Report on the transition to energy efficient lighting in Latin America and the Caribbean

UNEP/GEF en.lighten & REGATTA initiatives in cooperation with OLADE

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Executive Summary

This brief report has been developed in the framework of the IV Seminar on Energy Efficiency in Latin America and the Caribbean (OLADE/UNEP/CNE) by the United Nations Environment Programme, through its initiatives en.lighten seeking to phase out inefficient lighting globally and the Regional Gateway for Technology Transfer and Climate Change Action in Latin America and the Caribbean (REGATTA). The report has been developed with the support and the technical cooperation of the Latin American Energy Organization (OLADE) through its Energy Efficiency Coordination.

The objective of this document is to present to the participants of the IV Seminar on Energy Efficiency, and other relevant actors in the region – including governments, private sector organizations, civil society and international agencies – information concerning the status of the transition towards efficient lighting in Latin America and the Caribbean. The report addresses particularly the phase-out of inefficient incandescent lamps in the region, based on the multiple environmental, energy and financial advantages related to this transition. The document presents the advantages of efficient lighting, the main obstacles on the way towards an effective transition, the main activities and approaches developed by several countries in the region, and also indications to make of the region the first developing region free of incandescent lamps.

Preliminary estimations made by UNEP in 2010 in 20 countries of the region show that with just a simple switch from incandescent to compact fluorescent lamps (CFLs), these countries together could save up to 37.5 TWh per year, which averages to about 4% of their overall electric consumption. The phase-out would generate a reduction of CO2 emissions of 16.7 million tons, which would be the same as taking 4 million vehicles off the roads. As regards to financial savings, countries could save more than 4 billion dollars per year in reduced electricity bills. There is much more potential to be achieved in phasing out other inefficient technologies in other sectors such as street lighting, commercial or industrial sectors, or through the use of light sensors and controls. These sectors shall be object of future studies and assessments devised by UNEP. The concise recommendations made in this report are based on many of the successful examples which have already been implemented in different countries of Latin America and the Caribbean.

The information used to develop this report originates from different official sources, articles, publications and contacts held with Ministries and pertinent agencies in the region. Even efforts have been made to include the latest information; there report may include potential gaps concerning the status of activities in countries. These potential gaps 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.

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1. Climate change and the influence of lighting

Climate change is one of the key challenges confronted by humankind; the increase in the concentrations of carbon dioxide (CO2), methane, nitrate oxides and chlorofluorocarbons in the atmosphere as a result of human activities, produce the progressive warming of the Earth through the green house effect.

Due to their extent, these problems became a concern for the international community in the 1980s. The United Nations called countries to gather in Rio de Janeiro, Brazil, for the Earth Summit in 1992 when the United Nations Framework Convention on Climate Change (UNFCCC) was signed, gathering the agreement of governments to reduce by the year 2000 greenhouse gas emissions to the levels of 1990, with the decisive support from developed countries, main actors responsible for the increase of the emissions. The latter also agreed to transfer technologies to the developing countries in order to tackle climate change.

Against this backdrop the last Conference of Parties of the UNFCCC (COP 16), which took place from November 29th to December 10th, 2010 in Cancun, Mexico, resolved to limit the increase of global temperature to a maximum of 2 degrees Celsius, establishing the need to reduce CO2 emissions by 25% to 40%, in order to prevent emissions from surpassing 32,000 million tons by the year 2020.

By the end of 2010, global CO2 emissions reached their highest level in history, surpassing by 5% the preceding record from 2008, reaching 30,600 million tons, a value not distant from the 2020 threshold of 32,000 million tons of CO2[1]. In fact, an increase in 2011 similar to the one registered in 2010 would raise total emissions this year to the levels foreseen for 2020, which would result in a very concerning situation according to IEA experts. However, there is still a chance to succeed, for which it would be imperative to undertake energetic, decisive and urgent actions. It is precisely under the light of all these actions that energy efficiency in the lighting sector is presented as one of the key potential solutions.

2. CO2 emissions related to electricity production and lighting in particular

The global challenge of reducing CO2 emissions involves several different sectors such as reforestation and forest protection or transport, but undoubtedly the energy sector is the main determining factor to reducing total CO2 emissions, being the registered levels for this sector in 2010 practically the levels envisaged for 2020[2].

1 The Guardian (29 mayo 2011). Ailing UN Climate talks jolted by record surge in Greenhouse Gases http://www.guardian.co.uk/environment/2011/may/29/record-greenhouse-gases-jolt-bonn-climate-talks

2 International Energy Agency (May 30 2011). Prospect of limiting the global increase in temperature to 2 degrees Celsius is getting bleaker. IEA, http://www.iea.org.

According to estimations developed by the International Energy Agency, global electricity generation was responsible for 44.7% of total emissions in 2010 (13,700 million tons)[3], making of this sector a key component of any effective measure aimed at mitigating climate change. It is fundamental to increase the efficiency of the energy sector and all its components, and pursue energy efficiency actions by introducing latest available technologies. According to the International Energy Agency, electricity used for lighting at a global scale is responsible for 19% of total final electricity consumption[4]. Phasing out inefficient lighting systems and replacing them with energy efficient systems is a key alternative that will result in important electricity savings and emission reductions. The practical implementation of such transition is very simple, investments provide a fast return and they represent a critical action to build the trust and credibility required for the rest of energy efficiency actions to count with enough support to guarantee their implementation.

During the next 20 years, global electricity consumption for lighting is expected to grow by 60%[5]. In this context the use of efficient technologies would reduce the specific weight of its electricity consumption from 19% registered today to 7% of the world's total electricity consumption.

3. Some obstacles in the promotion of efficient lighting

Energy saving lamps (or compact fluorescent lamps, CFLs) are highly efficient and attractive from a financial point of view, based on the savings they produce. World estimates calculate that the average recovery time of the investment on CFLs is of about one year[6]. However, there are several obstacles blocking the way towards the wide adoption of this technology. Some of these obstacles are referred to in this section.

3.1 Need to implement product quality systems

Many countries have experienced negative situations with low quality CFL bulbs, which in many cases have flooded their markets and created disappointments over 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)[7]. In 2010, this amount decreased to one third (USAID, ECO-Asia, April 2010)[8]. 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

3 IEA Calculations (2011). http://www.iea.org

4 Light's Labour's Lost, International Energy Agency (2006)

5 Ibid

6 Country Lighting Assessments, UNEP/GEF en.lighten initiative (2010) Consulted in: http://www.enlighten-initiative.org/CountryLightingAssessments/tabid/29601/Default.aspx

7 Confidence in Quality: Harmonization of CFLs to Help Asia Address Climate Change. USAID Asia. October 2007.

8 Quality Control and Market Supervision of Compact Fluorescent Lamps in China. USAID Asia. April 2010

through appropriate testing and certification mechanisms can greatly assist in building trust among consumers and overcoming this obstacle.

3.2 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 with a higher initial cost. This, compounded with their high initial 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 barrier.

3.3 Split incentives

Those who make decisions about lighting equipment may not necessarily be the ones who pay directly for the system's energy use. Owners try normally to minimize the purchase costs of the installed systems while residents seek to reduce the cost of their electricity bills. Thus, there is a generalized lack of incentives to invest in energy efficiency equipment which would benefit the resident or renter. In addition, public 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[9].

3.4 Risk perception over CFLs

Concerns over the risk caused by the mercury contents of CFLs with regard to health and the environment are widespread in many societies. However, a CFL has an average content of 5 to 4 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 [10] provides a best practice example in this sense, reducing the amount of mercury in CFLs to 2.5mg. There is no reason not to reduce the mercury amount in CFLs to this minimum. Some manufacturers even produce CFLs with 1mg of mercury.

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

10 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 .

In addition, it is important to share information and guidance on what steps to take in case of breakage of CFLs (the US EPA[11], many manufacturers as well as regional and national authorities have developed good materials in this sense to inform consumers).

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 in the environment (European Union, South Africa, Philippines, Colombia, India, etc). A number of concerns have been raised regarding the effectiveness of these approaches for example, in the European Union, where the collection rates vary significantly between Scandinavian and Mediterranean countries. This also applies to other hazardous wastes 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[12], 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 turn recycling into a financially interesting activity for the recovery sector, offering the possibility to generate new economic activities and employment.

In conclusion, energy-efficient lamps are economical, commercially viable and technologically available, but due to several barriers, they have not reached the market penetration rate that they could under simple economic reasons. It is therefore necessary to promote a certain degree of market intervention at both national and international levels. A growing number of countries have already taken action in this sense, providing a wealth of information and experiences for other countries interested in promoting efficient lighting. There is no reason to repeat the errors of the front runner countries, information is already available and it is comprehensive enough for countries interested in phasing-out inefficient lighting to understand how to do it effectively and successfully.

4. 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 designing 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 cases additional voluntary measures have been adopted to support the transition.

In Latin America, Cuba was the first country to apply regulatory measures to phase-out incandescent lamps (2005). Since then, other countries have followed the example or will do in the near future, including Argentina (2010), Ecuador (2010), Brazil, Mexico and Colombia (2012).

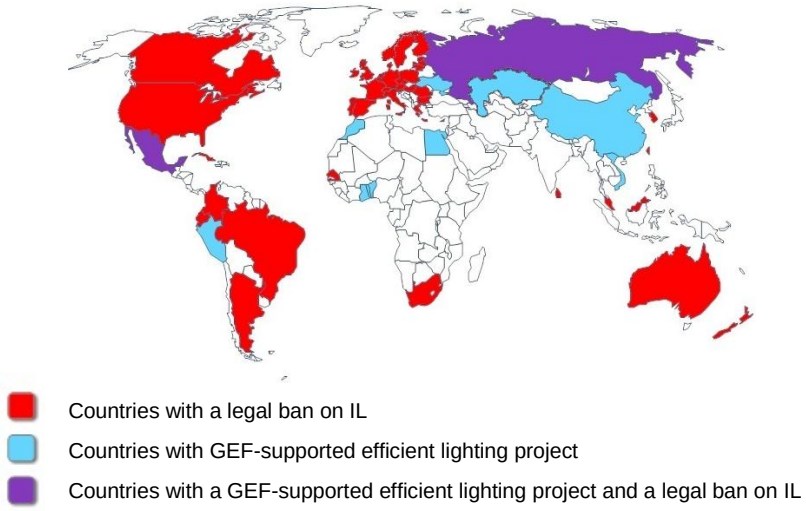
11 United States Environmental Protection Agency, 2011. Consulted in http://www.epa.gov/cfl/cflcleanup.pdf.

12 http://www.unep.org/hazardoussubstances/MercuryNot/MercuryNegotiations/tabid/3320/language/en-US/Default.aspx

In most of these cases the preferred approach to 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 the established requirements 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 – many of them in Latin America and the Caribbean and also in other continents – including China, Indonesia, Vietnam, India, South Africa, Thailand and the Philippines, have implemented promotion programs and in some cases even free CFL distribution programs, or have distributed them at a considerably lower price (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 efficacy of previously implemented promotional programs (i.e.: China, South Africa, the Philippines, Vietnam). Sri Lanka, Taiwan and Malaysia banned incandescent lamps through legislation.

Figure 1: Countries with a ban legislation on incandescent technologies and countries implementing national efficient lighting promotion projects with GEF support



4.1 The en.lighten initiative: objectives and scope

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

UNEP/en.lighten was created to gather the best international practices on this subject and propose a global roadmap to the international community in order to achieve this transition in the shortest time possible. This roadmap shall be based on the main experiences of transition programs developed successfully in different parts of the world, and the contribution of

knowledge from renowned experts of public and private institutions and international organizations specialized in the different key aspects of the topic.

Due to the wide sectoral coverage of efficient lighting, encompassing residential, commercial and public lighting, the first generation of recommendations provided by UNEP will be focused on the replacement of incandescent lamps. The reason for this is the high percentage of savings and emission reductions that may be achieved by materializing this objective. The second work phase shall begin in 2012 and shall include the above mentioned lighting sectors.

In order to carry out this task, several expert task forces were created, counting with the support of more than 40 organizations from developing and developed countries, governments, civil society, private sector, international organizations, etc. The expert task forces share knowledge and information, discuss regulatory frameworks and approaches, tackle technical, quality, efficiency, and financial issues in order to execute the transition in the most effective way, and adapted to the specific conditions of countries.

The en.lighten initiative established in September 2010 four international expert task forces (including representatives from Brazil, Cuba and Uruguay). Based on expert feedback the initiative is now integrating its best practices and recommendations on an *Efficient Lighting Toolkit*, which will be available in the last quarter of 2011 and will address the following efficient lighting areas:

4.1.1 The advantages of efficient lighting

This area deals with the potential of efficient lighting in terms of energy savings, CO2 emission reductions and financial savings. Estimates on the savings potential of an efficient lighting transition in the residential sector are presented here, providing guidance on how these assessments can be done. In addition, most common obstacles to the transition to efficient lighting are mentioned, along with ways to overcome them.

4.1.2 Policies and Regulations

This section provides practical information about the development of policies and regulatory approaches that countries may use to promote efficient lighting. It also includes examples of the best practices in countries that have approved regulatory frameworks to develop a transition program. Some of the subjects treated are the following:

- How to begin a transition strategy to efficient lighting.
- Assessment of national infrastructure to achieve the transition.
- Mechanisms to support the penetration of efficient lighting.
- How to implement surveillance, verification and enforcement programs.
- Developing and strengthening testing, laboratory and accreditation capacities.

4.1.3 Norms and technical aspects

In this section lighting norms are clearly discussed, emphasizing product performance and minimum efficiency requirements the most common types of lamps must satisfy. It also offers a general outlook of the tests to be performed and how to establish or improve national norms and standards in function of international regulations in place.

4.1.4 Financial mechanisms

This component introduces mechanisms and models that may be used to assist countries in financing the transition to efficient lighting, such as:

- Business models including utility-demand systems, private-public partnerships and energy services companies (ESCOS).
- Private financing including payment through installments, bank loans, financial leasing, donations or bilateral financing through donor and international organizations.
- Tax regulations, import rights and tax reduction schemes.
- Public financing, including subsidies and incentives.
- Carbon financing including CDM and NAMAs.

4.1.5 Environment and health, including end of life treatment of lamps

This component provides information on the life cycle of lamps, including data on the production phase in which materials and substances included in the lamps are provided. It also includes information about global best practice on the use and levels of hazardous substances in lamps. For the usage phase of a lamp, the focus is made on transferring clear and non biased information to customers concerning the environmental impact of the substances contained in the lamps and security measures during their use. The section includes information on the international policy framework for the environmentally sound management of lamps and best practices concerning collection, recycling and end disposal of lamps, as well as a general overview of existing lamp recycling technologies.

4.1.6 Communications, awareness and participation of stakeholders

This section provides practical information and suggestions about awareness raising campaigns for customers, labels and fundamental parameters of lamps. Security, quality, cost, reliability, energy, lifespan, saving and presentation are all discussed as well. This section includes also an array of different incandescent lamp replacements and a guide on how to choose the most appropriate ones.

Currently the first stage of the work of the task forces has been completed. On the basis of their recommendations, a market transformation methodology and a global efficient lighting roadmap

are being completed including steps to undertake a successful transition to efficient lighting. The goal is now sharing these recommendations among countries in order to seek comments and suggestions that eventually lead to its generalized implementation. The second phase of the initiative begins therefore with actions that help disseminate this methodology globally among experts and decision makers from countries which may lead transition initiatives. This phase foresees the organization and development of meetings and seminars in each major region, with the participation of experts from the energy and environmental sectors from all the countries. The IV Seminar on Energy Efficiency in Latin America and the Caribbean is the first of the scheduled regional meetings organized jointly between UNEP and the Latin American Energy Organization (OLADE).

4.1.7 Technical support possibilities for countries interested in starting the transition

The en.lighten initiative will also provide technical assistance to countries interested in making use of the proposed methodology to undertake the transition to efficient lighting through the phase out of incandescent lamps. Support will include provision of international technical advice to government officials to assist them in the design and implementation national transition programs adapted to the specific needs and conditions.

5. Estimated benefits of the phase-out of incandescent lamps in 20 countries of the region

In 2010, UNEP/GEF through the en.lighten initiative, developed estimations on 100 countries with the objective of calculating the potential of electricity savings, emission reductions and the resulting economic benefits accrued from phasing out inefficient lighting (ILs) and replacing them with efficient technologies (CFLs)[13]. Out of the 100 countries analyzed, 20 were from Latin America and the Caribbean. The results obtained from these calculations in 2009 are provided in Table 1:

13 Complete information on each country available on the UNEP/GEF en.lighten initiative website: http://www.enlighten-initiative.org/CountryLightingAssessments/tabid/29601/Default.aspx

Table 1: Results of the estimations of the transition to CFLs in the region

Country	Consumption Savings (TwH)	% savings electricity use	CO2 emissions savings (Mt)	% reduction CO2 emissions	Financial savings (million USD)	Medium-sized cars off the road	Amortization (years)
Guatemala	0.7	9.7	0.5	4.0	104	116,783	0.5
Nicaragua	0.2	8.4	0.1	2.2	22	24,748	0.7
El Salvador	0.4	6.5	0.3	4.1	52	63,204	0.6
Honduras	0.3	6.3	0.2	2.8	19	57,236	1.4
Argentina	5.8	5.5	2.8	1.7	351	708,900	1.3
Paraguay	0.3	4.7	0.0	0.0	17		1.4
Dominican Republic	0.6	5.0	0.4	2.0	109	98,532	0.5
Peru	1.4	4.7	0.7	2.4	104	183,540	1.1
Colombia	2.0	4.7	0.8	1.3	202	188,232	0.8
Mexico	9.0	4.5	5.0	1.1	897	1,246,830	1.2
Ecuador	0.5	3.8	0.3	1.1	46	76,475	0.8
Bolivia	0.2	4.2	0.1	0.9	13	26,749	1.4
Costa Rica	0.3	3.3	0.1	0.9	28	15,180	0.8
Brazil	12.4	3.0	4.0	1.1	2,111	993,600	0.5
Jamaica	0.2	2.4	0.1	1.0	21	32,160	0.7
Uruguay	0.2	3.0	0.1	2.4	12	33,695	1.4
Venezuela	1.7	2.1	0.4	0.3	85	90,632	1.3
Chile	1.0	1.8	0.5	0.6	118	115,127	0.7
Panama	0.1	2.6	0.1	1.5	17	23,943	0.7
Trinidad & Tobago	0.1	1.0	0.1	0.2	4	14,154	1.5
TOTAL	37.4	3.7	16.4	1.2	4,329	4,109,719	1.0

The 20 countries analyzed from Latin America and the Caribbean have a yearly electricity consumption of 1,013 TWh. This consumption emits 1,400 million tons of CO2 per year. The most consuming countries are Brazil, Mexico and Argentina. These three countries consume about 70% of the total electricity consumed in the region. Phasing out inefficient lighting would reduce electricity consumption by 37,4 TWh per year, representing almost a 4% of the total electricity consumption. Emissions would be reduced by 16.4 Mt CO2. This reduction would be equal to taking about 4 million vehicles off the roads in the region.

There is still much more 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 and controls. These sectors shall be the object of study of following phases of the work plan of the different organizations involved in the development of this report.

6. National initiatives in Latin America and the Caribbean in order to achieve the transition to efficient lighting

The accelerated rise of fuel prices, the worsening of climate change and the good results obtained from the experience of some countries in the region have turned inefficient lighting phase out programs into an almost generalized initiative in the region since the end of the last century. Taking as a reference the report “Situation and Perspective of Energy Efficiency in Latin America and the Caribbean” developed by UN-ECLAC and OLADE in 2009, specialized articles, up to date information generated by Ministries of Energy through surveys shared by UNEP, and information available from initiatives developed in the framework of Petrocaribe, this

section presents a short summary on the situation of efficient lighting in the countries of the region for which information is available. The report analyzes diverse areas of interest about the transition to efficient lighting. The broad areas analyzed by the report are the following:

- Regulatory framework and promotion mechanisms implemented in countries to foster efficient lighting (for example, regulations, minimum efficiency standards, labels, etc.);

- Characteristics and results of the inefficient lamp replacement programs;

- Mechanisms to ensure environmental sustainability, such as lamp collection, recycling and disposal systems, as well as public campaigns.

6.1 ARGENTINA

6.1.1 Regulations and promotion mechanisms

In January 2009 Argentina issued Law number 26,473 banning the import and sale in the country of ILs of 25 Watts and higher, as of December 31st, 2010. Additionally, Argentina established through the PRONUREE decree (decree N. 140/07) efficiency, technical and quality parameters that must be satisfied by compact fluorescent lamps (CFLs). This decree also includes a mandatory labeling system in order to ensure the efficiency of light technologies in the market.

6.1.2 Lamp distribution programs

Through its Resolution 8/08 endorsed by the Energy Secretariat in 2008, Argentina implemented a lamp replacement program, in which workers of the sector, with financing from the government, replaced 2 ILs for 2 CFLs for each family in the country, totalizing 25 million CFLs distributed. This program boosted CFL sales: in the 2008-2010 period, an additional 107 million CFLs were sold.

The installation of 132 million CFLs in the last 3 years saved 2,200 million kWh a year and reduced CO2 emissions by 1.1 million tons a year.

6.1.3 Sustainability

Studies carried out by the University of Buenos Aires on the environmental impact of the massive introduction of CFLs in the country indicated that if mishandled massively, the impact of the mercury contained in the CFLs would be lower than the CO2, mercury and other GHG emissions reduction derived from the reduction of the electricity generation.

Regardless of these conclusions, and in view of maximizing the reduction of mercury emissions, Argentina is currently in the process of approving a regulation requiring manufacturers and importers to execute the collection and recycling of CFLs.

6.2 BOLIVIA

6.2.1 Regulations and promotion mechanisms

Bolivia is currently elaborating a legal framework to phase out gradually the import of ILs through customs policies foreseeing the increase of taxes to imports of ILs and lowering at the same time customs taxes for efficient lamps.

The country is also working to establish quality standards and technical regulations through a certification and verification institution such as the Bolivian Institute of Regulations and Quality (IBNORCA, IBMETRO, among others).

6.2.2 Lamp distribution programs

Bolivia developed a lamp replacement program, carried out by young Bolivians and workers. A total of 8,509,691 CFLs were installed in Bolivia. Energy saved reaches 161.7 GWh / year and CO2 emissions were reduced by 1,890 Ton / year.

Currently, CFLs installed in Bolivia in the framework of this program are reaching the end of their lifespan, and families, especially the lower income ones, are turning back to incandescent lighting. Thus, a new free IL replacement program is foreseen, subsidized with government funds.

6.2.3 Sustainability

Bolivia is also studying the possibility of installing in the country a CFL manufacturer, which would also be responsible of the recycling of CFLs at their end of life.

6.3 BRAZIL

6.3.1 Regulations and promotion mechanisms

The inter-ministerial Decree number 1,007 of December 31, 2010, established minimum energy efficiency standards based on the Energy Efficiency Law.

The gradual ban program established by this Decree will begin on June 30th 2012 with the phase out of incandescent lamps of 150 Watts and higher, and will end four years later with 25 watts and higher lamps. Importers and manufacturers will have six months to sell their inefficient products whereas distributors and dealers will have one year to do so.

Brazil has developed three minimum efficiency and quality levels of mandatory compliance for the commercialization of CFLs in the country.

6.3.2 Lamp distribution programs

Brazil estimates there are currently 250 million ILs in the residential sector. The country is implementing a phase out program to be completed by 2016. According to estimations, the country shall be capable of reaching a staggered saving by 2030 of up to 10,000 million Kwh a year, representing about 5 million tons of CO2 per year according to the average emission factor calculated by the Ministry of Science and Technology of Brazil.

6.3.3 Sustainability

Law number 12,305 of August 2, 2010, concerning the National Policy on Solid Waste, recently amended by Decree 7,404 of December 23, 2010, establishes that “manufacturers importers, distributors, dealers, customers and holders of street cleaning and solid waste management companies are responsible for the final treatment at the end of life of products”. Thus, the disposal and posterior recycling of this type of products must be leveled to the work foreseen by Ordinance N. 1,007.

On the other hand, there are several initiatives in place dealing with the recycling of fluorescent lamps of all types, of all concerned sectors seeking to reach sustainability goals. The Ministry of Environment of Brazil expects to begin initiatives in the short term leading to the implementation and regulation of collection and recycling systems for efficient lamps.

6.4 CHILE

6.4.1 Regulations and promotion mechanisms

Since 2005 Chile established the National Energy Efficiency Certification and Labeling Program, applying to lamps and other articles of mandatory compliance throughout the country.

6.4.2 Lamp distribution programs

A National Lamp Replacement Program was developed, consisting in the distribution of efficient lamps in low income homes. The goal is to encompass 90% of this sector through the distribution of about 3,000,000 efficient lamps, which would mean a saving of about 225 million Kwh a year (equivalent to the generation of one 205 MW power plant). This is the first public project including a reduction of GHG emissions. The program envisages that each new low income home is equipped with efficient lamps.

6.4.3 Sustainability

Information unavailable.

6.5 COLOMBIA

6.5.1 Regulations and promotion mechanisms

The Colombian government started the change of inefficient bulbs in public buildings. Moreover, the government issued measures aimed at promoting the rational and efficient use of energy which led to the ban of incandescent lamps in January 2011. In the framework of the local program for the Rational and Efficient use of Energy and other forms of non conventional energy, the minimum energy efficiency requirements for CFLs have been developed.

6.5.2 Lamp distribution programs

Colombia recently worked on local replacement programs and pilots in order to encourage customers to move towards efficient lighting.

6.5.3 Sustainability

The Ministry of Environment, Housing and Territorial Development of Colombia is studying the development of the regulations to institutionalize the collection and recycling of mercury containing lamps.

6.6 COSTA RICA

6.6.1 Regulations and promotion mechanisms

In Costa Rica, Law 7447 is in force, concerning the Regulation of the Efficient Use of Energy. Costa Rica has an accredited laboratory in the Costa Rican Institute of Electricity, which plays a key role in the national energy efficiency normalization process, especially in CFL efficiency and public lighting lamps. They also guarantee the certification with a seal of energy efficiency in products, called ENERGICE.

6.6.2 Lamp distribution programs

In 2008 an Efficient Lamps Program was implemented in the residential sector. The initiative consisted in offering 3 CFLs to the population at the price of 2, the third one being financed by the Costa Rican Institute of Electricity. As of February 2009, the following results were obtained:

CFLs sold……1,475,224 units.
Saved Energy……..11,902 MWh.
CO2 avoided……..1,547 tons.

This project was accompanied strategically by an ad campaign focused on two elements, the first one, to transfer general savings advice, and the second one, to promote CFLs.

6.6.3 Sustainability

Information unavailable.

6.7 CUBA

6.7.1 Regulations and promotion mechanisms

Cuba banned the import and commercialization of incandescent lamps in 2005 and implemented a quality control program for the acquisition of CFLs in order to guarantee their efficiency and quality.

In 2009 the Ministry of Basic Industry of Cuba endorsed Resolution number 136 establishing the minimum efficiency, quality and security requirements that lamps must comply with in order to be imported, produced or commercialized in the country.

6.7.2 Lamp distribution programs

In 1997, Cuba organized the Cuban Energy Saving Program (PAEC), taking as reference experiences of Mexico and Peru, and developed a phase out program through the sale at subsidized prices of two CFL to each electricity customer. They also developed a communicational campaign aimed at raising the acceptance of these lamps in the population, and encouraging the replacement of lamps that stayed on most of the time. From 1998 to 2000 Cuba introduced about 3 million CFLs, and this in turn reduced by 150 MW the maximum demand of the electric system in peak hours, and electricity consumption by 216 million Kwh per year.

As of 2000, Cuba subsidized the sale of CFLs in order to reduce retailer prices. At the end of 2005, as part of the Energy Revolution Program in Cuba, a lamp replacement program begins, on a customer by customer basis (residential and non residential), replacing each incandescent lamp by a CFL of equal lighting power, offering the CFL for free in exchange for the incandescent lamp for its collection and later destruction.

With this program, Cuba replaced about 10 million incandescent lamps, reducing electricity consumption in the country by more than 720 million KWh, reducing its CO2 emissions in more than 1,300 million tons, and reducing its electricity demand in peak hours by more than 250 MW. This represents a saving in investments on new generation capabilities for over 300 million dollars.

6.7.3 Sustainability

Cuba established a program to collect linear fluorescent tubes, to later crush and store them in a safe place in order to prevent the mercury from being released to the environment. The country is also studying the implementation of a CFL collection system. One of the proposed variations is to reduce the sale price of the CFL if the customer turns in the spent and unbroken CFL.

6.8 ECUADOR

6.8.1 Regulations and promotion mechanisms

The country has a resolution from the External Commerce and Investment Council of Ecuador, COMEXI, which since 2010 prohibited the import of incandescent lamps for residential use in the range of 25 W to 100 W.

The Technical Ecuatorian Regulation RTE INEN 036 “Energy Efficiency, Compact Fluorescent Lamps. Energy Performance Ranges and Labeling” is in force, allowing commercialization of only A and B types of CFLs.

A COMEXI Resolution mandates the elimination of customs tax for A-type compact fluorescent lamps.

6.8.2 Lamp distribution programs

Ecuador launched an international tender of CFLs in 2007, acquiring 6 million CFLs and designed and organized its phase-out program based on international experience. It applied a subsidy policy on CFL wholesalers to reduce the retailer product price. Then it acquired other 5 million CFLs obtaining CDM credits.

The country has managed to replace about 12 million incandescent lamps which have achieved a saving of 1,051 million Kwh and a reduction in CO2 emissions of 662,000 annual tons. Recent estimations indicate that there are still about 18 million incandescent lamps installed in the country.

6.8.3 Sustainability

Currently the Ministry of Environment of Ecuador is starting a waste management program seeking to control the pollution of the spent CFLs.

6.9 HONDURAS

6.9.1 Regulations and promotion mechanisms

Honduras banned the import of incandescent lamps as of January 1, 2010. The Law on the Rational Use of Energy, soon to be approved, establishes the labeling of efficient appliances. The Normalization Office of Honduras shall be in charge of verifying the compliance of the mandatory regulations established on this regulatory framework.

6.9.2 Lamp distribution programs

In 2008 Honduras organized an incandescent lamp replacement program, executed by young Hondurans and workers of the sector. The number of installed CFLs was of 5,680,000. The government of Honduras estimates that the installation of CFLs has generated an energy savings of 98 million KWh a year and a reduction of CO2 emissions of 72,520 tons a year.

6.9.3 Sustainability

Information unavailable.

6.10 MEXICO

6.10.1 Regulations and promotion mechanisms

The full phase-out of incandescent is envisaged for the year 2015 according to the Official Mexican Regulation of December 2010 (NOM- 028 – ENER – 2010 Energy Efficiency of Lamps for General Use), establishing that 100 Watts and higher incandescent lamps for the residential sector may not be commercialized as of December 2011; 75 Watts as of December 2012 and 60 and 40 watts as of December 2013.

For the commercial and services sectors, the NOM establishes the minimum efficacy values (energy efficiency) that fluorescent lamps must comply with.

The National Program for the Sustainable Use of Energy 2009-2012 estimates that the endorsement of this norm shall result in a reduction of the energy consumption for lighting of about 48% by the year 2030, according to the baseline, with the corresponding savings of investments on energy generation.

The country counts with a national regulation establishing minimum quality, efficiency and security requirements that all efficient lamps in the market must comply with. The Official Mexican Norm setting minimum quality and security standards for CFLs is also in place (NOM-017-ENER/SCFI-208).

6.10.2 Lamp distribution programs

After several pilot projects as a part of the Energy Efficiency Program, Mexico developed the ILUMEX initiative from 1995 to 1998. It is the first significant phase-out program in the region, seeking to replace ILs with CFLs with a clear goal of increasing energy efficiency and reducing GHG emissions. It was one of the first GEF efficiency projects and was developed in the states of Guadalajara and Monterrey. ILUMEX was organized by the Federal Electricity Commission (CFE), which provided CFLs to low income customers in order to replace incandescent lamps. Customers paid for the lamps in installments, with no interest rates, through their monthly electricity bills.

ILUMEX managed to sell about 2.6 million CFLs bought through a tender. It also promoted a wide awareness campaign among the population, in order to diffuse the advantages of CFLs, resulting in an increase in their use. And, parting from this experience, the program was taken to other regions of Mexico where 10 million CFLs were introduced in the course of several years. Currently Mexico has more than 72.3 million inefficient lamps installed.

In 2010 a new phase-out program is underway with the financial support of the World Bank, seeking to install 45.8 million CFLs of very high quality in the years 2011-2012, saving 4,169 million KWh a year and reducing emissions by 2.78 million tons of CO2 per year.

6.10.3 Sustainability

A study of compact fluorescent lamp recycling centers is envisaged, and several projects are in place with the private sector in order to develop a collection and recycling mechanism.

6.11 NICARAGUA

6.11.1 Regulations and promotion mechanisms

Nicaragua is organizing a program to phase-out inefficient lighting for 2013-2014. As part of the regulations, they envisage the creation of mandatory technical regulations, incentives, low cost CFL distribution, and efficiency and quality regulations with a labeling system.

6.11.2 Lamp distribution programs

In 2006, Cuban experts shared knowledge with Nicaraguan specialists who then organized a replacement program to install 1.2 million CFLs, resulting in energy savings of 57.6 million KWh and a reduction of the emissions of 41,050 CO2 tons. Currently the country has about 2 million of installed inefficient lamps.

6.11.3 Sustainability

In Nicaragua several studies are under development for the treatment of CFLs at the end of life.

6.12 PANAMA

6.12.1 Regulations and promotion mechanisms

Panama is currently studying the possibility of establishing a regulatory framework to ban the commercialization of incandescent lamps. It also studies the possibility of establishing regulations to guarantee the minimum efficiency of the lighting technologies commercialized in the country.

6.12.2 Lamp distribution programs

In 2008, Panama organized a lamp replacement program executed by young Panamanians and workers using the Cuban methodology. The number of installed CFLs was of 2,993,154 units,

saving 2,550 million Kwh a year and reducing CO2 emissions by 145,000 tons a year. Currently, about 294,693 inefficient lamps are still installed in the country.

6.12.3 Sustainability

Panama envisages implementing an education and capacity building program, in order to promote the correct handling of CFLs at the end of their lifespan.

6.13 PERU

6.13.1 Regulations and promotion mechanisms

The government of Peru expects to eliminate all inefficient lamps by the year 2018 through the use of the following tools:

- The introduction of mandatory use energy efficiency labels in lighting technologies (by 2012). There are 19 Peruvian technical regulations (NTP) on lighting.

- The promotion of efficient lighting technologies in street, public, residential, industrial and commercial lighting.

- The MEM-GEF-UNDP Project “Energy Efficiency Regulatory Framework and Labeling in Peru”, which is expected to set mandatory efficiency and quality standards in the lighting sector.

- The MEM-GEF-UNEP Project “Transformation of the Lighting Market in Peru”, which includes as one of its main components the progressive phase out of inefficient lighting, through the use of market mechanisms and quality control of efficient lamps.

6.13.2 Lamp distribution programs

In 1996, due to a deficit in the electricity generation system, Peru organized the Energy Saving Program (PAE), which resulted in a very successful incandescent lamp replacement, based on a very effective communications campaign using a wide range of media. This campaign managed to create a trend in the population to replace ILs with CFLs. 1.5 million CFLs were commercialized at market prices despite the fact that these prices were several times higher than the price of incandescent lamps. As a result of this program, the maximum demand at peak hour was reduced by 53 MW, 77.4 million Kwh were saved and CO2 emissions were reduced by 43,000 tons.

6.13.3 Sustainability

There is no CFL collection system in place for CFLs in Peru. Concerned agencies are soon to propose a plan. Through the GEF/UNEP project, a proposal may be designed and implemented in order to create an effective collection and recycling system for spent lamps.

6.14 DOMINICAN REPUBLIC

6.14.1 Regulations and promotion mechanisms

The Government of the Dominican Republic is considering the adoption of measures to phase out incandescent lamps from the market.

6.14.2 Lamp distribution programs

In 2009, the Dominican Republic acquired 13 million CFLs and organized a lamp replacement program. According to the Dominican authorities' estimates, this replacement reduced the demand during peak hours by about 200 MW. The total cost of the project was of 25 million dollars.

6.14.3 Sustainability

Information unavailable.

6.15 URUGUAY

6.15.1 Regulations and promotion mechanisms

On April 1, 2010, mandatory efficiency labels for compact fluorescent lamps were enacted through a mandatory standard (Decrees numbers 429/009 and 428/009). A mandatory label for incandescent lamps is expected to be in force in 2012. This mandatory label will establish minimum efficiency and quality standards for lamps.

As of January 1, 2010, public authorities can only procure efficient lamps (Decree number 152/010). It is also envisaged to create promotional campaigns to inform customers and raise their awareness in order to promote the use of CFLs.

A tax regime is under consideration in order to reduce the price difference between efficient and inefficient lamps.

6.15.2 Lamp distribution programs

Through an international tender Uruguay acquired in 2008 14 Watt compact fluorescent lamps, and organized a replacement program for the residential sector, based on the exchange of two CFLs for two Incandescent lamps. According to estimates in December 2010, 1,840,742 incandescent lamps have been replaced, obtaining a saving of 117.6 million KWh per year and reducing CO2 emissions in 2010 by 72,100 Tons per year. Current estimates indicate that the country still has 7,315,416 installed incandescent lamps.

6.15.3 Sustainability

Currently the country develops the project "Rational Management of Mercury-containing Products in Uruguay", coordinated by the National Direction on the Environment (DINAMA), along with UNEP, UNIDO and the Basel Center in Uruguay. Through this project concerning mercury lamps, the following results are expected: national profile of mercury lamps, analysis of the lifespan cycle of mercury lamps, good practices' guide for the handling of mercury lamps and a management plan for lamps, which will start during the project implementation. The results shall be taken into account as a base to evaluate the feasibility of CFL recycling in the country.

6.16 PETROCARIBE COUNTRIES

6.16.1 Regulations and promotion mechanisms

According to the information available, lamp replacement programs in the Petrocaribe countries lacked regulatory measures concerning the ban of incandescent lamps.

6.16.2 Lamp distribution programs

In order to satisfy one of the main goals of Petrocaribe (achieving energy savings and protecting the environment), the Presidents Summit of this organization adopted in 2005 the decision to implementing the Cuban lamp replacement program in all the member countries. In 2006 the project development begins, and ends in 2007 with very good results, presented on Table 2:

TABLE 2: Results of the transition of incandescents to CFLs in Petrocaribe member countries, during the 2006-2007 period

Countries	*Installed CFLs*	*Peak hour demand reduction (MW)*	*Consumption reduction (million Kwh / year)*	*CO2 emissions reduction (thousand Ton / year)*	*Financial savings 1st year (million USD)*
Haiti	*2,366,768*	*0086.3*	*334.2*	*220*	*151.7*
Suriname	*445,538*	*18.8*	*69.8*	*40*	*29.1*
Jamaica	*3,010,493*	*93.3*	*340.6*	*200*	*158.6*
St. Kitts and Nevis	*210,603*	*2.2*	*8.2*	*5*	*4.2*
St. Vicent and the Grenadines	*235,029*	*3.5*	*15.0*	*9*	*6.4*
Grenada	*133,253*	*1.9*	*10.2*	*7*	*3.5*
Guyana	*633,268*	*16.2*	*59.3*	*34*	*26.0*
Belize	*173,412*	*2.1*	*16.8*	*10*	*5.6*
Dominica	*191,528*	*3.3*	*12.0*	*7*	*5.6*
Venezuela	*68,522,781*	*1,800.0*	*2,675.0*	*3,280*	*3,719.20*
Antigua and Barbuda	*176,672*	*5.0*	*21.1*	*12*	*8.7*
TOTAL	***76,707,183***	***2,209.3***	***11,208.3***	***3,824***	***4,084.2***

All the projects of Petrocaribe countries were implemented through house by house visits, replacing all the installed incandescent lamps by corresponding CFLs. Venezuela and Haiti are presently implementing replacements in non-residential sectors as well.

6.16.3 Sustainability

These programs lacked regulatory measures to guarantee their sustainability once the distributed CFLs reached the end of life.

7. General conclusions for the region

Generally speaking, the region counts with very positive experiences concerning the promotion of efficient lighting. At least 25 countries – 21 of them being OLADE members – have developed programs to replace incandescent lamps with CFLs, in the framework of public programs. These replacements were motivated to a greater or smaller extent by electricity generation crises, as a result of energy efficiency programs or through regional or international cooperation. Results concerning limiting power shortages, increasing generation reserves and bypassing the investment on new power generation capacities at a high cost were in all cases highly positive.

However, an important limitation in the lamp promotion programs is that in a large number of cases, once the distribution was over, it was not accompanied by legislation aimed at phasing out gradually inefficient technologies from the market (through the establishment of minimum efficiency standards). At least seven countries in the region learned from their positive experiences and implemented or plan to implement a gradual ban on incandescent

technologies. However, this is not being generalized yet. In those countries in which the replacement has taken place but has not been accompanied by a ban, there are high chances of experiencing future generation limitations and having the population turn back to inefficient lamps due to their lower purchase cost.

It is important to highlight that nine countries in the region have established a regulation on the minimum efficiency and quality levels that CFLs must comply with in order to be commercialized in the country.

Some countries have used tax policies to promote CFLs and discourage the purchase of inefficient lamps. This type of measures may be useful to support the gradual ban on inefficient lighting.

There are also some countries which have implemented labels on efficient products. There is insufficient information to know whether the labeling by itself is a strong enough condition to promote the use of efficient lighting. Other considerations, such as the low price of inefficient lamps, seek to further influence this decision, especially in the middle and lower layers of the population.

The report has not gathered enough information about monitoring, verification and enforcement (MVE) for those countries which have mandatory standards. In countries in which the switch to CFLs has been regulated, it is important to implement MVE in order to assure the success of the transition process. Certifications, import controls and the strengthening of national or regional laboratory and testing capabilities are important elements to guarantee the quality of products.

Only a few countries have adopted CFL collection, recycling or end of life programs. Based on the direction of the lighting market and international negotiations in mires of reaching an international agreement to limit and regulate the use of mercury, countries in the region may want to consider leaping forward towards establishing programs and activities addressing this issue.

Additionally, it is imperative to highlight that the significant experiences developed in practically all countries in the region that place Latin America and the Caribbean in a very advantageous position in order to attain a definite and sustainable transition towards efficient lighting through the gradual ban of incandescent lamps.

8. Aspects to take into consideration in order to achieve transition to efficient lighting in an effective and sustainable way

The experiences accumulated in several countries of Latin America and the Caribbean concerning transition programs constitute a great strength in order to promote future activities. It is important however to make a summary of current obstacles and aspects to take into account in this matter:

- It is important to create the necessary political will to promote a complete transition to efficient lighting in the shortest time possible, in light of the easiness of the move, the speediness of the transition, the small investments required and the significant savings and CO2 emissions reductions that stand to be made. This scenario provides a win-win for customers, governments and the environment.

- It is imperative that countries that have not done so define and adopt a regulatory framework that guarantees a sustainable and successful – and not just temporary – transition to efficient lighting, especially concerning:

    - The gradual phase out of inefficient lamps from the market in the shortest time possible, according to the circumstances and specific needs of each country.

    - Guarantee the quality, efficiency, security and variety for different uses of efficient lighting products offered to the population during the transition and later in the market.

    - Mitigate potential barriers related to the higher price of efficient lighting technologies, especially due to their impacts on lower layers of society and impoverished communities.

    - Articulate sustainable and effective systems to guarantee the collection, recycling and/or final disposal, as appropriate, of efficient lamps at the end of life, therefore avoiding potential environmental and health impacts.

- Convert the experience of the already successfully implemented lamp distribution and replacement programs into base grounds for the practical materialization of future energy efficiency initiatives.

- The relevance of promoting awareness in society, especially among the young, which takes into account the importance of the transition to efficient lighting and energy efficiency.

- It is critical that those countries with inefficient lighting industry reconvert it to efficient lighting production. As long as there are inefficient lighting manufacturers in the region, the transition will not be total.

- The design and development of communication strategies which produce awareness on the financial benefits related to the transition in reduced energy bills, country-scale benefits by avoiding expensive investments on new generation capabilities which, added to the energy savings, make the national economy more competitive and increase the benefit associated to the reduction of GHG emissions, making climate change mitigation more effective.

9. Strengths of the region in order to develop the process of transition towards efficient lighting

1. The overall transition to efficient lighting in the 20 countries of the region where information has been collected; point at reductions of electricity consumption by 37,400 million KWh/ year (almost a 4% of the total electricity consumption) and 16.7 million tons of CO2 per year would be avoided. The economic benefit is of over 4 billion dollars.

2. The great variety of lessons learned in the implementation of transition processes to in the region provide a wide range of examples to achieve success. These examples can be critical to inform the rest of countries in the region to initiate their own sustainable and complete transitions.

3. The region counts with the support of the Latin American Energy Organization (OLADE) which has been working continuously in the last years in the consolidation of Energy Efficiency programs, and is engaged in consolidating the transition to efficient lighting, as a first phase of the efficiency programs. This, along with the technical support that UNEP/GEF is willing to facilitate through the en.lighten initiative to countries which decide to implement initiatives to move in an integrated manner towards efficient lighting, may channel all the necessary assistance for countries that may require it.

4. The region counts with experts with vast practical experience in the organization and implementation of transition processes who are willing to share their experience and support the organization and implementation of transition programs in the region.

5. Most of the energy efficiency experts in the region (energy and environment fields) are convinced and fully support the individual, national and global advantages related to the transition towards efficient lighting.

6. The present situation in the region concerning this subject is completely favorable for Latin America and the Caribbean to become the first developing region that successfully achieves the transition towards efficient lighting through the phase out incandescent lamps. Therefore becoming a leader and a beacon for the rest of developing regions of the world.

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