANME), which plays an important role in fostering research and development, as well as designing and implementing policies and strategies. From 2004 2005, important steps were taken, such as the establishment of the National Energy Conservation Fund.

The current strategy for energy efficiency is contained within the Quadrennial plan for energy efficiency and renewable energy (2008-2011). The overall objective is to reduce the energy intensity of the economy by 3% each year over the same period.

Law 2004-72 and its amendments marked a critical turning point as it established energy efficiency as a national priority to achieve sustainable development and strengthened the position of the National Energy Conservation Agency (ANME). The law places especial emphasis on; the use of energy service companies (ESCOs), the labeling of household appliances and equipment, the regulation of the thermal performance of buildings, and the use of efficient lighting in public buildings.

Law 2004-72 obliges manufacturers, importers and retailers of household appliances to conform to the requirements of energy labeling according to the methods outlined in a separate declaration by the Minister of Energy. It bans the marketing of appliances that do not meet a minimum designated performance. On this basis, minimum efficiency standards and a labeling system has been established and continuously tightened. Currently, mandatory labeling programs are enforced for refrigerators, air conditioners, and new buildings.

A policy to phase-out of ILs has already been adopted in Tunisia since 2007. This policy is based on three main actions:

1. Gradual introduction of a consumption tax on the sales of ILs to reach 50 % in 2011.
2. Prohibiting the local production of ILs with the two local manufacturers already having ceased production of ILs in 2010

3. Gradual phase-out of ILs from the local market as follows:
    - In 2011: ILs with power ≥ 100 W;
    - In 2012: ILs with power of 75 W and 60 W;
    - In 2013: ILs with power of 40 W and 25 W.

Tunisia has adopted a different approach to disseminate efficient technologies. Instead of subsidizing the cost of CFLs, the cost of ILs has been gradually taxed to encourage consumers to phase them out. In addition, ILs have been banned as part of an ongoing approach.

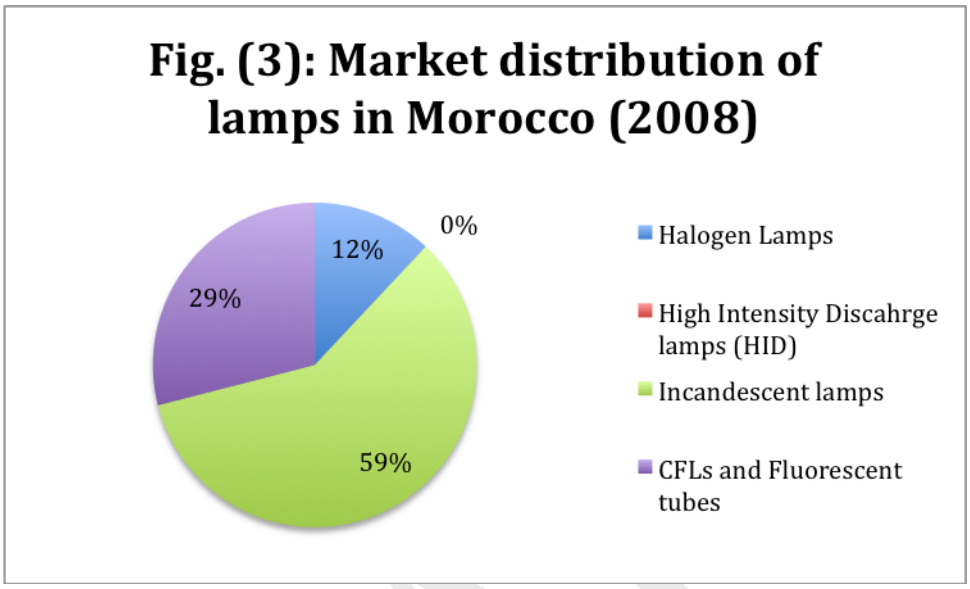
10.7 Morocco

Morocco has limited domestic energy resources and imports more than 95% of its primary energy needs. Economic growth increased primary energy consumption which reached 15.1 million toe in 2009. With a combined capacity of 4,160 MW, thermal power plants provide the base load capacity and generate more than 75% of total electricity consumption using mainly imported coal, fuel oil and, recently, natural gas. In addition, nearly 15% of Morocco's power requirements are imported directly from Spain. Hydroelectric plants and wind generate the remainder of its power requirements. The en.lighten Country Lighting Assessments estimated that switching to efficient lighting would reduce electricity demand by about 1.8 Twh and CO_2 emissions by 1.3 Mt per annum.

With an average annual growth of 6.5% during the last decade (1999 to 2009), electricity consumption in 2009 has amounted to nearly 25 Twh. In 2008, to cope with the increasing demand for electricity and to reduce the risk of power shortages, the government of Morocco adopted the short-term National Plan of Priority Actions (NPPA) to ensure the adequate supply of electricity to meet projected demand. This plan aims to reduce power consumption by 25% and power load by 15% by the end of 2012. To achieve these objectives, the NPPA intends to implement measures to strengthen power generation capacity by constructing nine new power plants with a total installed capacity of 4,688 MW. At the same time, the Spain's electrical support will be reinforced. In addition, the NPPA plans to implement measures to reduce demand for electricity. These include the dissemination of 23.4 million of CFLs which will reduce the peak load by 900 MW.

The National Electricity Utility (ONE) has launched a demand side management (DSM) plan to distribute the CFLs under its INARA program, which is part of NPPA. It signed an agreement with the Moroccan government in 2008 with a total cost of US$ 46.5 million. ONE will replace 15 million ILs with CFLs in households and offices. The project will take place in three phases, with 5 million CFLs to be installed under each phase. The first phase of the INARA program was completed with the support of the government in late 2010. Presently, ONE is preparing the implementation of the second and third phases and it is planning to finance them through a loan from the German Development Bank (KfW). The commencement of the second phase of the INARA program is expected begin in the last quarter of 2011.

The Moroccan lighting market is mainly driven by four types of lamps; incandescent lamps (ILs), CFLs and fluorescent tubes, halogen lamps, and high intensity discharge lamps. In 2008, more than 76 million lamps had been imported to Morocco with a total value of more US$32.46 million. Market penetration of the various lamp types is exhibited in Fig. (3).



All of the lamps sold in the Moroccan market are imported since domestic production and assembly facilities do not exist. The imported ILs are subject to a customs duty of 5%, and a value-added tax (VAT) of 20% as well as an additional import levy of 0.25%. Also, all imported CFLs are subject to a customs duty of 2.5%6, VAT of 20% and an additional import levy of 0.25%.

The major institutional barrier for energy efficiency improvements in Morocco was the absence of a national institution responsible for the development of energy efficiency strategies and policies. This barrier was removed on 11 February 2010 when the National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) was created under Law No. 16- 09. . This new agency, which replaced the Centre of Development of Renewable Energies (CDER), has many responsibilities including the design and implementation of programs for the development of EE and the promotion of standards and energy labels for household appliances. In addition, ADEREE is expected to carry out public awareness and communication activities to demonstrate the technical, economic, social, and environmental benefits of EE.

The absence of a specific policy to promote energy efficient lamps constitutes a major barrier to their dissemination and accelerated use. A new policy is required that would provide 1) regulations for energy efficient lighting, 2) incentives and fiscal measures for the promotion of energy efficient lighting, 3) a roadmap for the phasing out of ILs, 4) the strengthening of the regulatory framework for testing of CFLs as well as the harmonization of the existing

standards with international best practices, and 5) a regulatory framework for the disposal and recycling of CFLs.

A recent UNEP/GEF funded project entitled "Market transformation of Energy Efficiency Lighting" will support the second and third phases of INARA program. The goal of the project is to accelerate the transformation of the Moroccan market for efficient lighting technologies. The project intends to accelerate the phase-out of ILs and the reduction of GHG emissions by restricting the supply of energy inefficient lighting products and removing the market barriers to energy efficient lighting. The objective is to create an institutional, legal, financial and technical environment in Morocco that is in favor of energy-efficient lighting through the promotion of high-performance and environmentally sustainable new technologies such as CFLs, and the phase-out of inefficient ILs.

11 Strengths and driving forces towards the transition to efficient lighting in the region

The region is in a good position to facilitate a comprehensive and integrated transition towards efficient lighting. Positive factors include the following:

1. Commitment to energy efficiency

The move towards achieving sustainable development requires policies and measures be out in place to address the current challenges of the energy sector in the region. Countries are in different stages of developing energy efficiency strategies and action plans. The Arab Regional Strategy for Sustainable Consumption and Production (SCP) identified a set of strategic objectives which included improving energy efficiency. The same strategy pinpoints a complete list of policy requirements which include reforming existing energy tariffs to integrate environmental and social costs, while maintaining energy subsidies for the poor. As stated previously, the government of Iran aimed to improve energy efficiency within the second year of its five-year plan of socio-economic development. Turkey's Energy Strategy establishes a 20 percent primary energy intensity reduction target for 2023 compared with the 2008 level, and an energy-saving potential of 30% in the buildings sector.

Energy efficiency recently gained even more political support in the Arab region when the League of Arab States (LAS) adopted the *"Arab guidelines to improve electricity efficiency and its rationalization at the end use".* Based on the EC end use energy efficiency directive (2006/32/EC), this guideline is now being used by many Arab countries to develop their own National Energy Efficiency Action Plans (NEEAP). Switching to more efficient lighting fits this framework perfectly as a practical and cost effective action which could be easily integrated into such efforts.

2. A number of pioneering initiatives on efficient lighting have occurred

A number of countries in the region have developed successful initiatives to phase-out incandescent lamps. This sets an important example for the rest of countries. These initiatives highlight on the economic and environmental benefits of efficient lighting systems, raise public awareness at all level of the policymaking hierarchy, and drive policy development.

3. Capacity for standards development, testing, and certification

Most countries within the region have National Standardization Bodies (NSBs) and have gained reasonable experience and capabilities in the area of standardization. Some countries are in the beginning stages of establishing National Accreditation Bodies (NABs). Sufficient capacity for accredited testing exists in many countries even with existence of international service providers.

4. Existence of power sector reform and energy pricing reform policies

The energy sector in most of the countries in the region has been under the control of the state. This role is now being revisited in order to attract direct foreign investment which is crucial to satisfy the growing demand for energy. Structural reforms are ongoing in order to improve efficiency and meet the requirements of competitive markets. A gradual process of energy sector reform is underway in many countries. In parallel, many countries throughout the region are implementing or planning energy price reforms to remove subsidies and/or restructure energy prices.

5. Evolving green building initiatives

Buildings are major energy consumers in the region. Energy efficiency codes for buildings have been proliferating in the region for the past few years. Some countries have started to establish national councils for green buildings, others are adopting LEED certification schemes, and several are developing their own certification systems. Enforcing minimum levels of lighting intensity (w/m2) in buildings would increase demand for efficient lighting technologies. Thus, energy efficiency codes for buildings constitute an essential element of any policy package aimed at improving energy efficiency at the national level. It would also support the market transformation to efficient lighting.

6. Local manufacture of lighting products

The region has reasonable capacity to produce lighting products in collaboration with international lighting manufacturers. This local capacity could be extended and developed to produce efficient systems. Initiatives to disseminate CFLs would increase market uptake and help to reduce the cost. Some local manufacturing capacity can be used to provide CFLs at the regional level and may lead to economies of scale that further facilitate market expansion and cost reduction.

12 Barriers and gaps to the transition to efficient lighting in the region

Although the region has a number of important assets that can facilitate market transformation, there is economic, regulatory, or institutional barriers that can affect energy efficiency projects in general, and specifically efficient lighting initiatives.. These barriers may include:

1. **Limited political awareness about the benefits of efficient lighting**

   The lack of or weak political will both at the government and private sector level usually translates into a deficiency of national targets or strategies for promoting energy efficiency in the national energy policy framework;

2. **Lack of Minimum Energy Performance Standards**

   Few countries have developed standards and labeling schemes for electrical appliances, but none for CFLs. There is a lack of national standards, testing and certification schemes that has led to the installation of cheaper and poor quality imported products which has caused a variety of technical problems leading to consumer distrust.

3. **Limited involvement of the private sector and stakeholders**

   Limited number of private sector associations and other market intermediaries to promote energy efficiency and efficient lighting technologies in the region. The lack of information hampers the decision-making process and often leads consumers to stick with known technologies which are usually much less efficient.

4. **Lack of public awareness**

   A low level of consumer awareness leading to low market demand. There has been widespread skepticism about performance, reliability, and safety of CFLs due to past technology failures, weak products performance, or lack of information about new technology developments.

5. **Financial and cost barriers**

   High customs duties on efficient lighting technologies adding to high initial costs and hampering economic feasibility. Custom duties have been a major barrier for disseminating CFLs in Egypt and Morocco. Promoting local manufacturing proved to be a sound policy decision to reduce initial costs.

a. Lack of proper financing schemes to help overcome high initial cost of CFLs to residential consumers. Egypt, Morocco and Lebanon are positive examples of overcoming these barriers using innovative financing schemes.

b. The energy subsidies issue in the region has had social implications for decades. Subsidies have played a critical role in the development of rural areas and increasing access to modern energy services to the poor thus, removing energy subsidies might lead to negative social impact. However, energy subsidies impair the economics of efficient lighting projects and discourage households to switch to CFLs.

13 Conclusions

In conclusion, energy-efficient lighting technologies are economical, commercially and technologically available. Due to several barriers however, they have not reached their market penetration potential. Therefore, necessary to promote a certain degree of market intervention at both national and international levels. A growing number of countries in the region have already taken action, providing a wealth of information and experiences for other countries, and promoting international as well as south-south cooperation.

The preliminary situation analysis reveals the following:

- Four countries (Egypt, Iran, Saudi Arabia, and Turkey) consume the most electricity in the region, with Saudi Arabia ranked first. These countries are responsible for about 88% of the region's total electricity consumption. Phasing out inefficient lighting in those four countries would reduce 48% of the region's total electricity consumption and 66 % of its total CO_2 emissions from electricity generation.

- Only Egypt (2020), Lebanon (2012), and Tunisia (2013) have target dates to phase-out incandescent lamps.

- Three out of the four countries that consume that most have already initiated some activities to promote efficient lighting, with Saudi Arabia is still in the planning phase. These activities represent a starting point for market transformation, which is limited to the bulk distribution of subsidized CFLs.

- The case studies revealed a great deal of similarity with regard to the policies implemented to transition to efficient lighting in the region. In almost all of the cases, a policy package was developed which contains energy price reform, a strengthened legislative and institutional framework, the provision of fiscal incentives, the development of standards and labeling programs and the public awareness raising programs. However, since each country has its

unique requirements, they need to develop their own policy packages that suit their national circumstances. Countries are encouraged to benefit from the holistic approach developed by the UNEP/GEF en.lighten initiative, which contains the basic elements for a sustainable program to transition to efficient lighting.

- Six countries in the region (Iran, Turkey, Lebanon, Morocco, UAE, and Egypt) have already distributed about 99 million CFLs to consumers.

- Most countries (16 out of 24) are implementing or planning policies and measures to promote energy efficiency. Some are developing their energy efficiency policy framework. The easiest, the most economic and the most sustainable solution to improve energy efficiency in the residential sector is switching to CFLs.

- Though labeling programs exist for electrical appliances in most of the countries, labeling for lighting components is rare.

- MEPS for lighting exist only in Turkey, Saudi Arabia, Egypt, and Algeria. No other MEPS for CFLs exist in the region.

- There are energy efficiency codes for buildings in Iran, Turkey, Egypt, Algeria, Jordan, Tunisia, Syria, Kuwait, and UAE. Several green building councils have been established recently in the region. Presently, energy building codes in the region rarely consider switching to efficient lighting.

- Economic and fiscal incentives for efficient energy technologies and/or CFLs are provided by governments in Morocco, Iran, Turkey, Egypt, Algeria, Jordan, Tunisia, Lebanon, and Syria.

- Almost all of countries within the region have been conducting public awareness campaigns to promote energy efficiency and efficient lighting. However, the effectiveness of such campaigns in changing consumer perception needs to be measured.

- The energy efficiency policy framework of Tunisia seems to be the most developed in the region. Their lighting policy is limited to regulatory mechanisms, namely taxation, ceasing the production of ILs and setting target dates to phase- out ILs.

- While many of the countries in the region already have integrated strategies such as energy efficiency or efficient lighting targets or legislation, these steps are yet to be taken in other countries, like the Gulf States.

- Initiatives for the sound management of CFLs at end- of- life are currently absent in the region however, they are being planned in some countries such as Egypt, Turkey, and Morocco

- The region has some technical capabilities for monitoring, verification and enforcement. However, most of the countries do not have a structured verification and enforcement system, nor have they allocated sufficient human and financial resources to implement such systems. Verification and enforcement of lighting energy standards and labels is essential for the credible implementation and sustained impact of standards and labels. The results of an unstructured verification and enforcement system include a less effective market transformation process, the loss of consumer confidence, and decreased impact on energy and CO_2 emission reductions.

- The region has some basic capacity for the local manufacture and/or assembly of CFLs that needs to be expanded in collaboration with international lighting manufacturers.

- Many economic, market, and policy barriers need to be removed to secure market transformation to efficient lighting in the region, especially in the residential sector.

14.Recommendations

Based on the above, the following recommendations for governments in order will assist to facilitate market transformation to efficient lighting:

- Governments have a key role to play in accelerating the adoption of energy efficient lighting. They can:

    1. Set minimum energy performance standards with regard to the energy performance and quality of lighting systems, which effectively eliminate inefficient and low quality lighting products from the market
    2. Use financing schemes and fiscal arrangements to overcome initial high cost barriers in order to encourage efficient lighting technologies.
    3. Share information with decision-makers and the public at large about the benefits of energy efficient lighting and ensure that energy costs and positive lighting performance are visible in the market through labeling schemes.
    4. Encourage better building design with more effective use of daylight through education, training, and incentives.
    5. Lead by example by showcasing efficient-lighting technologies and practices in their own public buildings.
    6. Revisit subsidy policies to promote subsidizing CFLs instead of subsidizing electricity.

7. Given the small size of the market for some countries of the region, collaboration is recommended in the development of regional CFLs testing and certification schemes, so that CFLs produced or distributed in one country can easily be sold in other countries. Regional programs could provide economies of scale that would take advantage of local capacities and satisfy the needs of different stakeholders.
8. Governments are one of the biggest consumers of products and services. They can leverage their support for sustainable procurement to promote CFLs. This calls for local governments and municipalities to practice green procurement efforts with the installation and promotion of efficient lighting.
9. In anticipation of the widespread transformation to CFLs in the region, management strategies for environmentally sound recycling and disposal of CFLs at their end-of-life should be integrated into electronic waste policies and should include take-back schemes in collaboration with CFL producers.

- It is highly recommended that an integrated approach to the phase- out of inefficient lighting technologies be adopted. Countries should join the voluntary partnership proposed by the UNEP/GEF en.lighten initiative to develop national programs for efficient lighting and then disseminate the positive aspects about being a part of such a partnership. As explained throughout this report, an integrated approach includes:
    - The establishment of Minimum Energy Performance Standards (MEPS) across all lighting technologies
    - Monitoring, Verification and Enforcement (MVE) programs to eliminate the distribution of non-compliant products through; inspections, product testing, accreditation systems, fines, laboratory capacity development or strengthening, and/or other relevant activities
    - Waste Management by establishing maximum hazardous content limits to safeguard health and the environment. This also includes plans for the collection and the environmentally sound disposal and/or recycling of bulbs. This could be part of national electronic waste management strategy
    - Supporting policies to help restrict the supply of inefficient lighting and to promote demand for MEPS-compliant products, such as:
        - Regulatory and control
        - Economic and market-based
        - Fiscal instruments and incentives

- Support, information, and voluntary action

- Communications activities to explain the rationale and protocol for each of these measures to key stakeholders

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APPENDIX (1)
Questionnaire on
Efficient Lighting Initiatives in the Middle East and North Africa

Dear Colleague,

Please take few minutes to provide answers to the following questions regarding national initiatives to promote efficient lighting systems in your country.

This information will be used to develop a Regional Report on Efficient Lighting in the Middle East and North Africa sponsored by UNEP. The report will be made available to all concerned stakeholders.

Country: _____
Name of respondent: _____
Organization: _____

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1. How much electricity is used to provide lighting services at a national level?

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2. What is the share of lighting in the total electricity demand?

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3. Are there any national policy/strategy/programs to promote efficient lighting systems?

   Please provide any available documentation/information sources.

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4. Are there any mandatory/voluntary minimum energy efficiency standards for lighting?

   Please provide any available documentation/information sources

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5. Are there any mandatory/voluntary labeling and certification programs for lighting?

   Please provide any available documentation/information sources

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6. Are there any energy efficiency codes for building?

   Please provide any available documentation/information sources

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7. Please indicate which of the following policy instruments are used to promote efficient lighting.

   Please provide any available documentation/information sources

Policy instruments	Existence	Remarks
Energy efficiency obligations/quotas		
Energy service performance contracts (ESCOs)		
Loans (soft/commercial)		
Financial leasing		
Taxation		
Subsidies		
Grants and rebates		
Public education campaigns		
Voluntary agreements		
Custom duties reduction/exemptions		

8. Are there any end-of-life initiatives for lamps (collection, recycling, disposal)?

   Please provide any available documentation/information sources

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9. Are there any public-private partnership initiatives on efficient lighting?

   Please provide any available documentation/information sources

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10. Are there any national testing capabilities (accredited testing labs)?

    Please provide any available documentation/information sources

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11. Is there any national capability for lamp production?

    Please provide any available documents/information sources

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12. Please provide any additional information on national initiatives to promote efficient lighting.

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Thank you for taking time to provide this information. Your prompt response is highly appreciated. If you have any questions, please contact me.

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