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**Terminal Evaluation of the UN Environment/Global Environment  
Facility project “Global Market Transformation for Efficient  
Lighting” (en.lighten initiative)**

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**Final Report**



**Evaluation Office of UN Environment  
December 2017**



## Evaluation Office of UN Environment

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<http://economicdevelopment.org/2015/04/the-evolution-of-led/>

<https://energy.gov/energysaver/fluorescent-lighting>

<https://energy.gov/energysaver/led-lighting>

<http://www.anh-usa.org/compact-fluorescent-light-bulbs-a-new-cancer-risk-in-your-home/>

<http://www.ambilamp.es/en/installer>

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This terminal evaluation was undertaken prior to a new UN Environment Programme directive on the visual identity of the organisation, which replaces previous reference to the organisation as 'UNEP', with 'UN Environment'. This terminal evaluation report, having reached an advanced stage prior to the official directive, has retained the name 'UNEP' throughout to refer to the organisation.

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Terminal Evaluation of the UN Environment/Global Environment Facility project "Global Market Transformation for Efficient Lighting" (GEF ID 3457)

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## ABOUT THE EVALUATION<sup>1</sup>

**Report Language(s):** English

**Evaluation Type:** Terminal Project Evaluations

**Brief Description:** This report is a terminal evaluation of a UN Environment-GEF project, known as en.lighten initiative, implemented between 2010 and 2015. The evaluation has two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UN Environment, the GEF, and their partners, and the relevant agencies of the project participating countries.

**Key words:** En.lighten; market transformation; energy efficiency; efficient lighting; CFL; LED; technology; market barriers

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<sup>1</sup> This data is used to aid the internet search of this report on the Evaluation Office of UN Environment Website

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## List of acronyms & abbreviations

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ADEME	Agence de l'Environnement et de la Maîtrise de l'Énergie.
AusAID	Australian Agency for International Development
BMZ	Federal Ministry for Economic Cooperation and Development, Germany.
CFL	Compact fluorescent lamp
CLA	Country Lighting Assessment
CTCN	Climate Technology Centre and Network
DSM	Demand Side Management
ECOWAS	Economic Community of West African States
EE	Energy Efficiency
en.lighten	Efficient lighting for developing and emerging countries
EEL	Energy Efficient Light (here most commonly compact fluorescent lamps)
EO	Evaluation Office (UNEP)
FL	Fluorescent lamp
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German agency for technical cooperation)
Global LEAP	Global Lighting and Energy Access Partnership
GELC	Global Efficient Lighting Centre, China
GONGLA	Global Off-Grid Lighting Association
Gt	Giga tonne (10 <sup>6</sup> )
GWh	Gigawatt-hour
IEA	International Energy Agency
IFC	International Finance Corporation
IL	Incandescent lamp
Kg	Kilogram
LED	Light emitting diode
LFA	Logical Framework Approach ( also the Results Framework)
LFL	
LLCC	Lowest life cycle cost
lites.asia	Lighting Information and Technical Exchange for Standards
MEPS	Minimum energy performance standards
Mt	Megatonne (10 <sup>3</sup> )
MTE	Mid-Term Evaluation
MVE	Monitoring, Verification and Enforcement
NLTC	National Lighting Test Centre
NAMA	National Appropriate Mitigation Action
OECD	Organisation for Economic Co-operation and Development
OLADE	La Organizacion Lationamericana de Energia
PIF	Project Identification Form (for GEF agencies)
ProDoc	Project document as approved

SE4ALL	Sustainable Energy for All
SEAD	Super-Efficient Equipment and Appliance Deployment
SSFA	Small-Scale Funding Agreement
TE	Terminal Evaluation
TWh	Terawatt-hour
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme (now UN Environment)
UNFCCC	United Nations Framework Convention on Climate Change

**Table 1: Project identification details**

UNEP PIMS ID:	GFL/2328-2720-4EF1	IMIS number:	GFL-5070-2720-4EF1
Sub-programme:	Climate Change	Expected Accomplishment:	EA 1b
UNEP approval date:	19 January 2010	PoW Output(s):	Output 3
GEF project ID:	3457	Project Type:	Full Size Project
GEF OP #:	5	Focal Area(s):	Climate Change
GEF approval date:	17 August 2009	GEF Strategic Priority/Objective:	CC1 – Promote Energy-efficient Technologies and Practices in the Appliance and Building Sectors
Project Partners:	Philips Lighting, Osram, National Lighting Test Centre (China), Australian Government, German Federal Ministry for Economic Cooperation and Development (BMZ)		
Geographical Scope:	Global		
Participating countries <sup>2</sup> :	Algeria, Belize, Benin, Bolivia, Burkina Faso, Cabo Verde, Cameroon, Chile, Cook Islands, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Indonesia, Iraq, Jordan, Kiribati, Lebanon, Liberia, Maldives, Mali, Marshall Islands, Micronesia, Morocco, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Palau, Palestine, Panama, Paraguay, Peru, Philippines, Qatar, Russian Federation, Saint Lucia, Samoa, Senegal, Sierra Leone, Solomon Islands, South Africa, Sudan, Thailand, Togolese Republic, Tonga, Tunisia, Tuvalu, United Arab Emirates, Uruguay, Vanuatu, Yemen		
Expected Start Date:	Jan 2010	Actual start date:	Feb 2010
Planned completion date:	Dec 2013	Actual completion date:	Nov 2015
Planned project budget at approval:	US\$ 20,000,000	Total expenditures reported as of April 5, 2017	US\$20,548,038 <sup>3</sup>
GEF Allocation:	US\$ 5,000,000 (GEF Earth Fund)	GEF grant expenditures reported as of April 5, 2017.	US\$4,968,666.
PDF GEF cost:	US\$ 200,000	PDF co-financing:	US\$ 200,000
Expected MSP/FSP co-financing:	US\$ 17,939,413.65	Secured MSP/FSP co-financing as of 30 June 2015 <sup>4</sup> :	US\$ 14,318,000.00 (Based on financial statements of April 5, 2017). By GEF definition co-financing amount was US\$12,068,000. Leveraged finance in cash was US\$ 3,348,000. The total of US\$15,416,000 was

<sup>2</sup> UNEP GEF PIR Fiscal Year 2015 (1 July 2014 to 30 June 2015). The latter Figure is the account as reported by UNEP on April 5, 2017 (without the cost of the TE) and this is used subsequently in the financial analysis.

<sup>3</sup> As per details in Annex Table A7

<sup>4</sup> Details on co-finance and leveraged finance are available in the detailed Tables in the Annex 4. Allocations of the in kind co-financing provided by Philips and OSRAM was not available. [Evaluation Office: as per stakeholder feedback this was 'competitively sensitive information']

			non-GEF resources, of which US\$12 million was in-kind.
First Disbursement:	20 January 2010	Date of financial closure:	N/A
No. of revisions:	5	Date of last revision:	20 March 2015
Date of last Steering Committee meeting:	15 May 2015		
Mid-term review/ evaluation (planned date):		Mid-term review/ evaluation (actual date):	September 2013
Terminal Evaluation (actual date):	December 2017		
Dates of previous project phases:	n/a	Status of future project phases:	UNEP announced in mid-2015 that based on the lessons from the en.lighten initiative, it had launched a new initiative, United for Efficiency (U4E) to support countries on energy efficient appliances and equipment, including room air conditioners, residential refrigerators, electric motors, distribution transformers and information and communication technologies, in addition to lighting. <sup>5</sup>

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<sup>5</sup> see: <http://united4efficiency.org/category/media/>

The “Partnership to Accelerate the Global Market Transformation for Efficient Appliances and Equipment” was submitted to the GEF in October 2015, in partnership with multiple organizations. The new initiative provides for a programmatic approach with several national or child projects. Countries approved during the June 2016 GEF Council include Chile, Myanmar, Tunisia, Indonesia, South Africa. Subsequently additional countries approved include Myanmar, South Africa, Indonesia, Chile, Tunisia and additional countries are in the pipeline to join.

## EXECUTIVE SUMMARY

### Introduction

The Terminal Evaluation of the UN Environment/Global Environment Fund (GEF) project “Global Market Transformation for Efficient Lighting” (en.lighten) was conducted in May 2016-June 2017. The evaluation was undertaken in accordance with the standard UN Environment evaluation policy. The objectives of the evaluation were to provide evidence of results to meet accountability requirements, and, to promote operational improvement, learning and knowledge among UN Environment and the partners.

The en.lighten project goal was “to accelerate the on-going changes in the market for more efficient lighting technologies in developing countries, thereby promote the phase-out of incandescent bulbs”. The project aimed to achieve this by “assisting in the removal of market barriers” to more efficient lighting, “within the context of rapidly changing lighting technologies and with many other networks and efforts”, but where “a global, coordinated effort” had been absent. It planned to build upon existing efforts and experience, and link with earlier Global Environment Facility supported efficient lighting programs, and bring the major global players and stakeholders together.

The project was conceived in 2008, approved in 2009 and commenced activities in 2010 (the key milestones in the project are provided in Table 5 of this report). The core funds were provided by Global Environment Facility for 5.0 million US Dollars (see Table 6) and this was complemented by co-financing (in-kind) of an estimated value of 15.2 million US Dollars. The most significant contributors were the two lighting companies Osram and Philips, with six million US Dollars as in-kind contributions each, and a balance of 3 million US dollars was raised subsequently from additional private sector partners (see Table 7).

### Evaluation Approach

The evaluation findings are evidence-based, and used several streams of evidence, which were triangulated. The findings have integrated the views and perspectives of key stakeholders, while remaining fact-based and informed by the evidence. The evaluator maintained close communication with the different users, primarily the project team and the Evaluation Office to clarify linkages between assumptions and results and concerning the key evaluation questions.

The logical framework was utilised together with theoretical perspectives to reconstruct a Theory of Change of the project, keeping in mind additional result statements made in the Project Document. The reconstruction of the results statements (see Table 2) and the Theory of Change (figure 1) were reviewed and discussed with the project team and the Evaluation Office. Subsequently, this Theory of Change was used to assess project performance. Desk reviews of extensive background documentation produced by the project and key agencies including UN Environment were one key strand of the information collected (see Annex 5). Interviews (largely individual and some as groups) were conducted with the key actors (names are listed in Annex 6). Third, given the large and extensive coverage of the project across countries and partners, the data collection effort was enhanced through three web based surveys, focused on partners with greater links and activities connected to the project. These survey instruments were developed for distinct key stakeholder groups – members

of the project steering committee (13 persons); members of the four task forces (73 persons) and finally, to all 76 focal points of the en.lighten partner countries. It should be noted, however, that the response rates to the surveys was very low with only 19 out of the 144<sup>6</sup> people (13%) responding. Finally, three missions were conducted. The first 5-day mission, during the evaluation inception phase, was to meet the project team in Paris, the private sector partners at Osram and Philips, and the public sector and donor partners – German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Agency for Technical Cooperation (GIZ). The second field visit covered Chile and Uruguay in Latin America during a five-day period. The third mission for three work days covered the important partnership in China with the National Lighting Test Centre (NLTC) in Beijing (See country case studies in Annex 1)

The key limitations to the evaluation were the lack of precision in the descriptions of goals, outcomes and outputs, and indicators in the original results framework and the absence of reviews of concepts and theories used by en.lighten project, which posed challenges for the presumed project logic. The project presented additional challenges with its multiple outputs and outcomes spread across over one hundred partner countries, and engagements with an extensive network of actors. Finally, the small travel budget limited the field visits possible but this was compensated for by a focus on partners with greater links with activities of the project and the use of the rich and extensive set of available secondary sources.

## Evaluation findings

Under the criterion of **strategic relevance (Section 4.1)**, the project was rated as **Satisfactory (S)**. The evaluation determined that the project's relevance to global, regional and national environmental issues and needs; to UN Environment's mandate, policies and strategies; and to the GEF's focal area on Climate Change, were highly satisfactory. It also found the project's relevance in relation to the Bali Strategic Plan (BSP) and South-South Cooperation satisfactory. On the other hand, there was an absence of any consideration of gender in the implementation, activities, and outputs such as the toolkits and guidelines produced. This is considered by the evaluation as a serious gap, especially as there are many reports and findings on the evidence of gender inequalities in access to and control over energy resources; the specific vulnerabilities of women and children to harmful emissions from traditional lighting sources; and the many ways in which women and children experience additional incremental benefits when higher quality modern lighting is available to households. In addition to gender, alignment with Human rights based approach (HRBA) and relevance of UN Environment environmental safeguards (ESS) were found inadequate. Despite the fact that the project did identify and propose activities to assess the negative environmental implications of fluorescent lamps, it made no efforts to engage with concerned communities to "minimize, mitigate and manage the risks introduced" concerning mercury.

The evaluation reviewed the outputs of the project (see Table 8 and Table 9) for their clarity, coherence, usefulness as reference products for experts and their relevance for policy actors. The project delivered – largely and well – on 10 of the 13 specified outputs, contributing largely to a rating of the achievement of **project outputs as Satisfactory (S)**. Two outputs were delivered partly, where

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<sup>6</sup> 144 was the total number of delivered survey messages (without a delivery error)

reduced delivery stemmed largely due to constraints on resources and limitations of the initial design. Although the project covered some aspects of mercury waste in its publications, the evaluation concludes that it did not deliver in a satisfactory manner on outputs related to the compact fluorescent lamp disposal strategy and action plans (item 3.4 in Table 8). The attention and resources of the Centre of Excellence to different outputs varied but they were mostly executed well and efficiently. The complete list of outputs of en.lighten, in numbers and coverage, is impressive and speaks to the efforts of the en.lighten team. The reports are also well laid out and appropriate for the audiences that they are aimed at.

With respect to **effectiveness (Section 4.3)**, the direct outcomes of the project were mostly achieved (see Table 10) and two of those were found to be highly satisfactory. First, the direct outcome 1: global support for a common approach by countries; and second, direct outcome 4: country capacity increased. The results concerning the direct outcome 2 on operational and effective Centre of Excellence were mostly good but there were also lapses, including weaknesses in the analysis and recommendations on the mercury issue and consideration of gender and weaker populations in the project deliverables. Low participation of representatives from developing countries in the governance structures (steering committee), task forces and expert groups was seen as a factor lowering the effectiveness of the Centre of Excellence. The achievement of the direct outcome 3 on market transformation was confirmed; nevertheless the attribution of the en.lighten initiative could not be established by the evaluation. The above factors resulted as **Satisfactory (S) rating of the achievement of direct outcomes.**

For **medium-term outcomes** (Section 4.3.2), the evaluation was unable to identify or confirm additional countries that have phased out incandescent light bulbs because of en.lighten. Positively, the evaluation noted that the data shows the share of incandescent light bulbs in the lighting markets globally has dropped sharply, supporting the goals of lower greenhouse gas emissions from lighting; lower mercury emissions from the associated coal consumption; and improved economic welfare contributing to sustainable development goals. However, it must be noted that there is no simple way to measure the extent to which the project has contributed to these outcomes. Nevertheless, following the Theory of Change there is a progression in an increased number of countries taking actions to obtain the benefits (medium-term outcome) and the assumption that lighting technology keeps advancing, resulting in lower costs and higher efficiency holds (see also section 4.3.3) supporting the progress towards the expected impacts of the project

The evaluation also examined the likelihood of any unintended negative effects. It is noted that studies have shown that energy efficient lighting technologies have the potential to decrease mercury emissions in those countries that rely heavily on coal for energy production. However, during the project period the number of mercury-containing lamps has also doubled worldwide. While those are longer lasting than the lamps they replace, they are ultimately discarded<sup>7</sup>. Although some positive developments in awareness are noted – there exists little evidence indicating that compact fluorescent lamps are being collected and disposed of properly. The potential of increased mercury

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<sup>7</sup> Evaluation also acknowledges that the amount of mercury in compact fluorescent lamps has been limited by regulations and standards

contamination in waste streams is an “unanticipated negative outcome” and has so reduced the ‘Likelihood of impact’ rating. Overall the **likelihood of impact is rated Likely (L)**.

With regard to the achievement of project objectives and results (Section 4.3.4) the evaluation notes that the numbers for compact fluorescent lamps and light-emitting diode lamps (LEDs) have increased and those for incandescent lamp have decreased substantially. It concludes that while the changes cannot be unequivocally attributed to the project, the project has contributed in a small but significant way, not simply to the changes in the composition of lights, but more importantly, by increasing technical awareness and bringing together best practices from numerous global experiences.

Under the **sustainability criterion** (Section 4.4) - socio-political, financial, institutional, and environmental aspects were assessed. The evaluation concludes that almost all the actions initiated by en.lighten are likely to be sustainable. The project has built the capacity of national stakeholders to make institutional and policy change and contributed to national replication activities. Replication is also underway for a second and expanded phase, and so is found to be highly satisfactory. While the evaluation would rate the overall sustainability of the project outcomes highly likely, due to the lower rating for environmental sustainability due the issues related to mercury, the overall rating is reduced to **Likely (L)**.

In Section 4.5 on **efficiency**, the evaluation finds the project to have been very efficient in use of funds and in the achievement of outputs and outcomes with the given resources, and several design and larger constraints outside the scope of the project management. While the project did suffer from delays, they were not found too significant by themselves. The project efficiency is rated as **Satisfactory (S)**.

In Section 4.6.1 on **preparation and readiness** the evaluator finds that while the project design had several positive elements, there were significant weaknesses also. The preparation and readiness of the project could have been much better, beginning with improvements to the design. There was a lack of a thorough review of lessons from similar projects already completed as well as lack of utilisation of lessons from past Global Environment Facility experiences of private sector partnerships. If these had been given due consideration, corrective processes could have been undertaken before and during implementation.

Under **project implementation and management** (Section 4.6.2) the evaluation found this was very competent in many dimensions but suffered in some important areas. The project engaged with potential partners at multiple global conferences, resulting in many organizations and individuals being aware of the project and agreeing to partner the initiative. Key communications products also helped attract partners to the network, including key funders. There was a well-attended global conference organized at the end of the project, which increased its value. The project team was able to deliver a very large number of high-quality outputs competently and efficiently. Deficiencies included inefficiency in the planning and preparation of meetings (including Project Steering Committee and some working groups) meetings; slow responses to, and inadequate engagement with, national stakeholders; numerous reports that were not sufficiently tailored for varied national circumstances; and inadequate representation from developing country partners, as noted above. Positively, findings demonstrate that the project was able to adapt to a “complex reality”, including developing a partnership model on the fly and moving quickly to project execution.

**Stakeholder participation, cooperation and partnerships** (Section 4.6.3) were a key part of this project. The small project team worked with over 200 stakeholders and partners, including implementing partners, national coordinators, policy makers, experts, regulators, financiers, non-governmental organisations and environmental organizations. There were four “sponsoring partners”, UN Environment, Global Environment Facility, Osram and Philips. World Bank and United National Development Programme (UNDP) were also members of the Steering Committee later. UNDP was originally to be an implementing partner, but that was changed and the evaluation found this to be a weakness reducing the degree of linkage with previously funded Global Environment Facility projects. The evaluation found that the standard partnerships agreement between en.lighten and the initial 66 “partner countries” gave these countries recognition in the global effort, but did not oblige them to any specific actions. This was a useful first step to build a network, create awareness and to amplify the project message. The network membership increased to over 100 organizations between 2010 and 2011 and even then as a global network and platform project, this large membership represented a small fraction of the potential population.

With respect to **communication and public awareness** (Section 4.6.4), the evaluation found that the quality of the various workshops, publications, websites, webinars, etc. produced together with the high level of visibility and the awareness of the platform by various global actors were considerable strengths of the project. At the same time, the low priority given for consultations with the wider public and certain specific sub-groups; inability to often adapt the message to individual countries; and inadequacies of focus on the complex issue of toxicity, recycling and closing the material loop were weaknesses. Under **Country ownership and driven-ness** (Section 4.6.5), this was often most apparent when there were specific small allocations for country-level work. However, some national stakeholders felt that they were not sufficiently involved in the project development and overall trajectory of the project. With respect to **Financial Management** (Section 4.6.6), the evaluation noted this to be competent within the constraints imposed by Global Environment Facility and UN Environment Economy Division procedures.

As a summary of the **factors affecting performance** (Section 4.6) the evaluation found that constraints to achieving higher effectiveness were mostly stemming from initial decisions during the design and approval process. These included limited financial resources from Global Environment Fund; the decision to forgo a partnership with United Nations Development Programme, as planned; the nature of the agreements with two private sector partners (i.e. financial aspects); the many weaknesses in the ProDoc and project design; and the delays which exacerbated initial constraints. This made coordination of the project across many countries more difficult and hampered results. The evaluation, however, judges that very good efforts were made especially by the project team to overcome these constraints. Some factors were rated highly satisfactory and some that were less satisfactory stem largely from the larger overall constraints.

## Conclusions

The project’s overall performance was evaluated as **Satisfactory (S)**. The project approach to promote energy efficiency measures through a global network/platform, supported by a project together with experts (the Centre of Excellence), to augment other global, regional and national environmental efforts was a highly appropriate and relevant response. The project deliverables include a large number of outputs - publications, country assessments, and studies, regulatory tools, partnerships, networks developed etc. They can mostly be utilized further during the next phases of

the project, provided they are kept updated. The sustainability of project directions does not require further UN Environment support, but the on-going successor project can contribute to the on-going shift towards more efficient products in lighting and in other sectors, and thus also supporting the replication of the en.lighten results. A number of countries have initiated follow up actions with new financial support from Global Environment Facility. The overall progress made has contributed to the project goal. Challenges in the design and outset of the project and potential negative effects of mercury reduced the value of the extensive and high quality outputs. The lack of a theoretical framework in the causal model, and varying interest of different partners, also contributed to challenges. The evaluation sees the successful uptake from the project outputs, analysis and recommendations, is largely due to the large positive economic gains for all countries and their populations, with some smaller losses, borne potentially by smaller and weaker sub-groups.

## Recommendations

1. Heads of Branches in the Economy Division should ensure that multi-stakeholder projects develop processes that allow for broadening the partnerships to additional manufacturers either at the project design stage or during the inception phase of a project, as especially with Light-Emitting Diode [LED] technology a number of new actors have emerged and this would widen linkages and reduce the influence of any single manufacturer. The selection of partners should be done based on well-defined criteria.
2. Heads of Branches in the Economy Divisions should ensure that Project Managers and Fund Management Officers record financial contributions (cash and in-kind) with complete transparency of budgets, total resources and their use, partner contributions and progress reports, in all multi-stakeholder projects/efforts, and in particular if involving the private sector. It must be required that all the above details on any co-financing – if listed in the project document, and utilized in a significant manner by the project, must be available to the project manager, partners and evaluations in the same level of detail and clarity as the Global Environment Facility contribution and used with identical management systems. This should also be undertaken by the team managing the successor United for Efficiency (U4E) project and other upcoming initiatives with multiple partners.
3. UN Environment/Economy Division must examine whether the on-going and future projects, expanded to cover energy efficient appliances are sufficiently resourced for the much larger demands on the Centre of Excellence for expertise on a number of additional sectors. Considering that en.lighten focused only on lighting technology in the residential sector and it was still found to be difficult to tailor outputs and support to individual country needs or technology options, it is critical to ensure that the project team and the expert network, the Centre of Excellence, is adequately staffed both in numbers, skills and knowledge required for the expanded services. A possible tool that can be used would be to track technical assistance demands and link it to plan activities of the COE to match the 'supply' with the 'demand'.
4. Heads of Branches in the Economy Division should contribute expertise across the branches. Appropriate involvement of Chemicals and Health Branch (mercury) and Resources and Markets Branch (lifecyle approach) in the on-going and future projects on energy efficient lights and appliances and where products involving new technologies are being promoted should be ensured. Such involvement should ensure that adequate scientific determination is made of potential negative consequences of new technologies as well as related processes, inputs, components and the final

product, for any population group and to the environment. This is consistent with UN Environment's Environmental, Social and Economic Safeguards policy. Where such risks are identified, established UN Environment principles for appropriate actions must be followed. Should this require reallocations for the current budget the Economy Division is encouraged to follow up with Global Environment Facility as necessary to achieve this.

5. Heads of Branches in the Economy Division should review processes and practices concerning hiring and guiding experts. The work by expert groups that review current knowledge and arrive at findings and recommendations require a higher degree of care in managing the often-disparate individual views shaped by different experiences, expertise and interests. As the discussion concerning the mercury issue has proven, the UN environment processes should support transparent presentation of the differentiating views on technical issues based on which recommendations are made.

6. The Project Manager(s) for the successor projects should strengthen the Centre of Excellence by expanding and building a stronger roster of experts/expert organizations, to better cover different regions and languages, and specific areas of expertise, as well as to utilize experts and expert organizations from the developing countries. In addition, the fact that financing of implementation was a major barrier to moving from knowledge to action, the involvement of financial institutions and their experts, at earlier stages of the project, could improve the incentives for national policy enforcement.

7. The Project Manager(s) for the successor projects to enlighten and the Head of the Branch, are advised to consider the human rights and gender dimensions of the new project(s) in the same way as they should be considered in the design, implementation and management of every intervention by UN Environment. The successor projects should undertake an expanded stakeholder analysis, ensuring that human rights and gender analysis is conducted adequately, even if this is done after the start of the new project. All future data on the project activities, outputs and outcomes should cover appropriate data on human rights and gender aspects, disaggregated as required. The expanded stakeholder analysis and participation must include consumer groups, and those involved in recycling and waste disposal. The detailed requirements can be seen in the UN Environment policy and strategy documents that guide programming.

8. UN Environment, with the support of the Evaluation Office, should review the extent to which a more systematic review of project and programme evaluation documents can be used at the design stage and in subsequent execution, so that the lessons from the past can be incorporated more appropriately. Mid-term Evaluations should provide an opportunity for useful and relevant feedback that was inadequate in this case and the process should be improved by making its timing flexible, with clearer specification of the kind of information that is required, according to the needs of the project as determined jointly by the Project and Task Managers and in consultation with the Project Steering Committee, and thus adapting standard pre-existing templates of the Evaluation Office as most appropriate. The team managing the United for Efficiency (U4E), successor project should work with the Evaluation Office to begin planning the evaluation of the current project six to nine months before its end. This practice could be incorporated in all future projects in planning, Project Implementation Reports and milestones, as a part of normal "good practice".

## 1 INTRODUCTION

1. The Terminal Evaluation (TE) of the United National Environment Programme (UNEP) implemented and executed project “Global Market Transformation for Efficient Lighting” (en.lighten), supported by the Global Environment Fund (GEF), is presented here. In accordance with the UNEP Evaluation Policy and Programme Manual, a TE is undertaken after completion of the project to assess project performance regarding its relevance, effectiveness and efficiency, and to determine the outcomes and impacts, and their sustainability.

### 1.1 Subject and scope of the evaluation

2. The subject and scope of the evaluation is limited to this specific UNEP project, supported by the GEF. It is critical to delineate the boundaries carefully as this single project is linked to multiple global and national organizations, projects and programmes, both preceding its approval and during implementation<sup>8</sup>. The Scope of the Evaluation<sup>9</sup> has been bounded as in all UNEP/GEF Terminal Evaluations, to examine the extent and magnitude of direct project outcomes achieved and possible impacts to date, and assess the likelihood of future impacts only from this single project. The evaluation also reviewed the implementation of planned project activities and planned outputs against actual results<sup>10</sup> as part of an assessment of the project performance.
3. The project goals were stated as “to accelerate the ongoing changes in the market for more efficient lighting technologies in developing countries, thereby promote the phase-out of incandescent bulbs.” The stated goal leads to the main evaluation question as to whether the Project did indeed help accelerate the phasing-out of incandescent lamps. The project aimed to achieve its goal by “assisting in the removal of market barriers to energy-efficient lighting,” in a context of rapidly changing lighting technologies, where it pointed out there were many efforts already ongoing, but “a global, coordinated effort” had been absent. The project was to “build upon existing efforts and experience” of “GEF supported efficient lighting programs in various countries”; and “bring the major global players and stakeholders together”. It specifically planned that UNEP would join forces “with UNDP and other GEF agencies”. The evaluation was bounded by the project time period of 2010-2015.

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<sup>8</sup> In fact, the evaluation will discuss subsequently under the design, programme logic and the reconstructed ToC, that the most fundamental aim of the project was to bring together multiple initiatives, countries, agencies, types of stakeholders and issues under one platform supported by the UNEP and GEF, where the value added would be provided by a coherent and collective global approach.

<sup>9</sup> The objectives and scope of the evaluation are taken from the ProDoc page 89, and the Terms of Reference, Page 11

<sup>10</sup> The conclusions reached have used information from project antecedents and related activities, as relevant, and keeping in view the boundaries of the project.

## 1.2 Evaluation objectives

4. The objectives as per the Terms of Reference<sup>11</sup> and in line with the UNEP Evaluation Policy<sup>12</sup> the evaluation<sup>13</sup> is to:
  - (i) provide evidence of results to meet accountability requirements, and
  - (ii) promote operational improvement, learning and knowledge sharing through results and lessons learned among UNEP and the multiple partners in this project.
5. The evaluation requirements have two distinct parts – one is a stock taking exercise and the second focused on findings, lessons and recommendations oriented for the future. A follow-up project has been developed and it has secured GEF funding. Hence the learning from the project experience was deemed more important and it was prioritized. The evaluation was asked to “identify lessons of operational relevance from the project and consider how these should be taken into account” in the implementation of the next phase. Therefore, the evaluation has prioritised the understanding of “why” the performance was as it was, i.e. of processes which affected the attainment of project results and their sustainability, and drawing lessons for the future. The seven key evaluation questions below focus on the second part. These questions and multiple other sub-questions are addressed and the limitations in the evaluation are discussed in the section 1.4 on the evaluation approach and methods.

## 1.3 Key evaluation questions

6. The evaluation was to focus on the following sets of **key questions**<sup>14</sup>, based on the project’s intended outcomes:
  - i. To what extent there is evidence that en.lighten activities and outputs contributed to a reduction in market barriers and increased rate of use of energy efficient lighting<sup>15</sup>? To what extent the progress in this area can be attributed to project interventions?
  - ii. To what extent the participating countries and regions have agreed on the road-map to transform lighting markets? How does this progress contribute to the overall project goal?
  - iii. Is the Centre of Excellence operational and does it effectively support the overall project objectives? To what extent the produced publications/toolkits/guidelines have

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<sup>11</sup> Terms of Reference, Page 11

<sup>12</sup> <http://www.unep.org/eou/StandardsPolicyandPractices/UNEPEvaluationPolicy/tabid/3050/language/en-US/Default.aspx>

<sup>13</sup> A proposal for the second phase of the initiative has been developed and approved under the sixth GEF cycle. Based on the lessons learned from the on-going initiative the next phase is designed to have a global component together with country specific components (co-implemented in partnership with UNDP). The next phase will also expand the sectors of work beyond lighting to address energy efficiency in other appliances and equipment, such as air conditioners, refrigerators, electric motors, or distribution transformers.

<sup>14</sup> As required in the ToR, the consultant has reworded the set of key questions to make them more appropriate following preliminary reading of the documents and the ProDoc, while maintaining coherence with those specified in the ToR.

<sup>15</sup> Notes – there is considerable evidence available on the fact that two forms of EE lights, namely CFL and LEDs, have had a very high growth rates in the past 20 years. The project team did not have the data on this at the beginning of the evaluation and their best estimates provided later are shown in Table 11.

- been utilized - in countries, at the regional level and by other partners? What are the reasons for successful/unsuccessful uptake of findings/recommendations/analysis?
- iv. How effective were the capacity building efforts by the project among the programme countries and regions? To what extent the global components of the project contributed in the capacity building in the national and regional level?
  - v. To what extent the project intervention has been relevant to the UNEP mandate, comparative advantages and priorities? To what extent the project is aligned with GEF priorities and built on the lessons from earlier GEF funded projects in this area?
  - vi. How well has the project been linked to and coordinates with other global, regional and national initiatives with regard to the promotion and transformation of the market towards efficient lighting?
  - vii. To what extent the project deliverables (such as the outputs, publications, country assessments and studies, regulatory tools, partnerships, networks developed etc.) can be utilized further during the next phases of the project? How can the sustainability of project achievements be promoted in the future?
7. The above questions were taken into account during the evaluation process, with areas for emphasis and limitations on the evaluability of the questions noted and approaches developed to arrive at suitable judgements.

## 1.4 Evaluation approach & methods

8. The overall design of this evaluation is based on the specifications in the ToR. The evaluation reconstructed a Theory of Change (ToC) based on the Results Framework, as articulated in the ProDoc. This was used to assess how the project has performed; whether or not the proposed logic of results held, if the assumptions made in terms of external factors and conditions needed to achieve higher level outcomes were valid, and how the internal and external factors affected performance. The evaluation was adaptive and participatory, working with the project team to clarify linkages between assumptions and results, the causal relationships between factors within the control of the project and those outside, on the achievement of outcomes; and the critical enabling factors that did or did not support change at higher levels.

### 1.4.1 Approach

9. The evaluation has been evidence-based, where several streams of evidence were collected; triangulation from evidence was used and the evaluation cross-references its findings and areas of recommendation. The findings have integrated the views and perspectives of key stakeholders, while remaining fact-based and informed by the evidence. The evaluation maintained close communication with the different components of UNEP, and the Evaluation Office (EO), the primary users of this evaluation – to ensure that the assessment critically supports the information needs of the management.
10. The process included an inception phase, used to ensure that the UNEP Task and Project Managers, the EO and the consultants have a shared understanding of the evaluation (purpose, scope, approach, deliverables and timeline) and that the assessment will address key stakeholders' needs. The process was initiated with electronic exchanges with project

staff (email and video) and some partners, where the evaluation relied on semi-structured interviews. A very large number of project documents were reviewed and they provided a broad overview of the project activities, time lines, reported outputs and outcomes and other similar information which was used to develop a better understanding of the project - purpose, scope, approach, deliverables and timeline and how the assessment would address key stakeholders' needs. As part of the Inception phase, the consultant:

- i. Conducted a preliminary review of available documents to help sharpen the focus of inquiry and probe deeper on emerging issues, trends and ideas;
- ii. Developed a draft Inception Report and evaluation matrix;
- iii. Constructed a Theory of Change based on the project's Results Framework and validated the assumptions, focus and boundaries; and
- iv. Finalized the methodological approach.

11. The Inception Phase document reviews and interviews led to some important preliminary observations which guided the methodology and the approach. The en.lighten project has a very rich and well documented sets of reports generated from the project. They cover the budgets, expenditures (as reported to 30 June 2015, and then details of the final expenditure was available only at the end of the TE), revisions, annual progress reports, and mission reports for the project. They provided a valuable set of information for the evaluation and form an important base of evidence of activities and outputs, and the basic data for the key questions on efficiency, and one source of information on outcomes and impacts. In addition, the project has one Mid-Term Evaluation (MTE) conducted and one project component, which was undertaken with the additional support of AusAID for Asia Pacific, which has been evaluated.<sup>16</sup> These two documents provided a strong foundation for some of the evaluation questions, and were added to the data used.

12. The review of the documents confirmed that the Logical Framework Approach (LFA) in the ProDoc had some deficiencies in the goal indicators and it was anticipated that sufficient information would not be available on the stated goal indicator<sup>17</sup>. The question of how and if

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<sup>16</sup> Lites asia, is a network, which predated en.lighten, hence any activities and outcomes before 2010 cannot be attributed to en.lighten. It is an important precursor to en.lighten and it was a natural partner network for en.lighten to work with. A decision was taken by AusAID to allow en.lighten to manage lites asia and AusAID made co-financing contributions. The evaluation considers the achievement of this co-financing as one "outcome". This outcome allowed en.lighten to undertake new and additional activities with lites asia; and engage more intensively with 3 sub regions of the Asia Pacific – South and S.E Asia, and the Pacific Island Countries (PIC), which then led to additional outputs and outcomes in the Asia Pacific region and are well documented by the AusAID evaluation report. In view of the high quality information provided in the Lites Asia evaluation report, all facts as reported there have been taken as strong evidence for the TE.

<sup>17</sup> This was discussed with the UNEP Paris team. The difficulties envisaged were fully discussed in the evaluation of the first seven country EEL project funded by GEF and executed by IFC, called ELI between 1999 and 2003, see IFC, 2005. The ELI Story: Transforming Markets for efficient lighting - IFC/GEF Efficient Lighting Initiative (ELI). Again more recently the issue of attribution and measuring the changes with and without the project is discussed extensively in UNEP, 2015. Narrowing the Emissions Gap: Contributions from renewable energy and energy efficiency activities, with the Norwegian Ministry of Foreign Affairs, see pages 13-14. The key point is that it is not often feasible to accurately *attribute mitigation outcomes* to individual actors or actions. This is due to the "cooperative and collective nature" of many such efforts, and the "vast field of actors working to implement them", who are often working in collaboration with each other. Disaggregation of the impacts of individual contributions from all joint efforts is always difficult. In addition there is the challenge of establishing the "counterfactual" or what would have otherwise happened in the absence of the specific intervention, and in most cases,

the project *changed and accelerated* the sales of high-efficiency lighting technologies, is particularly difficult to evaluate. The baseline conditions were such that there was already substantial market penetration of efficient lights before the en.lighten project. At the goal level the question was modified to read - to what extent is there evidence that en.lighten has contributed through its activities and outputs to the direct and medium term outcomes defined in the Theory of Change diagram (see Figure 2). The evaluation considered that the outcomes of the project could be more reliably gauged by the project's impacts on precursors to improved markets - policies, standards, information, with credible labelling and consumer knowledge, monitoring, verification and enforcement (MVE)<sup>18</sup> activities to ensure compliance, and the safe collection and recycling of waste. These are all critical elements of reducing barriers and increasing the social, economic and environmental benefits of efficient lighting thus enhancing longer term acceptance. They provide the building blocks to support the ongoing technical changes towards higher lighting efficiency, thus promoting longer term sustainability in the shift towards higher efficiency lighting technologies as shown by reviews of experiences in dozens of countries.

13. The evaluation examined this directly in greater detail in two countries where en.lighten made larger investments, (this was one part of the mission visit selection criteria) then supplemented that with data from a survey of all national stakeholders and other credible information. It was not possible to assess all of the project effects on an ongoing global process, within which there are many other global, national and regional initiatives, some of which existed before en.lighten and continued during its life and continued after its close. The evaluation on the other hand, sought evidence at the country level to assess if and how the project provided support to positive factors that promote enhanced markets for efficient lights, thereby promoting their increased use. The information from national sources has been supplemented by some additional data provided by the en.lighten project team.

#### 1.4.2 Methodology

14. The methodology used has been largely as specified in ToR. The evaluation has been conducted by an independent consultant under the overall responsibility and management of the UNEP Evaluation Office, in consultation with the UNEP Task Manager at the Economy Division (formerly known as DTIE). It was an in-depth evaluation using a participatory approach (within constraints of time and resources discussed) whereby key stakeholders were kept informed and consulted throughout the evaluation process. Numerical indicators were used with qualitative evaluation methods to determine project achievements against the expected outputs, outcomes and impacts. The evaluator maintained close communication with the project team to promote information exchange throughout, and to increase their

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there are insurmountable difficulties in assessing the outcomes and impacts of actions against the 'business as usual' scenario. The issue is discussed again in the Theory of Change and also on the LFA that had been developed for approval. The UNEP Paris team provided estimates in 2017 of changes in the composition of lights in use, during the period of the en.lighten project, and that is provided as information in Table 11.

<sup>18</sup> Monitoring, Verification and Enforcement (MVE) is used in different ways in the project document – as MVE of the en.lighten project and as MVE at national levels of compliance of the market with regulations and standards, as well as an output document of en.lighten, leading to MVE practice as an outcome, and national MVE leading to impacts on the lighting market

ownership of the evaluation findings. The findings of the evaluation have been based on the following:

15. **Desk reviews** of the extensive background documentation. Such documents included the UNEP Medium-term Strategy 2010-2013 and 2014-2017 and associated Programmes of Work and, similarly, GEF climate change programming documents, which were used to assess the relevance of the project to broader organizational priorities. They included the UNEP project design documents (ProDoc) including comments on project design and review by GEF and subsequent discussions in review documents that covered this project; Annual Work Plans and Budgets or equivalent, revisions to the project (Project Supplement), the logical framework and its budget; reports such as Project Implementation Reports (PIRs), six-monthly progress and financial reports, progress reports from collaborating partners, meeting minutes and relevant correspondence. In addition, project outputs/publications, strategies and policies developed by partner countries and regional integration bodies, technical publications, guides and toolkits, reports, webinars, videos, country lighting assessments, policy and regulatory maps, workshop reports, were reviewed. A separate evaluation undertaken of Australian support to en.lighten provided high quality and validated evidence on outputs and outcomes in Asia Pacific. In addition, documents related to the project activities as reported by other agencies and researchers were consulted. The evaluation undertook a “purposive” follow up<sup>19</sup>, with written documents, interviews and surveys, among selected “strong” links of en.lighten to the network of partners – such as key persons, organizations and countries. (See the section on partners, stakeholders and networks). The project documents used as well as all external references are listed in Annex 5.
16. **Interviews** (largely individual and some as groups) were conducted with the UNEP Task Managers; the project management team; key project partners and other stakeholders, where the criterion for the selection of key interviewees was the degree of importance of the individual and organization to the project. The names are listed in Annex 6.
17. **Survey.** Given the large and extensive coverage of the project across countries (over 100) and partners (over 500 individuals and organizations), and with multiple outputs and activities, the primary data collection effort was enhanced through three web-based surveys. They focused on partners with greater links and activities connected to the project, and not to those who attended only one workshop. The assumption made was that individuals who were linked more closely to en.lighten activities, and/or valued them more intensely (both positive and negative) would be more inclined to take the time to respond. The three web-based survey instruments were each developed for, and administered to, distinct and key stakeholder groups – members of the project steering committee (13 persons); members of the four task forces (73 persons) created by en.lighten and finally, to all 76 en.lighten “National Partner” focal points. For each stakeholder group, there were common questions on their personal information, the nature of their role with regards to the project, and both ratings and open ended questions on their opinion and views on the en.lighten activities they were involved in for the relevance and utility. All respondents were also provided with several open-ended questions to add their views on any matter not addressed. Beyond the common questions

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<sup>19</sup> This is as opposed to a random selection.

there were specific questions to each group based on their functions. As there were four en.lighten Task Forces, the questions here probed if there were any differences between the task forces based on their core tasks and functions, as well as their opinion on the quality and usefulness of the outputs related to their core expertise and task force. All surveys were opened for responses on 22 November 2016, and closed on 12 December 2016; and four email requests were sent to each of the persons in each category, to encourage wide response. All respondents were provided with an option to request feedback on the results and all who wished to see the final survey results were sent the clean copy for their group. It should be noted, however, that the response rates to the surveys were extremely low with - only 19 out of the 144 people (13%) responding<sup>20,21</sup>.

18. **Evaluation missions.** Three missions were conducted within the evaluation. The first mission for five days was to meet the project team in Paris during the inception phase, the private sector partners at Osram and Philips, and the public sector and donor partners – BMZ and GIZ. The second field visit covered Chile and Uruguay in Latin America during a five-day period. They had been chosen as the LAC countries were the first to sign up on the en.lighten partnership, and they were “pilot” countries; they had Small-Scale Funding Agreements (SSFA) for resources allocated by en.lighten and both had been rated by the project documentation as countries with highly positive outcomes.
19. The third mission for three work days covered the important partnership in China with the National Lighting Test Centre (NLTC) in Beijing. The NLTC partnership with en.lighten led to the creation of the Global Efficient Lighting Centre (GELC) in 2011, as an autonomous entity within NLTC, which worked on the international mandate of en.lighten. GELC provided support on testing and monitoring the quality of lamps. Its role and location in China, the world’s largest producer, supplier and exporter of lamps, and with its own earlier efficient lighting programme supported by GEF, made this field visit critical. In all missions to the countries the discussions focused on their role in the en.lighten project, the relationships and inputs provided by the project (or for GELC the contributions made to the project), the direct and intermediate outcomes if any and any other information as relevant for the key evaluation questions (as detailed in paragraph 6). Annex 1 and 6 provides a list of all individuals interviewed during the missions.

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<sup>20</sup> The response rates by stakeholder group are provided here. The project team provided 13 names and addresses for the PSC and they were all contacted. 8 were unopened, 3 bounced, one person opened and clicked through, and only one (7.6%) response was completed, providing the lowest response rate. 73 members of the Task Force named by the project team were contacted and 33 never opened (46.6%), 13 bounced (17.8%). 27 respondents opened the message (35.6%), 16 clicked through (21.9%) and did not complete. Eleven (15%) responses (10 complete and 1 partial) were obtained. For the national focal points, the questionnaire was sent to 76 persons as provided by the project team - 33 were unopened, and, 2 bounced (44%). 34 were opened, and 27 clicked through, and 7 (9.2%) responses were completed.

<sup>21</sup> Evaluation Office conducted an additional survey in June/July 2017 to fill in gaps in the evaluation concerning the financial management aspects of the project. A short questionnaire (6 questions about the project’s financial management practices) was sent to 5 recipients ( - project stakeholders who have been closely involved in project/financial management of the project) ;3 responses were received. The evaluation office rating of financial management is based on and supported by this survey.

## 1.5 Limitations

20. A lack of precision in the descriptions of goals, outcomes and outputs, and indicators in the original results framework, presented a significant challenge. The original framework prevented assessments to be made against the exact statements. These issues were identified early in the evaluation process, and the results statements modified to provide evaluable evidence for en.lighten contributions through its activities and outputs to the direct and medium term outcomes. The changes were made keeping them in the context of the statements made in the ProDoc, then reviewed and discussed with the project team and the EO, and then defined in the constructed Theory of Change diagram. In this complex project, the weaknesses in the wording in ProDoc and in the LFA, and, the absence of any reviews of concepts and theories used posed additional challenges for developing the presumed ToC. The original LFA and revisions are provided in Table 2, The ToC diagram is necessarily simplified, but is discussed in detail in section 3.
21. The project presented additional challenges for the evaluation because it has multiple outputs across over one hundred countries and the project interventions were also similar to other ongoing processes within multiple networks of actors. The evaluation used evidence at the country level and from key stakeholders and network partners to assess the nature and content of the project support provided and their contributions to the positive factors that are known from previous experience and theory to enhance markets for efficient lights.
22. This evaluation was undertaken with a small travel budget, which limited field visits to the project team, two partner countries, and two partner organizations. Given the large and extensive coverage of the project across countries, partners and ranging across multiple activities, the primary data collection effort was necessarily limited. Primary data collected focused on partners with greater links with and activities connected to the project, and towards assessing the most significant examples of outcomes and impacts. A rich and large set of secondary sources were available, which were used as relevant to overcome this limitation.
23. They were not meant to be statistical in nature given the small number of persons each group of stakeholders but the percentage who responded was smaller than hoped for. A lower response rate had been anticipated given the breadth and numbers of stakeholders globally, and the time that had elapsed from the close of the project to the evaluation<sup>22</sup>. However, the 19 respondents added to the feedback from stakeholders obtained through other means.

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<sup>22</sup> This leads to the recommendation that the project team in successor project to en.lighten should work with evaluation office to begin planning the evaluation process six to nine months before the end of the project. Such practice if useful could be incorporated in future project planning, PIR and in milestones, of all projects as a part of normal “good practice”.

## 2 PROJECT BACKGROUND

### 2.1 Context<sup>23</sup>

24. The ProDoc (2010) states that en.lighten was undertaken in a context where “the worldwide lighting panorama is quickly changing”. It pointed out that electric lighting represented “a very energy-consuming sector” where the provision of lighting required 650 Mtoe of primary energy in 2003, which represented 8.9% of total global primary energy consumption, and lighting-related CO<sub>2</sub> emissions were estimated at 1,900 Mt CO<sub>2</sub>, (approximately 8% of world emissions). Incandescent lights (IL), the most traditional technology for converting electricity to light, provided an opportunity to be replaced by Compact fluorescent lamps (CFL) as theoretically, if globally, all ILs were replaced by CFLs, it would reduce the emissions by 470 Mt CO<sub>2</sub> in 2010. Given the new technological option, from a climate policy perspective, reducing the energy consumption for lighting by raising the efficiency of lighting systems had become an important means to abate CO<sub>2</sub> emissions. The higher the efficiency of energy conversion, the lower the energy required to deliver a given amount of light, and - depending on the carbon intensity of the electricity generation fuel mix – the lower the greenhouse gas emissions.
25. The ProDoc pointed out that “high quality and product innovation” and “technologically advanced and long-lasting, energy-saving products” (non-incandescent and LED lamps, HID lighting, electronic ballasts) were becoming more central in the future. “The demand for efficient lighting is likely to be fuelled massively by China, as a rise in living standards and an increase in real estate activity (new construction activity) will act in synergy to bulge the demand for energy-saving devices. Where new construction activity is more modest, the maximization of energy efficiency in existing buildings is likely to contribute to the demand for new lighting equipment” and “market forces were tilting towards energy efficient lighting”. It added that while the positive results from increased use of the new technologies provide large “economic benefits as well as the global environmental benefits” and many of them were well recognized (as per its reference to the Group of 8 (G8) countries’ initiative and the follow up work by the IEA<sup>24</sup>), “a global, coordinated effort to transform the efficient lighting market” was still absent. The project, with the GEF support, would build upon existing efforts and experience and, linking many of the GEF supported efficient lighting programs in countries, bring the major global players and stakeholders together to accelerate the market transformation and the phase-out of incandescent lamps. It was planned that UNEP and UNDP would join forces to develop and implement the global program, and also that “other GEF agencies may also get involved in the global program as well as country projects”. The

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<sup>23</sup> ProDoc, Pages 6 and 7; and it provides the Figures that the efficacies of lamps are commonly described in units of lumens per watt of energy (lm/W), which improved from the low range of 11 to 22 lm/W for incandescent lamps, to 18 to 65 for mercury vapour, 40 to 80 for fluorescent lamps, and with high ratios for other options. LEDs or solid state lighting (SSL), are now considered the most promising technology with efficiencies up to ten times that of incandescent lamps and twice that of fluorescent lamps, with the bonus that they also contained no mercury, hazardous to human health, unlike fluorescent lamps.

<sup>24</sup> IEA, 2006. Light’s labour’s lost: Policies for Energy-efficient Lighting (In support of the G8 Plan of Action), Paris.

design as specified in the ProDoc had some advantages of simplicity, but that was accompanied by many disadvantages. The weaknesses in the results framework are discussed in the next section; while those pertaining to the theoretical and framework issues are discussed in the Theory of Change section. How some of the shortcomings in the logframe affected the M&E are discussed in the results sections. Many of these facts embedded in the design, affected the project performance and they are discussed also in the preparation and readiness section.

## 2.2 Project objectives and components

26. The ProDoc and the Terms of Reference<sup>25</sup> for the Evaluation specified that the **goal** of the Project, was to:

- speed up the transformation of the market for environmentally sustainable efficient lighting technologies in the emerging markets of developing countries; and
- to accelerate the phase-out of incandescent bulbs by removing the market barriers to energy-efficient lighting, promote the development of mercury free technologies and thereby reducing global greenhouse gas emissions as well as mercury releases.

27. The **objective** was to create locally and regionally, an institutional/legal/financial /technical environment that was in favour of energy-efficient lighting through the promotion of high-performance and environmentally sustainable new technologies such as mercury free CFLs and the phase-out of inefficient, incandescent lamps.

28. The Project planned to:

- (i) work in close partnership with highly qualified experts specialized in energy efficiency and lighting
- (ii) provide a global "open space" for exchange and communication in between all the stakeholders and
- (iii) provide support to the implementation of country programs to be adopted, expanding the market transformation mechanisms in a large majority of developing countries.

29. The Project was to be built upon the existing and related activities supported by the GEF. The global project and its structures/approach were to serve as an umbrella under which additional national projects in various countries could be undertaken. The project comprised of three main components:

- (iv) the creation of a Global Platform for lighting actors,
- (v) the establishment of a Centre of Excellence (CoE) to deal with political as well as technical (performance, quality standards, certification, etc.) aspects and

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<sup>25</sup> Terms of reference, Page 3; and the ProDoc, page 34.

- (vi) the provision of support for the implementation of efficient lighting programs in countries at national or regional level.

### 2.3 The project results framework

30. The exact original results framework or LFA<sup>26</sup> as in the ProDoc was found to be deficient. It was not fully consistent with accepted terminology. It was satisfactory in describing the activities to be undertaken, but it was deficient in some descriptors and a number of suggested indicators. The Table 2 below has been created from the original LFA, with changes made for clarity, and for the development and use in the reconstructed ToC later (in section 3). The LFA statements as shown in Table 2, together with the reconstructed ToC, provide the main basis for the evaluation ratings. The changes made were due to rectify, first, inexact terminologies used in the ProDoc or not always well defined, for example what was meant by the Centre of Excellence (COE). Second, the purposes of individual activities were sometimes described differently at different points within the ProDoc<sup>27</sup>, but it is important for the evaluation to be consistent. Third, the log frame was not consistent in distinguishing between outputs and outcomes. Fourth, the baseline was not available and the “SMART indicators” were often inadequate. Finally, the evaluation found that the important goal statement “Acceleration of the rate of change” was not evaluable and needed to be changed as it required a comparison of the change in the rate of growth with the project, to the rate of growth that would have happened<sup>28</sup> without the project, yet no counter-factual scenario had been identified or measured at baseline.
31. On the other hand, the deficiencies above in the LFA were often remedied by clearer statements at other places in the ProDoc (which was over 160 pages). To take one as an example - while the exact description, size and composition of the COE was not stated in one single location of the ProDoc, there were over 20 locations where the roles, activities, outputs and other aspects that were to be covered by the COE are discussed<sup>29</sup>. Clarity in the evaluation was taken to be critical, and so the Table 2 below was prepared with modest editing of the actual statements and indicators, using where available, the additional elaborations in the ProDoc. For the sake of transparency, Table 2 has one column on what was stated originally, then what changes were made in the LFA and

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<sup>26</sup> The evaluation reviewed all project revisions to see if the log frame for results had been revised at any point and noted that the LFA had not been revised during execution. The evaluation considers the log frame not to be fully consistent and finds it was good in describing the activities but less so the transition from outputs to outcomes and the SMART indicators.

<sup>27</sup> This would make some logic if the proposal was not sure if this was describing one project or a longer term programme. GEF has subsequently funded the successor to enlighten as a programme grant. The GEF defines programmes as a strategic combination of projects with a common focus to build upon or complement one another, so as to produce results not possible through a single project, as they can maximize the impact of GEF resources by securing a larger scale and sustained impact on the global environment, by implementing medium- to long-term strategies for achieving specific global environmental objectives; see <http://www.thegef.org/about/funding/project-types>.

<sup>28</sup> ProDoc, page 90.

<sup>29</sup> It is described at length in pages 41-49 of the ProDoc and again in pages 50- 52 for component three, followed by discussions on key deliverables for the COE in pages 78-81; and in the budget for the staff and finally in pages 109-116 on the skill composition required for the COE. The COE is also stated to be both an output and also an outcome of component two in the LFA.

why, taking due care that it did not unduly change intended outputs and targets. The modified wording used was discussed with the EO and the en.lighten project staff to affirm their accuracy and their appropriateness for the evaluation.

**Table 2: Project LFA with revisions and comments<sup>30</sup> for the reconstructed ToC**

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	<b>LONG TERM IMPACTS:</b> Global: Reduced GHG from efficient lighting technology	<b>LONG TERM IMPACTS:</b> <b>Global:</b> Reduced GHG from efficient lighting technology; increased access to electric light by poorer people <sup>31</sup> , efficiency and technology transfer and diffusion, and, potentially reducing mercury emissions from coal burning <sup>32</sup> . <b>Local:</b> lower lighting costs for people and increased welfare of people.	The additional benefits are important in their magnitude and value and needed to be noted. They are especially important motivators for national and global actors who support efficient lighting, and are noted in the assumptions for the ToC.
A	<b>Goal: Accelerate</b> the global commercialization and market development of energy-efficient lighting technologies in industrial; commercial, and residential sectors as well as in public lighting	<b>Goal:</b> Promote the increased use of efficient lighting in the residential sector of developing and transition countries.	“Acceleration” of EEL use would have been good, if the effect could be ascertained, as all changes in the global market cannot be attributed to en.lighten alone <sup>33</sup> . Hence Intermediate and proxy outcomes are used in the ToC, see medium term outcomes below. Promotion of activities and policies to shift the composition of only residential lighting towards using

<sup>30</sup> The statements and indicators as edited for clarity were discussed and reviewed with the EO and the en.lighten project staff to affirm their accuracy and appropriateness.

<sup>31</sup> The “Sustainable Energy for all (SE4ALL)” initiative, was launched in 2010 by the UN Secretary General. It has three global objectives for 2030: to ensure universal access to affordable, reliable, sustainable and modern energy services, which is also the Sustainable Development Goal (SDG) 7. SE4ALL also includes the goal to “double the rate of improvement in global energy efficiency”. They also map the goals of en.lighten, while the third component of SE4ALL to double the share of renewable energy in the global energy mix, is not a goal of en.lighten but if achieved it would reduce the ghg reduction benefits from en.lighten in the longer term.

<sup>32</sup> The *potential* to reduce mercury pollution from coal burning has been noted in the ProDoc but it was not raised to a goal or outcome. The ProDoc was inconsistent in its approach and a clear discussion on issues related to mercury is provided in Annex 5.2. The evaluation has assumed the actual changes on the market composition *due to the project within the project time* frame of 3-4 years would be small. Based on several drivers, the market changes were likely to increase in the medium term. Hence, a possible unintended local and global consequence from mercury was added for the medium term and discussed further in the section 3, and shown in the ToC.

<sup>33</sup> *Acceleration* requires a comparison of the *change in the rate of growth with the project*, to the *rate of growth in its absence*. This is discussed in paragraphs 51-56 in the ToC section.

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
			higher efficiency lamps was the primary long and short term goal of en.lighten.
A1	<p><b>Goal Indicators (original):</b></p> <ul style="list-style-type: none"> <li>-Amount of estimated global light production by user sector and lamp type</li> <li>-Annual market growth rate of energy-efficient lighting in the Project participating countries.<sup>34</sup></li> <li>-Number of governments adopting a policy to phase out inefficient lighting and start-up of replication of market development activities in their countries.</li> </ul> <p><b>Original targets (goal indicators):</b></p> <p><b>Market transformed:</b></p> <ul style="list-style-type: none"> <li>-An additional 1 billion EEL products sold per year at the completion of the project compared to the expected baseline</li> <li>-The sustainable market growth of at least 20 % in average in the participating countries by the end of the project.</li> </ul>	<p><b>MEDIUM TERM OUTCOMES:</b></p> <ol style="list-style-type: none"> <li>1. Incandescent lamps <i>phased</i> out globally<sup>35</sup></li> <li>2. Lower GHG emissions from lighting</li> <li>3. Lower mercury contamination from coal for electricity.</li> <li>4. Increased welfare of people from lower costs and higher illumination</li> </ol> <p><b>Goal indicators</b></p> <p>As at the end of project- direct outcomes:</p> <p><b>Market transformed:</b></p> <p>1 billion additional EEL sold; 20 new countries initiate actions; 20% increase in growth in EEL in those countries<sup>36</sup></p>	<p>The evaluation considered these to be clearer and more reasonable statements for medium term outcomes and achievements.</p> <p>The market transformation indicators were retained as it was anticipated that some transformation of the market and higher sales of EEL would happen, but with the caveats on attribution of results. The number 20 countries was read as the total change anticipated and of these 14 could be attributed to en.lighten (see row 3.2 below)</p> <p>One new, potentially <b>unanticipated outcome</b> was added to the medium term – that the increased sales of fluorescent lights without vigorous and improved collection and recycling of waste products could increase mercury pollution in the waste streams.</p>

<sup>34</sup> See previous footnote.

<sup>35</sup> Improved efficiency in lighting does not require that the use of incandescent lamps drops to zero, as long as increasing portions of lighting technology moves away from IL and towards more efficient technologies. It is also achieved through improvements in quality, and performance, and reduced costs of the new technologies, and by enabling countries and users, to adapt to and adopt EEL as the technologies continue to evolve.

<sup>36</sup> This is in the goal indicators in the LFA, and so could have been read as medium term outcomes. The TOC and the evaluation has placed them under "Direct Outcomes" as these were also stated to be achieved by the end of the project.

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	-20 new governments expressed interest in and start-up of replication of similar activities.		
1	<p><b>COMPONENT 1: ESTABLISH A GLOBAL PLATFORM</b>  <i>Outcome 1:</i>            Consensual decisions and a roadmap for global lighting market transformation all over the world agreed upon</p> <p>Number of countries with EEL market transformation and strengthening activities initiated-            Number of countries participating to a phase out agreement.</p>	<p><b>DIRECT OUTCOME 1: Agreed global road map</b>– that is understood as support for a common but not identical approach by countries and an agreement on the benefits and methods for reaching the goals.</p> <p>The evaluation has adapted the indicator for “agreed global road map”, as resolutions adopted by countries at workshops and at subsequent events sponsored by en.lighten.</p>	The evaluation also examined the levels of “coordinated effort”; it did not focus on the words “phase out”, which is the only policy change mentioned here, but it examined countries’ willingness to officially adopt the set of en.lighten policies in the toolkit developed.
1.1	<p><b>Output 1.1:</b> A stakeholder forum for policy dialogue is established and fully operational</p> <p><b>Indicator:</b> The global platform (GAFEL) legally established at the end of the first year of Project</p>	<p>Policy dialogues for EEL promotion launched at multiple forums.</p> <p><b>Revised indicator:</b> Numbers and coverage of such forums; discussions and conclusions reached by countries at forums, workshops, and at subsequent events sponsored by en.lighten towards a coordinated efforts.</p>	A single global stakeholder platform would likely have been unwieldy and inefficient for ongoing policy dialogue on EEL. No specifications were provided for GAFEL and so the formation of a legal entity was not retained.
1.2	<p><b>Output 1.2:</b> Stakeholders agreed upon a roadmap for global market transformation and coordinated phase out of inefficient lighting.</p> <p><b>Original target:</b> A consensus is reached one year after project start to phase</p>	<p>The nature of policy dialogues among stakeholders promoting consensual activities towards policy sets.</p> <p><b>Revised indicator:</b> The quality of policy dialogues and related activities, conclusions and resolutions.</p>	The language is ambiguous as the project had not defined the set of stakeholders, who agree, beyond that it would work with all countries eligible for GEF support (section 2.4). It is mis-specified also in time as it assumed that there would be a single consensus on an important issue affecting millions of people, within one year. Third, achieving the “agreement” of stakeholders is not an output but an outcome, and is

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	out inefficient lighting <sup>37</sup>		already covered in row one. Fourth, the single minded focus on “replacing ILs” was misplaced as that is not the only way for positive movement on EEL. The idea of completely phasing out IL was highlighted often in the communications. It could possibly have served a useful role as a communications and branding tool. The evaluation considers this case as emblematic of several design flaws.
1.3	<b>Output 1.3:</b> A communication plan set up and implemented to strengthening coordination mechanism in energy efficient lighting market transformation <b>Original target:</b> A communication tool-kit developed during the first year and implemented	A communication plan for supporting the market transformation efforts for EEL is produced and utilized for project purposes.  <b>Indicator:</b> Communication plans and communication outputs.	The plan made in one year is only the first step, and its content and use by the project for supporting market transformation efforts is important.
2	<b>COMPONENT 2: IMPLEMENTATION OF A CENTRE OF EXCELLENCE</b> <i>Outcome 2:</i> An International Centre of Excellence (COE) in charge of strategies, policies, knowledge management, best practices diffusion, quality harmonization, etc., established and	<b>DIRECT OUTCOME 2: COE is operational and effective.</b>  <b>Indicators:</b> Availability of timely and cost-effective technical backstopping responding to the needs of EEL lighting technology improvement.  The number of countries with whom EEL products quality	The CoE was never fully defined in the ProDoc. It has been interpreted at its most minimum level to consist of a team of people who promote collaboration; utilise best practices around a specific focus to attain the valued results. In this evaluation the COE was used to refer to the core project team, with an “extended COE” consisting of the team plus seconded staff plus some key partner staff, with a further extended network of expertise, as provided by

<sup>37</sup> The evaluation used relevant policy and behaviour changes in countries because of en.lighten contributions rather than only the self-imposed and narrowly defined goal of consensus that “IL phased out after one year”, see footnote 25.

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	operational	improvement initiated.	<p>the task forces assembled. See annex A3.1.</p> <p>COE is operational is an output and covered under output 2.1, below. That it is effective requires changes in the countries, initiated by COE inputs, an outcome.</p> <p>The global technical assistance needed for EEL products quality improvement met at the adequate level and timely manner leading to effective implementation of country specific EEL market transformation strengthening activities was seen to be the key role.</p>
2.1	<p><b>Output 2.1:</b> A Centre of Excellence capable of coordinating Project's policy and technical activities selected and enhanced</p> <p><b>Indicator:</b> Legal entity designated to coordinate activities</p>	<p>A team was in operation, called the COE.</p> <p><b>Indicator:</b> Entity or team, performed tasks defined, produced outputs defined and supported progress towards all direct outcomes, and performed the 9 priority actions as specified for the COE (see Table 9).</p>	<p>The emphasis on a legal entity being formed was removed as it was never seen in the plans.</p> <p>The project required only that the technical assistance needed for EEL products quality improvement were delivered as specified, at the adequate level and in a timely manner, promoting EEL market transformation was seen as the core role. This is to be observed through feedback from partners, resolutions adopted at events sponsored by en.lighten; and, indications of degrees of consensus on goals and processes required.</p>
2.2	<p><b>Output 2.2:</b> A network of technical institutions is established and enhanced for lighting products quality improvement</p> <p><b>Original target:</b> The institutes for EEL quality improvement are operational one year after project starting.</p>	<p>A network of institutes for EEL quality improvement in co-operation with en.lighten and used by the project.</p>	<p>The focus on one year, was seen as unrealistic and similarly that a network of technical institutions be established and enhanced.</p>
2.3	<b>Output 2.3:</b> Guidelines	Guidelines for harmonisation	Their "adoption" would be an

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	for harmonisation of quality and performance-based standards developed and adopted <b>Indicator and target:</b> Technical guidelines established and are available during the first year of project implementation.	of quality and performance-based standards developed. <b>Indicator and target:</b> Technical guidelines established and are available and timely (between the first and second year of project implementation).	outcome. The ProDoc used one year very often as the target and they were not seen to be based on a realistic appraisal of the activity <sup>38</sup>
2.4	<b>Output 2.4:</b> Capacity for harmonisation of quality and performance-based standards built in partner organisations and GEF programme countries. <b>Indicator and target:</b> Number of EEL market staff trained for above. At least 2 representatives from major stakeholders trained including national and global entities.	Capacity enhanced in GEF programme countries for the policy and institutional support required for EEL. <b>Indicator:</b> Number of EEL market staff trained for quality and performance (The target is not specified but it should be reasonable for reaching end of project goal indicator, above, 2 representatives is not sufficient)	The indicator “At least 2 representatives from major stakeholders trained” was dropped as it made no sense for a global project including national and global entities. Increased capacity of partners would be an outcome, but the training materials produced and number of persons trained are the outputs to be discussed here.
2.5	<b>Output 2.5:</b> Guidelines for quality certification and labelling schemes are formulated for energy-efficient lighting products. <b>Indicator and target:</b> Number of EEL market staff trained on testing and certification procedures. At least 2 representatives from testing laboratories	Same. <b>Indicators:</b> Technical guidelines established and available (between the first and second year of implementation).	The quality and delivery of the guidelines were considered to be important. As above, the number – “at least 2 representatives” trained was dropped as it made no sense for a global project.

<sup>38</sup> The evaluation used M&E documents, project reports and publications to review the list of outputs and their purpose. It also examined feedback from interviews and the survey, on the use and relevance of such materials produced, and, for information whose capacity was built and how, the purpose and possible use of the capacity built.

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	trained.		
2.6	<p><b>Output 2.6:</b> A best practice catalogue elaborated and made available to relevant stakeholders</p> <p><b>Indicator and target:</b> Operational toolkit for EE lighting programmes design and implementation available. Developed in the 1<sup>st</sup> year.</p>	<p>Output same.</p> <p><b>Indicator:</b> Status of toolkit for EE lighting programmes, design</p>	<p>The focus on one year was considered to be unrealistic.</p>
3	<p><b>COMPONENT 3: SUPPORT TO COUNTRY AND PROGRAMS</b></p> <p><i>Outcome 3:</i> The specific EEL market transformation targets of the first participating countries reached by the end of the project, conducive to the overall, global market transformation goals of the project.</p> <p><b>Indicator and target:</b> Market characteristics of 20 new participating countries at project end, where EE lighting products purchased grow at 20% and one billion additional EEL sold.</p>	<p><b>DIRECT OUTCOME 3:</b> Markets transformed.</p> <p><b>Indicator:</b> Changes in efficient lighting sales.</p>	<p>This was retained for the ToC diagram, so as not to prejudge the outcome proposed in the ProDoc. This was done, even though the evaluation considered this as unrealistic that the EEL market transformation targets of the first participating countries could be reached by the end of the project. But it was anticipated that there would be changes in the market due to the principal driver.</p> <p>For clarity, the ToC, added country level capacity increased as Outcome 4 below.</p>
3.1	<p><b>Output 3.1:</b> Policy toolkit accessible to countries online and support provided to country programmes for capacity building</p> <p><b>Indicator and target:</b> Status of the EE lighting policy tool-kit</p>	<p>No change, except for elimination of the one year target.</p>	<p>In several cases there is a one year target, which is not based on clear assessment and without appreciation for the need for sequencing activities and outputs.</p>

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	to be developed by the umbrella programme. A communication tool-kit developed during the first year and implemented		
3.2	<b>Output 3.2:</b> Technical assistance provided to new countries to develop their programs. <b>Indicator and target:</b> Number of countries with EEL programs launched. At least, 14 new countries engaged in EE lighting programs design and implementation.	Technical assistance provided to new countries to develop their programs.  <b>Indicator and target:</b> Number of countries that were provided support to by en.lighten to enable EEL programs to be launched.	Programmes launched by countries would be outcomes, not an output.  The target - Initiation of new GEF projects in at least 14 new countries because of en.lighten was used as an outcome indicator.
3.3	<b>Output 3.3:</b> Public Information and awareness campaign plan implemented. <b>Indicator and target:</b> The use of awareness and training material & feedback from countries. High level of awareness -esp. decision makers and consumers	Public Information and awareness campaign plan implemented. <b>Indicator and target:</b> The number of communications, methods, availability of information and awareness material	Use would be an outcome, not an output, and so removed.
3.4	<b>Output 3.4:</b> CFL disposal strategy and action plan adopted. <b>Indicator and target:</b> Number of countries to adopt CFL disposal the strategy and action plan. All participating countries have adopted the strategy and implemented the action plan	CFL disposal strategy and action plan reviewed across countries and best practices recommended. <b>Indicator and target:</b> The guidance produced; awareness of material & feedback from experts and countries.	Adoption would be an outcome. The evaluation considered the restatement as more reasonable for output. Given the additional costs and low global adoption of appropriate waste CFL recycling, the outcome of adoption was shifted to a <b>possible medium term outcome</b> . In addition given the possibility that this is not adopted, it suggests the possibility of an <b>unanticipated negative outcome medium term outcome</b> of increased mercury in the waste streams.
4	<b>New and added for clarity and is</b>	<b>DIRECT OUTCOME 4: Country level capacity</b>	As discussed it was anticipated that the EEL market transformation

	<b>Project Strategy and Indicators (Source: Original Project Documents)</b>	<b>Reconstructed statement of results used for the Theory of Change. Indicators revised for the evaluation where appropriate and so indicated.</b>	<b>Justification for reconstruction</b>
	<b>essentially an improved statement of Outcome 3, without the sales figures.</b>	<p><b>increased Indicators:</b> some supportive legal and regulatory framework adopted in the participating countries; the level of awareness of the targeted end users raised; capacity of the key local stakeholders on required policies built. Increased resources available to countries to undertake market transformation (for example en.lighten assistance led to new GEF grants to support implementation of such national policies and plans).</p> <p><b>Target:</b> those set in row 3.2 of 14 countries, was kept in view.</p>	<p>targets of the first participating countries as provided in outcome 3, may be unrealistic to be reached by the end of the project and there was the issue of attribution of such changes to en.lighten.</p> <p>On the other hand, some supportive legal and regulatory framework could be adopted in the participating countries. The level of awareness of the targeted end users could be raised. The capacity of the key local stakeholders can be built. They can lead to new plans for implementation and to new GEF resources. They are simply stated and also provide measurable indicators.</p>

32. The above Table 2, with the two statements for the goal level, four Outcomes and 13 output statements, was used to provide the basis for the reconstructed Theory of Change (section 3 and Figure 2 and an “Unanticipated Negative Consequence was added as discussed in row 3.4), and the evaluation approach and methods.

## 2.4 Target areas and groups

33. The en.lighten initiative was stated to involve all GEF program countries and stakeholders, including policy makers, the industry, and the consumers. Its target countries were defined as first, countries who had received GEF support for lighting projects – via utility demand-side management, standards and labelling and building codes projects<sup>39</sup>. It then listed other relevant initiatives to include UNEP's Sustainable Consumption and Production Program, the IEA-G8 mandate to phase out incandescent lighting, and APEC's initiative to harmonize energy efficiency norms and labels in the Asia-Pacific. The final list of countries and projects targeted are provided in the Annex 2. In the end, all countries which are eligible to receive GEF support for Climate Change mitigation were targets of en.lighten, where key targets were ministries of energy,

<sup>39</sup> In 2007, the Project Identification Form (PIF) for en.lighten had noted completed GEF projects, examples include - Efficient Lighting Initiative (ELI) in seven countries, the Greenlights Project in China, efficient lighting projects in Poland and Mexico, and utility Demand Side Management (DSM) programs in Thailand and Jamaica. It also listed ongoing GEF-funded projects and stated that the initiative “would draw on lessons learned from these projects”.

environment and those concerned with lighting in the national governments, and international and regional organizations which are active in supporting or advising national governments for promoting efficiency in lighting use.

## 2.5 Project partners and stakeholders

34. The Project aimed to work with a very large number of partners and stakeholders<sup>40</sup>, as would be appropriate for a global project which aimed to bring about “a global, coordinated effort to transform the lighting market”. The project documents spoke of building upon “existing and related activities supported by the GEF”; creating “an umbrella under which additional national projects in various countries could be undertaken”; with the main components being:- “a global platform for lighting actors”; a “Centre of Excellence” managing and serving the needs of the actors brought together within the global platform; and the provision of support for the implementation of efficient lighting programs, at national or regional levels.
35. The evaluation has restricted the use of the word partners to individuals and organizations that actively “participated” in the project, as shown later in findings with examples in Table 14. Active “participation” includes helping to fund and expanding the scope or intensity of the intervention, guiding and managing the activity, the sharing of efforts, experience and technical information, and contributing knowledge and experience towards the planned outputs and outcomes. Active participants also assisted in the dissemination of information, experiences and lessons as produced by the shared en.lighten platform. The ProDoc had named four “sponsoring partners” – UNEP, GEF, Osram and Philips. The project added the World Bank and UNDP to the PSC, increasing the partnerships and network members.
36. The project documents spoke of many ideas– building upon “existing and related activities supported by the GEF”; creating “an umbrella under which additional national projects in various countries could be undertaken”; with “a global platform for lighting actors” provided by “a Centre of Excellence”; managing and serving the needs of the actors brought together within the global platform; and to provide support for the implementation of efficient lighting programs, at national or regional levels. Under stakeholder mapping and analysis, the ProDoc stated that they were “envisaged to consist of: policy makers, consumers, potential investors, regulators, manufacturers, recycling services, donors and others at the national, also at regional and global levels, as appropriate<sup>41</sup>. In most regions, some of the groups are also represented as regional

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<sup>40</sup> OECD DAC defines Partners as “individuals and organizations that collaborate to achieve mutually agreed upon objectives”; while stakeholders are a larger group of organisations and/ or individuals who have a “direct or indirect interest in the development intervention or its evaluation”. See OECD, 2002. Glossary of Key Terms in Evaluation and Results Based Management; pages 28 and 37.

<sup>41</sup> The complete list of stakeholders en.lighten engaged with is not provided as they will run to hundreds of names. The methodology section discusses how the evaluation planned to, and made use of the long lists and networks of partners, stakeholders and beneficiaries.

groups/associations<sup>42</sup>, and most of the international and global stakeholders are also present both regionally and nationally.

37. Beyond those already listed in the list of partners, the ProDoc defined the stakeholders broadly to be as in Tables 3 and 4, with their roles defined:

**Table 3: Stakeholder groups at the country level**

	<b>National</b>	<b>Role</b>
1	Public authorities of the participating countries	Share their experience, define national needs, undertake national programs and regulations, collect/share national data
2	Lighting industry associations	Share their data and views, their needs, commit to undertake quality and other changes as a group
3	Energy-efficient lighting manufacturers and large actors in the logistics	Share their views, and commit to undertake quality and other changes
4	Banks and local financing entities	Provide financing to industry as needed and to consumers
5	Local power utilities	As they gain in peak power reductions as beneficiaries and as partners who often incentivize efficient lamps
6	Testing and Standards Programme agencies	Set up the minimum standards for products and labelling and testing
7	Consumer associations	Represent user views and expectations

**Table 4: Stakeholder organizations and groups at the global level**

	<b>International/Global</b>	<b>Role</b>
1	United Nations Environment Programme (UNEP-DTIE, UNEP Global Mercury Partnership, Secretariat of the Basel Convention)	Learn, share, manage, execute
2	GEF	Share experience and needs, finance new programmes
3	Banks and financing entities such as World Bank and Regional Banks	Provide financing to countries for programme; share experience and needs
4	United Nations Development Programme	Active implementation in 30-40 countries, share experience and use results
5	Renewable Energy & Energy Efficiency Partnership's (REEEP)	To link to their global mandate on lighting
6	Bilateral donors involved in lighting and their specific projects"	Examples are USAID for Asia and GIZ for India, BMZ in West Africa, and AusAid in Asia Pacific and so on.
7	International Energy Agency	Experiences in OECD countries on lighting
8	Collaborative Labelling Appliance (CLASP)	Experiences in appliance and other labelling
9	Public authorities of key partner	Share their experience, define national programs

<sup>42</sup> A separate Table of regional stakeholders is not shown here, as they were not specified, but the en.lighten team made good use of partnerships with many regional organizations and they are mentioned subsequently under findings.

	countries	and regulations
10	Lighting industry associations	Share their data and views, their needs, commit to undertake quality and other changes as a group
11	Energy-efficient lighting manufacturers and large actors in the logistics	Share their views, and commit to undertake quality and other changes
12	Associations of energy producers	As they gain in peak power reductions as beneficiaries and as partners who often incentivize efficient lamps
13	Testing and Standards Programmes and International harmonization institutes and organizations	Discuss minimum standards for products and labelling and testing such as IEC and COPANT
14	Consumer associations	Represent user views and expectations

Source: ProDoc

38. The ProDoc stated that all these stakeholders would be involved in project implementation by using appropriate mechanisms and channels<sup>43</sup>; where the channels would include - direct consultations, workshops, and public awareness raising and training, “while consumer surveys and public media would be more relevant for the views of individual consumers”.

## 2.6 Milestones in project design and implementation

**Table 5: Project milestones**

Milestones	Dates
Project Identification Form (PIF) submitted to GEF	September 2007
GEF approval of project	17 August 2009
Expected Start Date:	Jan 2010
Actual start date:	Feb 2010
Midterm Evaluation (MTE). (The MTE reported 44 country partners)	September 2013
Global Efficient Lighting Forum	November 2014
Project completion – planned	Dec 2013
Project completion – actual operational closure	Nov 2015
Final project financial closure	Not completed.

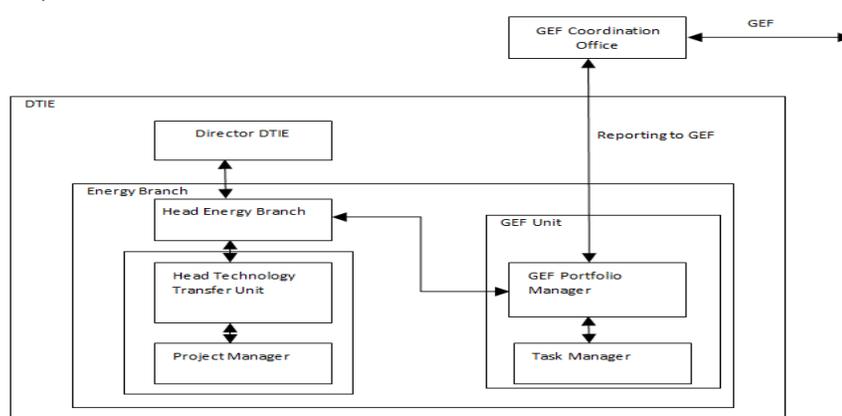
Source: Compiled from different project documents.

<sup>43</sup> The ProDoc states that many other relevant international and regional entities, involved in supporting lighting activities in different countries, will be involved in close co-operation, for exchanging experiences and lessons learnt, and for joint activities and possible cost sharing. The written documentation confirms awareness in the project design of an expanding web or *network of partners and stakeholders*, who would be involved in some ways as the en.lighten project unfolded. The numbers of such individuals and organizations are many hundreds, so a complete list of all stakeholders by name, is not provided in the report. The en.lighten web site is a good source for the multiple interactions of the project with many different stakeholders.

## 2.7 Implementation arrangements

39. UN Environment was the GEF Implementing Agency. The UNEP Economy Division (formerly DTIE) was the Executing Agency with responsibility for global project management, monitoring and technical assistance components including financial instruments. A project team was put in place for the duration of the project, with a project manager responsible for the day to day management and administration of all activities. The ProDoc also stated “The UNEP/DGEF monitors implementation of the activities undertaken across the UNEP, providing progress reports through UNEP to the GEF” but the separate DGEF unit was discontinued, and the Implementing Team was moved to a Unit within the Economy Division called the Climate Change Mitigation Unit. This implementing unit is separate from the project execution team who reside in another unit called Technology Transfer Unit.
40. The decision-making body for the project was made up of the Project Steering Committee (PSC), composed of UNEP, UNDP, World Bank, private sector partners, Natural Resources Defence Council, GEF Secretariat and the other project co-financiers. The PSC was expected to work on the basis of the agenda and background documents prepared by the Centre of Excellence (COE), it was expected to provide orientation for the programme of work of the COE, and was to physically meet at least once a year. The PSC did meet once every year. The PSC minutes have been provided for the evaluation and reviewed<sup>44</sup>.

**Figure 1. UNEP Organigram as relates to GEF Implementing and Executing Agency arrangements (at approval)<sup>45</sup>**



## 2.8 Project financing

41. The overall GEF funding at the project design stage was 5,668,000 USD for the period of 4 years (2010-2013)<sup>46</sup>. The Table 6 below provides specific details of the 5,000,000 USD

<sup>44</sup> The background documents prepared for the PSC were not fully available for the evaluation.

<sup>45</sup> The special DGEF Division was abolished during the implementation period, sometime after 2013, however the GEF coordination office remains and is still active in its coordination role within UN Environment.

<sup>46</sup> From ProDoc Annex 3, page 1; 200,000 USD had been allocated for project preparation and 468,000 USD (9 %) as UNEP agency fee.

of GEF resources available as per the project components, and the plans for the total project including co-financing at project design which was 20,868,000 in total (see Table for details).

**Table 6: Breakdown of the budget by components as approved.**<sup>47</sup>

Component/output	GEF Financing		Co-financing sources		Total budget USD
	USD	%	USD	%	
Component 1: Establish a global platform	800,000	35	1,500,000	65	2,300,000
Component 2: Implementation of a Centre of Excellence	3,000,000	43	4,000,000	57	7,000,000
Component 3: Support to country and programs	600,000	7	8,000,000	93	8,600,00
Component 4: Project Management & M&E	600,000	25	1,500,000	75	2,000,000
Total contribution	5,000,000	-	15,000,000	-	20,000,000

Source: Project approval document.

**Table 7: Project co-financing anticipated as per project document and CEO endorsement**

Funding Source	Classification	Type	Amount (\$)	%
UNEP	Executing agency	In-kind	68,000	0.5
Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME) <sup>48</sup>	Government	Cash	132,000	1
OSRAM	Private sector	In-Kind	6,000,000	39.5
Phillips	Private sector	In-kind	6,000,000	39.5
Others	Private sector	In-kind (to be raised from the private sector during the project implementation)	2,800,000	19.5
TOTAL Co-Financing <sup>49</sup>			15,000,000	100.0

<sup>47</sup> As per CEO endorsement (submission date 12/5/2009).

<sup>48</sup> ADEME funds were the only cash co-financing planned. Subsequently this could not be accepted as ADEME and UNEP did not agree on the conditions. Subsequently, funds were provided by Australian Aid, BMZ, NLTC/GELC, not known earlier.

<sup>49</sup> It has been stated "The co-financing structure of the project evolved during the project implementation and the evaluation needs to take into account the new funding sources". Discussion and analysis of the co-financing is done in the financial management section. The ProDoc states - Co-financing "are project resources that are committed at the inception of the project, and meeting co-financing obligations and reporting on them is part of this legal agreement. Resources which are not committed as part of the essential financing package *at the outset, but which are mobilized subsequently*, are not considered 'co-finance' but 'leveraged' resources. This definition of GEF is used here.

Source: Project approval document.

## **2.9 Changes in design during implementation**

42. The project documents did not indicate any formal changes were made to the design during the implementation. But they do suggest adaptations which appear to have been made, sometimes to adjust to missed time lines, at other times due to new opportunities and challenges as they emerged. No significant budget revisions were noted in terms of areas of activities and efforts. But each year the project had difficulty in spending the planned budget during the twelve-month period and the budget revisions are shown in Annex 4.

### 3 THEORY OF CHANGE

44. The project did not provide for an explicit Theory of Change (TOC)<sup>50</sup> to guide and monitor progress towards results, though it used the Strategic or Results Framework (ProDoc Appendix 4) to guide the design, implementation and monitoring of results. In the UNEP and GEF TE, a key element is an effort to assess project outcomes and likelihood of impacts, even though many outcomes and especially impacts often accrue only after time-lags, often several years after completion of activities and closure of the project.
45. Despite these limitations, it is possible to enhance the scope and depth of information available for the Terminal Evaluations on the achievement of results through a rigorous review of project progress along the constructed pathways from activities to outputs to outcomes and finally to impacts. This is done with a reconstructed Theory of Change diagram that identifies the sequence of conditions and factors deemed necessary for project outcomes to yield impact and to assess the status and future prospects for results<sup>51</sup>, with verification of the causal logic between the different levels of the logical framework. The aim is to develop an improved understanding of the causal logic of the project intervention. In reality, especially in this project, the processes are often complex; they always involved multiple actors and decision-processes and are subject to time-lags, between the activity and following stages.
46. The final stage involves the analysis of the ‘impact pathways’ that link project outcomes to impacts. The pathways are analysed in terms of the ‘assumptions’ and ‘impact drivers’ that underpin the processes involved in the transformation of outcomes to impacts via intermediate states (see Figure 2). Project outcomes are the direct intended results stemming from the outputs, and they are likely to occur either towards the end of the project or in the short term following project completion. Medium term or intermediate states are transitional conditions between the project’s direct outcomes and the intended impact.
47. The evaluator reviewed key documents related to the project in the inception phase of work and identified explicit and/or implicit statements about the intended objectives of the project, and assumptions on how and why the project was expected to work. The model for the global project began with the facts that there was a rapid rate of technological change taking place in providing illumination, such change was increasingly more energy efficient than the traditional incandescent lamps, and the technical changes improved other performance characteristics such as longevity, while accompanied by rapidly falling costs for illumination provided by the lamps in all markets. The model for the project envisaged a move to a coordinated global approach

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<sup>50</sup> It needs to be stated that a ToC diagram was not a requirement at the time of project design and approval.

<sup>51</sup> In evaluation literature the relationships are also described as Impact ‘Pathways’, ‘Results Chains’ and ‘Causal Pathways’. The GEF process does not formally include the activities level in the methods but here it is included in the causal pathway for clarity, as per the OECD DAC guide which defines the causal sequence for a development intervention, to include the sequence beginning with inputs, moving through the activities and outputs, and culminating in outcomes, by the end of the project. Impacts happen after a time lag.

towards outputs - data, policy, standards, and specifications, testing and so on to be provided through a global forum supported by a Centre of Excellence, together with strong links with earlier work on EEL and with the multiple stakeholders, nationally and globally involved in the market transformation. The contextual background has been provided in the earlier section. The nature and scope of the project contribution and its logical framework has been presented in a simplified and revised form in section 2.3, Table 2.

48. There were several weaknesses in the wording in ProDoc and in the LFA, and these were revised for the purposes of the evaluation (see comments in Table 2). The goal level statement was not evaluable<sup>52</sup> as stated and was modified as “Promote the increased use of efficient lighting in the residential sector of developing and transition countries” (see Table 2 for all changes). The key question one (para 6), was modified to read - to what extent is there evidence that en.lighten contributed through its activities and outputs to the direct and medium-term outcomes as re-defined<sup>53</sup>; and, the extent to which any progress observed can be attributed to project interventions? The evaluation considered that the outcomes of the project could be more reliably gauged by its contributions on precursors to improved markets such as policies, standards, information, with credible labelling and consumer knowledge, monitoring, verification and enforcement (MVE) and safe collection and recycling of waste. The project aim - Market Transformation - requires the removal or amelioration of these critical barriers and the increased social, economic and environmental service benefits of efficient lighting, thus enhancing their longer term acceptance. The main barriers hampering the adoption of efficient lighting were listed to include the first costs, technical performance of the new lamps, the organization of the market, consumer preferences, and, the health risks, with a focus on mercury content<sup>54</sup>. The above provide the building blocks to support the ongoing technical changes towards the project goal of higher efficiencies in lighting. In addition, the promotion of longer term sustainability of the shift to higher efficiency lighting, required increased consumer acceptance.
49. In this complex project, the absence of any frameworks or reviews of concepts used for the LFA, posed additional challenges for developing the presumed ToC. The evaluation view is that en.lighten was guided by the assumption, based on the information reviewed on a sample of GEF supported EEL projects, that users of new technology, such as EEL,

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<sup>52</sup> For example the much earlier IFC/GEF project the Efficient Lighting Initiative (ELI), implemented during 1999-2003 with a GEF investment of US\$15 million (much larger than for en.lighten), focused on only 7 countries, acknowledged the “market transformation aspect of makes any impact estimate imprecise” as most program effect on sales are indirect, not direct. Second, they are heavily influenced by exogenous factors beyond the control of the project. Third, such effects should take a longer time to become apparent and hence benefit assumptions must be made over a ten year period. And fourth, it would not be possible to attribute the changes to the project alone. See IFC/GEF, 2000. Efficient Lighting Initiative (ELI) Tranche II, The Czech Republic, Hungary, Latvia and The Philippines- Project Document, January 2000, pages 9 and 10.

<sup>53</sup> The question had only stated “reduction of market barriers”, while the expanded outcomes as discussed here have been used to answer the main intent of the question.

<sup>54</sup> The ProDoc devoted pages 8-22 for a discussion of each barrier. It paid special attention to the challenge of mercury in fluorescent lamps, with its own special section in pages 13-14 and in 52 instances. It also paid attention to the reduction of mercury emissions due to reduced coal consumption and emphasized in paragraph 29, the UNEP goals of reductions in anthropological emissions of mercury, and in paragraph 30, “Any significant CFL-promotion effort must take into account the environmental risks pertaining to the disposal of CFLs”.

faced several barriers. They were - inadequate information, uneven and often poor quality products, and, initial higher costs, which stem from the relative novelty of the technology. The novelty of the products often means the absence of appropriate national and global standards, and the lack of verification and enforcement in the market of standards. Adequate and relevant information, provided clearly to buyers, is a necessary condition for the buyer to make a rational and informed choice. These barriers have hampered the faster growth in the adoption by users of more efficient lighting in many countries. Thus, the enlighten activities were focused on barrier removal at the national level, through better information, capacity support for new regulations and increased enforcement, delivered through the network of global, regional and national partners. While regulations and verifications are necessarily national<sup>55</sup>, such national level actions (outcomes) were also supported by the parallel regional and global actions, and through the support of, and collaborations with, multiple pre-existing networks, stakeholders and partners.

50. The evaluation noted multiple conceptual and theoretical frameworks that can be used to situate the Theory of Change. A model often used in the literature on diffusion of innovations, is that three key factors – Knowledge, Attitude and Practice (KAP) <sup>56</sup>are involved. In its simplest variant – there is a piece of “new” knowledge that needs to be transferred (sometimes after it is developed in this case by the COE and the Task Force) as an object, to those who do not have the knowledge. Successful transfer would result in a change in attitude, which in turn would lead to practice or action. Here the report does not pause to discuss the many strands in KAP theory, where the attitude may itself affect if knowledge transfer takes place, and, the many complex variables that can intrude between the attainment of K and A, and then the non-attainment of actions or practice.
51. It was also seen during the review phase that “Collective Impact” theories<sup>57</sup> could be explored. Such theories concern programmes for change, where many social actors,

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<sup>55</sup> The ProDoc stated (page 8), “the project is global, however success will depend on the commitment of the participating countries to carry out market transformation at the national level”.

<sup>56</sup> Among classic references on the diffusion of innovations is Rogers EM. 2003. Diffusion of innovations. New York: Free Press; and some more recent reviews can be found in Dearing, James W., 2009. Applying Diffusion of Innovation Theory to Intervention Development, Res Soc Work Pract. Sep 1; 19(5): 503–518. doi: 10.1177/1049731509335569. Dearing adds that these ideas have been applied in many fields, leading according to him – “into a science of dissemination”. He adds effective interventions to promote evidence based good practice can be combined and communicated to potential adopters in “delimited clusters” to encourage choice and adaptation. Effectiveness is heightened through visibility and with demonstrations, potential adopters and implementers can be conceptualized as members of social actors, which can lead to efficiencies in communication and the potential for spread. Finally, references to contextual conditions can increase the perception of relevance and opinion leaders can increase the effects among colleagues.

<sup>57</sup> See for example a discussion Kania, John & Mark Kramer, 2011. Collective Impact, Stanford Social Innovation Review, Winter 2011. They state that the scale and complexity of many issues require multiple actors to come together for a “Collective impact”. This requires all participants to have a “Common Agenda” or a shared vision for change, with a common understanding of the problem and a joint approach to solving it through agreed upon actions. But they caution that when organizations have different definition of the problem they can be ignored when they work independently, but the differences can undermine the impact as a whole. Collective impact requires that these *differences be discussed and resolved (emphasis added)*. Funders can play an important role in getting organizations to act together. They add agreement on a common agenda is improved by agreement on measuring results

come together to support actions, many to be yet determined but along a common vision while maintaining their distinct identity. The “collective impact” model requires a “backbone support organization” with staff at the core of the initiative, such as the COE<sup>58</sup> in this project. Such coordination takes time, effort and skills, and the literature cautions, that too often it is assumed that collaboration can occur without a supporting infrastructure of adequate capacity. In our view, KAP and diffusion models, and, collective impact and network theory, all provide overlapping and useful theoretical frameworks. The network models cover issues of social interactions and information exchanges between nodes, the use and role of central nodes in meeting information gaps in technological innovation and diffusion models, the communications and links between the key actors, and the existence of multiple and overlapping networks, appear most appropriate. But none of them or any other concepts have been stated, used or defined in the ProDoc.

52. The evaluation developed the assumed Theory of Change (ToC) in Figure 2, looking closely at the defined activities, outputs and outcomes, as described in the linear and sometimes poorly worded LFA (already laid out in Table 2). The weakest element of the LFA was the lack of discussions on the linkages required between activities and outputs and potential sequencing, opting often for one year targets for many activities, when they were required to be sequenced (discussed in the findings). The schematic diagram for the ToC that was developed (Figure 2) was deliberately kept simple and also to match closely the activities, outputs and outcomes in the LFA (as reconstructed for clarity in Table 2). The hypothesis made was that a simpler schematic would allow the evaluation to focus first, on how the project activities actually supported the partners, through the 13 prescribed activities/outputs. Then the ToC would flexibly examine the evidence on how the outputs delivered contributed to the desired and direct outcomes, individually and collectively achieve. Only then the evaluation would examine potential achievement of the medium-term outcomes. The simple ToC was chosen to focus on the changes that the project can be seen to unambiguously contribute to, while keeping the schematic of the ToC visually uncluttered and in agreement with the LFA (Figure 2). The evaluation considered it important for the ToC diagram to emphasize two important visual elements. The first is in grouping the 13 activities into a more coherent sequence, within three activity groups. The second is to highlight the ongoing, anticipated and continued rate of technological change in EEL which is the major impact driver for the changes in lighting, which the project wished to *accelerate*. The trend of rising sales of EEL globally, was already a fact, driven by the technological trends and earlier efforts in countries and regions to promote EEL (see paragraph 25). This is shown by the lower and rising curve labelled “slower take up of EEL” in Figure 2<sup>59</sup>. The project influence and

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consistently so efforts remain aligned. Collective impact depends on the network of diverse group of stakeholders working together, on mutually reinforcing activities.

<sup>58</sup> In the theory, the COE as defined here, must follow an adaptive approach, responding to developing needs; must focus group attention and work with some urgency; and have the skills to engage the diverse stakeholders with the ability to mediate conflict among stakeholders.

<sup>59</sup> Here “slower” refers to the business as usual, without en.lighten accelerating the sales of EEL. The difference, between the lower curve, without en.lighten and the upper, faster rising curve, with en.lighten, has been exaggerated for schematic clarity only. The evaluation in fact considers that the difference between the with and without en.lighten sales would not be easily distinguishable, given that this was a five million expenditure by GEF to influence

impacts on increasing sales of EEL would be represented by a faster rising curve, shown by the higher trend line in Figure 2. It could begin early, as assumed in the LFA, continue through the life of the project, and continue on through medium term outcomes to the final impacts, where all opportunities for accelerating sales of EEL are exhausted. One intermediate state (medium-term outcomes) was located between the project direct outcomes and the intended impacts.

53. For the conversion of activities to direct outcomes, the project design and the ToC, make two sets of assumptions. The first is high levels of political support from countries; and that is followed by national support from private sector champions with global collaboration and partnerships, to convert all 13 activities to the 13 project outputs, which map to four direct outcomes. The collaboration network is represented by the global steering committee; multiple partnerships; and the anticipation in the design for close working relationship among different UN Agencies, and international support is an incentive to national actions, a driver. Continuing challenges for project outcomes could be anticipated at the project execution levels; and at the country levels because of varying country capacity factors - readiness, choice of institutions and individuals to lead the work, the availability of resources, and mobilization of stakeholders, attaining coherence in approaches and governance structures. In addition, given the large sets of partnerships, over which the project did not have control, it can be expected that some partners may “free-ride” and not devote appropriate resources to the collective enterprise. The impact drivers are the incentives provided to change the behaviour of market participants, which link back to the national plans for energy, emission and the economy and international support. The drivers are supported through en.lighten support for the communication of facts of how the benefits can accrue nationally, experiences in different countries of such actions, the support provided to build national capacities for action plans, and to take these plans forward into national process and also for international donor and GEF financial support, as appropriate.
54. The combined ideas as expressed in Table 2 and diagrammed in the ToC (Figure 2) assisted in the conceptualization of the evaluation process and its approaches. The networks supported by en.lighten could also have been shown as an overlay in the same ToC diagram (see Figure 3). But given the complexity of network diagrams, and the difficulties of manipulating the information and metrics, it was decided to keep the ToC diagram simple and close to the descriptions in the ProDoc<sup>60</sup>. Thus the ToC diagram does not attempt to create an overlay of platform network and nodes (while a visual is provided separately in Figure 3) nor the sequencing adapted and regional entry points used. The findings section of the evaluation report includes descriptions of the project outputs and outcomes as shown in the ToC and identify the elements of the outcomes of the ToC that were verified by evidence, and those for which the evaluation found either no supporting evidence or any contradictory evidence. They are also used to assess the sustainability and progress towards impacts in light of the drivers and assumptions (in paragraph 52).

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a market with annual sales of around one hundred billion dollars; and some of the larger countries and regions had already moved to adopt the policies and recommendations provided by en.lighten.

<sup>60</sup> The activities and outputs have been kept identical in the TOC and project Log Frame. For the effectiveness analysis the TOC outcome statements are privileged.

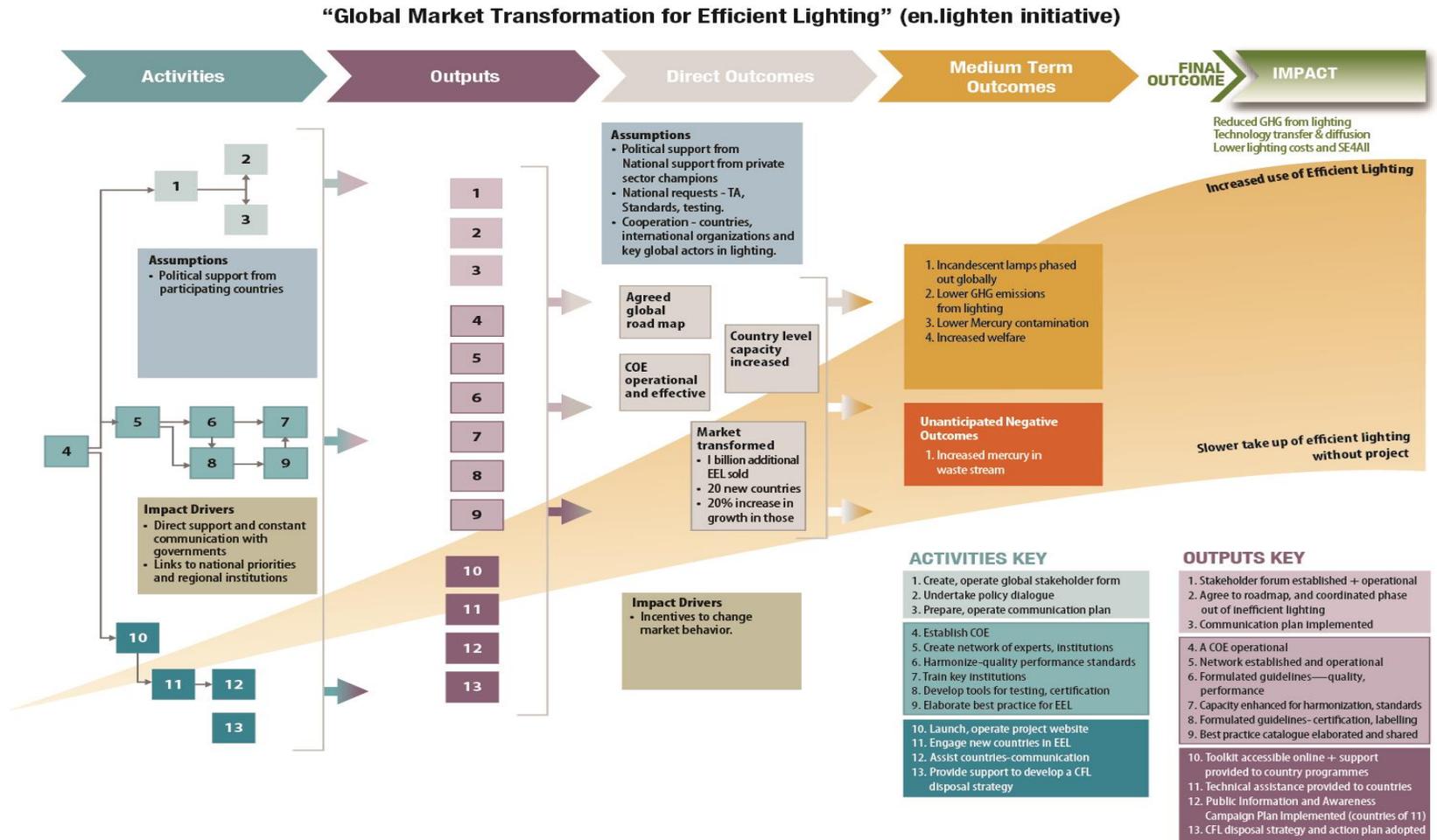
55. The evaluation considered that given the shortcomings in some of the descriptions in the LFA, (see the reconstruction made for greater clarity, in Table 2) the ToC has been sketched with one distinct new direct outcome: **Country level capacities increased**. As per Table 2, **this has two** indicators: one, supportive legal and regulatory framework adopted in the participating countries; and second, capacities enhanced at the country level. The latter includes - levels of awareness of the targeted end users raised, and the capacity of the key local stakeholders on required policies built, so that policies and frameworks can be enhanced. They could be enhanced by being more effective, efficient or attain greater coherence in the policy framework. Examples that support an increased rate of diffusion of EEL would be those that increase consumer confidence and welfare. This would be achieved by labelling, increase of quality, and reduced mercury content in lamps thereby reducing the hazards of mercury in individual lamps; and increased/enhanced safe collection and recycling. The second, increased resources available to countries to undertake market transformation, for example enlighten assistance leading to new GEF grants to support implementation of such national policies and plans. A key role of the project, as indicated in the discussions in the ProDoc and in the review of activities and purposes, is to increase country level capacities to request and manage additional tasks and increased resources made available to undertake market transformation.
56. The above outcomes are simply stated and they also provide measurable indicators. The results that the original LFA stated, is found by the evaluation to be overly ambitious and cannot be verified. The evaluation has used the modified and verifiable words in the ToC to better capture the project results and it has added the potential medium term unintended outcome of increased mercury in the waste stream.
57. The documentation reviewed was often found to focus narrowly on two goal statements - the first was the removal of incandescent lamps (IL) from use in the residential sector of countries by national legislation, and, followed by its replacement, largely by compact fluorescent lamps (CFL), with attention to improved quality of lamps. It is reasonable for the project to assume that as inefficient ILs are removed and replaced by more efficient CFL, then the energy used at each existing light point would be reduced for the same amount of light output, leading thereby to national reductions in GHG from that specific use. It would then follow, that the reduced energy consumption can lead to monetary gains on energy expenditures nationally, and for electricity producers and by individual consuming households/entities. In addition, in countries with significant shares of coal in the energy supply mix, the reductions in energy use could lead to a corresponding reduction in total coal consumption, unless coal use goes up due to other non-lighting demands. The reduction in coal consumption was then associated with reductions in mercury emissions associated with coal. These are all seemingly reasonable assumptions but are not equally supported by theory and experiences.
58. In fact, in the more detailed activities and reports in the ProDoc, there was an awareness that there were a number of additional benefits and costs to the shift in the markets to EEL. First, when higher quality products become available to consumers, that leads to additional benefits to consumers, while any higher prices and lower quality of life would reduce the potential consumer welfare. Secondly, changes in local production and imports would lead to additional gains and losses for some firms and some workers. Third, the new technology, as with all cases of technological change, added a new toxic pollutant, mercury, to the production, use and disposal of such lamps, which was a

negative effect and needed proper management (specifically for some additional information on mercury in lamps see Annex A3.2). The ProDoc was ambivalent about the issues<sup>61</sup>. Another new medium term outcome was added in the ToC called “Unintended consequences” of added mercury in lamps (see discussion in Table 2 on this point). Fourth, these added costs and benefits accrued to different stakeholder groups. Finally, the project concept was static and not dynamic. It did not clearly take into account, in its impact analysis of the reduced energy demand, the “rebound” or “take-back effect” – where the reduction in use of the input and the expected gain from new technologies, is in fact lower than the engineering estimates used by the project, because of behavioural and systemic effects. The degree to which these additional dimensions were noted in project outputs and communications, and preferably attended to, is assessed in the evaluation.

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<sup>61</sup> Mercury issues are mentioned or discussed 52 times in the ProDoc. Paragraph two is clear and highlights both the potential added benefit of “reducing mercury release from coal combustion” and the negative of the mercury content in CFLs, for which reason the project would “seek to find feasible energy efficient alternatives to CFLs, in addition to *addressing the current need to find environmentally sound recycling and disposal of CFL waste (italics added)*”. On page 8, it listed four main barriers hampering the uptake of energy-efficient lighting and the fourth was the health risk due to mercury content, again identifying it as a health risk on page 13. Simultaneously, in the following sentences, it suggested the low mercury demand for “CFL production”, believed it would remain low for ten years with increased production, as each CFLs would use less mercury, and the possible achievement of a “mercury free CFLs”. It then referred to UNEP Governing Council, decisions on priorities for work on mercury, the goal of the UNEP Global Mercury Partnership to reduce, and where feasible eliminate anthropogenic releases of mercury”, and “the focus of the UNEP Chemicals mercury program on reducing the demand of mercury for all uses, including lighting and lamps”, to conclude that “significant CFL-promotion effort must take into account the environmental risks pertaining to the disposal of CFLs”. On page 22, it added that the “third component of the Project will address this issue by supporting governments in the establishment of a national strategy of CFL disposal as well”, including the reduction of mercury supply, the reduction of mercury use and...”. Finally, it stated “the Project will include as an objective reducing the demand of mercury for lighting and lamps (Activity 3.4)”. It was not added to the objectives.

Figure 2: The Theory of Change diagram



## 4 EVALUATION FINDINGS

59. The design for answering the key evaluation questions involved the construction and application of an evaluation matrix, discussed with and approved by the UN Environment Evaluation Office. This then guided the data collection and analysis, keeping in mind the 29 evaluation criteria/dimensions, 7 key questions, and, sub-questions and 14 defined outputs, with over one hundred partnerships of different kinds and intensities. The evaluation matrix clarified the above dimensions, and was used together with the reconstructed Theory of Change (Figure 1). The matrix, with additional explanations and discussions of the issues, has been the basis of the findings reported below. A summary of the findings, along the specified criteria, is provided in Table 17.

### 4.1 Strategic relevance

60. The relevance criteria and rating has eight subcategories, and each is discussed below. The Evaluation Office (see also TOR in Annex 7) requires an emphasis on the aspects of relevance to global, regional and national environmental issues and needs; to UNEP's mandate and its alignment with UNEP's policies and strategies; and, to the GEF's focal area on Climate Change. The subsections below discuss the finding that the project was of high relevance to those three main components, and so they are rated to be **Highly Satisfactory (HS)**.

61. The evaluation was also required to assess the project's relevance in relation to five additional aspects – the Bali Strategic Plan, South-South Cooperation (SSC), gender; Human rights based approach (HRBA) and UNEP Environmental, Social and Economic Sustainability Framework (ESES). The sections below discuss that the project relevance for the first two aspects (BSP and SSC) were **Satisfactory (S)**. But it was not satisfactory on Gender, HRBA and ESS dimensions. In UNEP evaluation practice the poor performance on the above 3 aspects, lower the overall relevance rating to **Satisfactory (S)**.

#### 4.1.1 Relevance to global, regional and national environmental issues and needs

62. The evaluation found a very high degree of congruence between the strategic objectives and the priorities and needs of many participating countries, in energy, efficiency and GHG reductions, during the project time period of 2010-2015. It supports goal seven: "Ensure access to affordable, reliable, sustainable and modern energy for all" and goal thirteen: "Take urgent action to combat climate change and its impacts" of the global Sustainable Development agenda.

63. At the regional and national levels the original project design did not clearly articulate how differences in national circumstances would be dealt with, for example for countries where goal seven was fully met versus countries where it remains far away. In the latter case it did engage in a review of EEL options for off grid applications but this was in the nature of an add-on to the main message. Similarly, it had challenges in its communications for countries where a high percentage of electricity was from renewable sources and where coal was not a source for electricity.

64. During implementation, the project was able to allow for some, though often a small, degree of flexibility of responses to national differences by working through regional

entities, which allowed for recognition of differences by region and from there, to a degree at the country level. The actual degree of flexibility available to the project was limited due to the standardized design, tight deliverables of many outputs, and resource constraints. An example of where there were differences between the standard message and country needs and the degree of adaptation by the project team to the actual circumstances, was noted in Uruguay (Annex 1.2), where project funds allowed the national stakeholders to undertake additional work on mercury emissions. This support contributed to a larger GEF supported project to examine the issues of waste from lighting in greater depth<sup>62</sup>. The perceptions of key stakeholders in the interviews and in the survey largely reflect the finding that the project outputs were *mostly relevant* to their needs, and, the project as a “global platform” was not, and could not always be, fully congruent with varied and individual national contexts in each country, given the number of dimensions and the variations between countries. The evaluation rates the strategic relevance of the project as highly relevant for its main characteristic, a first global platform, supporting efficiency and focused on lighting.

65. The objectives and strategies were consistent with the global, regional and national environmental issues and needs, as defined and prioritized by the *key partners in the climate change mitigation sector* (see Tables 3, 4 and 14 on partners and stakeholders). Each partner and stakeholder had specific interests and priorities by location and by issue, outside their common interests. The process did not often attend to such differences, which have been noted to be a major challenge in collective action projects (see section 3, and especially paragraphs 48-52, and 52-54) were not always catered to well. For example - lower attention was paid to the complex issues of the toxicity of mercury and the importance safe handling and recycling than they deserve. This was not a priority for many of the stakeholders the project engaged with – mainly those responsible for GHG mitigation nationally and globally, and, with the economic and financial gains that the switch over to more efficient lamps provided. The project could have done much more in this area – by expanding its range of partnerships to address issues of chemicals and recycling - but it was hampered by budget limitations and overambitious global statements, so its adaptation capacity to local variations in circumstances and needs were less adequate<sup>63</sup>. It was well linked to, and was aware of, other global, regional and national initiatives with regard to the promotion and transformation of the market towards efficient lighting and the objectives were highly consistent with the global priorities for GHG reductions, where it has a high priority as, the adoption of efficient lighting solutions, nationally and globally, provide for cost

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<sup>62</sup> This is especially noteworthy, given the finding that the issue of mercury waste was not addressed adequately through many of the project outputs. See Annexes 6.2 on Uruguay and 5.2 on mercury.

<sup>63</sup> The project team does not fully agree as the main goal of this project was energy efficiency, and hence the main focus from for the activities and the partners. In their view the mercury issue was taken into account since the start; en.lighten supported the Minimata convention by proposing a maximum mercury content allowed for CFLs under Minimata and also had a chapter in the toolkit on mercury emissions, health aspects and waste collection and recycling. The evaluation does not agree that the issue of mercury was covered well -in quantity or quality. It is agreed, this was not a primary objective and it was not a chemicals project. But the coverage required was well specified in the ProDoc and LFA. The coverage by the project failed to meet the specifications. In particular, it did not discuss adequately, waste collection and recycling practices, or the actual practical difficulties faced by countries in this effort and the need for significant investments to do it well.

reductions and other additional benefits, unlike many other measures that require significant additional costs and so is rated to be **Highly Satisfactory (HS)**.

#### 4.1.2 Alignment with UNEP's strategy, policies, and mandate

66. The evaluation found the project to form a coherent part of the programme framework of UNEP Programme of Work (PoW) for 2010, 2011 and 2012. It is also referred to in the UNEP Strategic Plans and Annual Reports for the period and in UNEP DTIE programme of work on Climate Change mitigation<sup>64</sup>.
67. The evaluation found the intended results (outcomes, see next sections) were likely to contribute to the stated UNEP Expected Accomplishments (EA), namely, "Countries make sound policy, technology, and investment choices that lead to a reduction in greenhouse gas emissions and potential co-benefits, with a focus on clean and renewable energy sources, energy efficiency and energy conservation" and the outputs were closely *correlated* to the outcomes expected<sup>65</sup>. The pathway from project outputs to EA contributions were not clearly delineated in the ProDoc but were stated in the PoW and to contributions to the Expected Accomplishments (EA). The EA indicators were appropriate<sup>66</sup> to measure contributions, and with the project milestones could link to programme outputs and to the EA. Overall the evaluation found the alignment of the project design with the UNEP PoW and its contribution highly satisfactory. The evaluation found the likelihood of outputs contributing to the PoW and to the EA as highly likely. This was based on the fact that there was sufficient prior evidence from dozens of similar efforts at smaller scales, which the project planned to deliver through the global platform. So the support to be provided to the stakeholders is relevant and appropriate and this is rated as **Highly Satisfactory (HS)**.

#### 4.1.3 Alignment with GEF focal areas and strategic priorities

68. The project was a part of the GEF's climate change priorities, both as mandated by UNFCCC, reflected in GEF priority statements and its allocation of resources. The project met all conditions for a GEF enabling activity and supported capacity development measures; it focused on technology, and the strengthening of national capacities to fulfil commitments made under the Convention. The countries participating were self-selected, and *to that extent*, it was a country driven process, where en.lighten only provided strategic and technical network support and contributed to national policy and implementation capacity. The principles were built on the lessons from many earlier GEF funded projects, and as noted, it was well linked to and aware of other global, regional and national initiatives in its area of focus. The evaluation found that the ProDoc had not provided clear directions on the linkages with other relevant projects by GEF and its implementing agencies, beyond statements to such intent, and plans for the representation of GEF and its implementing agencies at the annual Project Steering Committee meeting.

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<sup>64</sup> Its divergence with UNEP policies in other areas is discussed subsequently in sections 4.1.6 through 4.1.8.

<sup>65</sup> UNEP, 2008. Medium-term strategy 2010–2013. See page 26.

<sup>66</sup> It is clarified here that the indicators for the programme of work are not the same as the project specific indicators for monitoring the progress that have been discussed for lack of clarity and weaknesses for measurement.

69. An additional GEF priority – engaging with the private sector was a critical element in the design and execution of en.lighten, which was to fulfil the directions of the GEF to work with private sector partners. The GEF has made several efforts and a long history of engaging with the private sector<sup>67</sup>, begun with a strategy in 1996 which identified the “removal of market, information and other barriers” as the key logic to engaging the private sector, as was the aim of en.lighten. Later reviews by the GEF saw the gains to manufacturers without contributions as a “critical weakness” (sic) of such projects. It noted dissatisfaction with the Efficient Lighting Initiative (ELI) implemented through the International Finance Corporation (IFC), which was deemed a great success in seven countries, because the IFC “maintained, on purpose, a stance of detachment from the manufacturers in order to maximize the credibility of the lighting products” and certified high standards independently<sup>68</sup>. The en.lighten project approval was fast tracked and funded through another GEF initiative “Earth Fund” which required direct private sector co-financing. The private sector contributions had diminished during GEF-4 (see GEF, 2013), and so was a high priority for the GEF at the time en.lighten was approved. A subsequent GEF review<sup>69</sup>, found the performance of the new fund used for the project was unsatisfactory and the Earth Fund was closed (with no direct repercussions on en.lighten). Thus, the project was perhaps *too closely* aligned with the uncertain and shifting institutional priorities of the GEF. This was suggested by a number of stakeholders during personal interviews, where the earlier fast track GEF approval and the high visibility of en.lighten, were given as a possible reason for some of the implementation challenges, and are discussed subsequently in this report. This dimension is rated as **Highly Satisfactory (HS)**.

#### 4.1.4 Alignment with the Bali strategic plan (BSP)<sup>70</sup>

70. The Bali Strategic Plan<sup>71</sup> aims to strengthen the capacity of governments to: (1) participate fully in the development of coherent international environmental policy; (2)

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<sup>67</sup> The most recent review of GEF engagements with the private sector can be found in GEF, 2013. Review of GEF Engagement with the Private Sector Technical Document #13; November, 2013. In 1999, in another policy paper, reviewing engagements on energy efficiency and private sector, concluded that the removal of barriers to large-scale application, implementation, and dissemination of energy-efficient technologies, were “risks” for manufacturers, and so by promoting efficient energy use, the energy efficiency programs can have a major impact in fostering market transformation and removal of barriers, “which allow for greater private sector engagement”. It discussed two projects in China, implemented by UNDP, which had “successfully demonstrated standard setting, certification, and labelling activities to promote consumer awareness and build markets for energy efficient products” (one was China Efficient Lighting, discussed in the Annex on the China mission). But the review lamented that while the activities increased the market for the efficient products in China; and 300 manufacturers were involved in efficient bulbs, they had contributed “no resources” and the lack of their contributions as a “critical weakness” (sic); (see GEF 2013, page 16).

<sup>68</sup> GEF, 2013. Review of GEF Engagement with the Private Sector Technical Document #13; November, 2013

<sup>69</sup> GEF, 2010. Review of the Global Environment Facility Earth Fund, GEF/ME/C.39/2, October 26, 2010, GEF Council November 16-18, 2010, Agenda Item 8, by the GEF Evaluation Office.

<sup>70</sup> The ProDoc did not specifically mention the Bali Strategic Plan; South-South Cooperation; Gender or Human rights based approach (HRBA).

<sup>71</sup> The Bali Strategic Plan for Technology Support and Capacity was developed in 2004 by a High-level Open-ended Intergovernmental Working Group, in Bali, Indonesia, on 4 December 2004. See

<https://aarhusclearinghouse.unecce.org/resources/bali-strategic-plan-for-technology-support-andcapacity-building>.

The UNEP Governing Council adopted the BSP in February 2005.

comply with international agreements; (3) achieve their environmental goals and environment-related development goals, including the Millennium Development Goals; (4) and develop national research, monitoring, and assessment capacity as well as establish infrastructure for scientific analysis and environmental management. The BSP provides a framework for UNEP to strengthen the capacity of governments in developing countries to achieve environmentally sustainable outcomes and the outputs (Tables 10 and 11) and the outcomes of the project (Table 12) show that the project was fully consistent with the principles for BSP. At the same time, as a global project with limited budget, it could not contribute significantly to the fourth objective and so its rating is reduced from the highest level, and this is rated as **Satisfactory (S)**.

#### 4.1.5 South-South cooperation

71. South-South Cooperation (SSC) - the exchange of resources, technology, and knowledge between developing countries - has been suggested as one of the primary mechanisms for the implementation of the capacity building and technology support objectives set forth in the BSP and also other environmental plans and strategies of the UNEP. The project recognized China as the dominant producer of EEL products, and with high capacity for quality control and testing, and made a successful effort to enlist one Chinese testing laboratory as a key partner. This allowed for additional inputs on quality and testing. In addition, a strategy adopted by the project, that had not been pre-specified, was to take a regional approach – working with regional country groupings and using regional workshops for dialogue, discussions and dissemination. Examples of collaboration with regional partners have been provided under partnerships and that created many opportunities for information and lessons sharing between countries, including the potential for regional harmonization of standards and testing. The evaluation concludes that important venues and opportunities for SSC were provided and also seen to be used by countries, without SSC being an explicit goal or objective. The evaluation finds that the opportunities for SSC were very well provided for and utilized in the project within its bigger goals. This is rated as **Highly Satisfactory (HS)**.

#### 4.1.6 Gender

72. Gender is a word that does not appear in the ProDoc. The evaluation considers the complete absence of gender in the ProDoc, and the lack of attention to gender issues in the design, implementation, activities, and outputs, as both surprising and a serious gap. It is surprising because there are many reports and documents prepared by UNEP and the principal stakeholder organizations<sup>72</sup> on the evidence of gender inequalities in access to and control over energy resources; the specific vulnerabilities of women and

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<sup>72</sup> A few most relevant documents which then contain multiple references would suffice here and include - International Energy Agency (IEA) and the World Bank. 2015. "Sustainable Energy for All 2015—Progress Toward Sustainable Energy" (June), World Bank, Washington, DC, and Pachauri, S. and Abeeku Brew-Hammond, Energy Access for Development, Chapter 19, in GEA, 2012. Global Energy Assessment – Toward a Sustainable Future, Cambridge University Press, an effort sponsored by UNEP. A more detailed review on energy and gender, which also covers lighting and efficiency issues can be found in Rath, Amitav, 2005. Energy, Women and Rural Poverty: A review focusing on Latin America, 31 May 2005; at [https://agiregionieuropa.univpm.it/sites/are.econ.univpm.it/files/materiale/2007/publications\\_050921\\_amitav.pdf](https://agiregionieuropa.univpm.it/sites/are.econ.univpm.it/files/materiale/2007/publications_050921_amitav.pdf)

children to harmful emissions from traditional lighting sources; and, the ways in which women and children experience additional benefits when higher quality modern lighting is available to households. The team has reported that the project followed the design as per the GEF-4 template, while gender considerations were only introduced by the GEF in 2011, several years after this project started in 2009<sup>73</sup>. However, the implementation of any project should be a dynamic and adaptive process that is able to respond to emergent guidelines and priorities.

73. UN Environment has adopted a gender mainstreaming approach since 2009/10. The United Nations Evaluation Group (UNEG) states<sup>74</sup> that gender mainstreaming is “a globally accepted strategy for promoting gender equality. Mainstreaming is not an end in itself but an approach, and means, to achieve the goals and requires that gender perspectives and attention to the goal of gender equality are central to all activities – policy development, research, advocacy, dialogue, legislation, resource allocation, and planning, implementation and monitoring of programmes and projects.” In addition, in relation to lighting technologies, poor women (and sometimes children) in many countries also play a major role in the collection and disposal of waste materials. So some groups of women and children are more exposed to the negative and unintended results of the project of added mercury in household waste. The evaluation found the complete absence leading to the lack of attention of gender issues, also in the final toolkits and guidelines produced by the project, to be **Unsatisfactory (U)**.

#### 4.1.7 Human rights based approach (HRBA)

74. The ProDoc and all project documents, from the design, implementation, activities, and outputs, do not mention that any issues related to human rights and gender were considered. Hence this was also missing in the implementation and monitoring reports. The hypothesis made here is that the reasons for this failure could be the technocratic framework of the project proponents. They focused on “energy efficiency” through the new technologies only and the resultant lower GHG emissions from residential lighting as their primary concerns. A review of several other lighting efficiency project documents supported by the GEF noted that the lack of attention to these issues is not dissimilar in other similar approved projects. Beyond the technical orientation, additional reasons behind the missing elements would most likely be due to budgetary and time pressures to maintain focus on the “main” goal. The similarities of views by most stakeholders engaged in the PSC, and the project focus on manufacturers, governments and ministry officials and agency representatives, to the absence of user groups, most likely contributed to the lack of any subsequent feedback on omissions.
75. The evaluation has the concern that the intervention promoted large scale switch over to compact fluorescent lamps in the residential sector, without sufficient attention to potential negative impacts. The evaluation notes the efforts of the project in its

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<sup>73</sup> Yet, the evaluation notes, UNEP had laid down guidance for gender beginning in 2004; United Nations Environment Programme, 2004. Women and the Environment, Policy series, 116 pages; at <http://staging.unep.org/PDF/Women/ChapterSix.pdf> see pages 84-100; especially page 88 refers to the application of “UNEP Gender Sensitivity Guidelines in UNEP Project Manual for project formulation, approval, monitoring and evaluation, and is cited in box 26.

<sup>74</sup> UNEG, 2014. Integrating Human Rights and Gender Equality in Evaluation: Towards UNEG Guidance; page 28.

recommendations and guidelines to highlight the need for recycling of wastes (see a full discussion in Annex A3.2). However, the evaluation assesses the potential for negative health impacts of cumulative burdens, and, on particular stakeholders with potentially greater vulnerability – especially women and children both as consumers and also as waste handlers (despite the small quantity of mercury in each lamp) to be potentially much higher than acknowledged. The evaluation concludes that the inadequate analysis and attention to environmental safeguarding negates UN Environment’s role as the pre-eminent global forum for a coherent system for environmental information and assessments.

76. The largely technocratic approach to the issues of lighting focusing only on costs, GHG emissions, national economic benefits and issues of quality, testing and MVE, is deemed deficient for a large global project approved in 2010 and operating through 2015. The project did add some attention to the issue of using EEL to enhance light for poor and remote communities, and it had a special report on EEL for off grid use. But it neglected to note, that in many countries, large sections of those not connected to the grid are people who are also poor, and are often from indigenous groups. Potentially increasing the vulnerabilities of women, children, the poor and indigenous communities to increased toxic emissions from mercury, groups who are often marginalized and sometimes discriminated against, without due care for them to be informed, and provide their feedback on the potential issues, and, not providing greater attention to options for mitigation of the added toxic waste, is found to be a notable deficiency and so this is rated **Moderately Satisfactory (MS)**.

#### 4.1.8 Safeguards

77. UNEP has adopted a new policy framework for Environmental, Social, and Economic Sustainability (ESES) in 2015<sup>75</sup> to avoid, minimize or mitigate adverse environmental, social or economic impacts associated with supported projects. This Framework now covers all programmes/projects and requires them to adequately consider environmental, social and economic risks, establish whether they were vigilantly monitored, and, whether the UNEP ESES requirements were complied with. Based on the analysis of project documents, activities and reports, and, discussions with stakeholders, the evaluation concludes that the project did *identify, define and propose* activities to assess the negative environmental implications of the technology of fluorescent lamps, and to determine the scope of such adverse impacts and risks. However, the evaluation finds that no efforts were made to engage with concerned communities and stakeholders on the issues of avoidance of emissions, or to “minimize, mitigate and manage the risks introduced”.
78. The evaluation considers applying safeguards in normative work is neither easy nor straightforward. However, en.lighten was not only normative, as it also promoted and supported actions to “ban Incandescent Lamps (IL)”, and their replacement by CFL. The evaluation finds the written outputs of en.lighten minimized potential negative consequences, and that the project team did not undertake significant reviews such as

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<sup>75</sup> UNEP, 2015. Environmental, Social and Economic Sustainability Framework, January 2015, as approved by the Executive Director on 31 December 2014.

an analysis of existing practices or options that could be required under the current ESES policy. As there is a successor project, the evaluation considers that the new project should be reviewed to determine if the standards are being met now, under the current UNEP guidance. The applications of the ESES standards are mandatory and such a review must be undertaken with urgency. This element is rated as **Moderately Satisfactory (MS)**.

## 4.2 Achievement of outputs

79. The project aimed to deliver a large number of the outputs. Many (numbered 6 through 13 in the outputs key in Figure 2, and, in the rows 2.3 to 3.3 in Table 2) are knowledge products. They are intended to stimulate, inform and communicate key *approaches* for promoting EEL; provide *lessons, guides and tools* to national policy actors, other stakeholders (see Tables 3, 4 and 14) and in different venues. The evaluation reviewed the outputs listed in Table 8 (as revised in Table 2), followed by those in Table 9, which set out an expanded set of activities for the COE, to examine the contents for clarity, coherence, use as a reference products for experts, and, their reach and relevance for policy actors, and how these outputs directly contributed to the four outcomes (Table 2 and Figure 2). There are 13 specified outputs and the **project delivered – largely or almost fully- on 10 of the 13**. It delivered only partly on two outputs – technical training provided and support for national laboratories. Its **delivery on one output** – “CFL disposal strategy and action plan reviewed across countries and best practices recommended” (see item 3.4 below) – was found to be of insufficient quality. The reduced delivery on the specific outputs noted above, stemmed largely due to the weaknesses in the initial design (see section 3), constraints on resources that persisted through the entire period of the project (see sections 4.3, 4.4, 4.7 and 4.12) and from weaknesses in the implementation of the M&E plans (see 4.14).

**Table 8: Achievement of outputs as reconstructed in Table 2 and in the TOC, Figure 2.**

Sr. No.	Outputs	Achievements and Evidence	Comments
1	<p><b>Output 1.1:</b> Policy dialogues for EEL promotion launched at multiple forums.</p> <p><b>Indicator:</b> Numbers and coverage of such forums; discussions and conclusions reached by countries at forums, workshops and at subsequent events sponsored by en.lighten towards a coordinated effort.</p>	<p>A global platform for EEL was first initiated, also called the Centre of Excellence (COE), see also 2.1 below.</p> <p>The COE began policy dialogues on EEL through regional networks, and at the annual COP conferences, beginning at the end of year one.</p> <p>Such network support continued through the project, providing a coordinated effort to launch a stakeholder forum on EEL in the year 4 (2015). There was a global forum for policy dialogue that was delivered in Beijing.</p> <p>There were many policy dialogues, especially regional workshops and events, which were used to promote EEL. A total of 73 countries (see Annex 2) formed some partnership with en.lighten, where they signed formal statements, participated in activities and were beneficiaries to different degrees of the project. A large number of the partner</p>	<p>This was largely achieved but not exactly as stated in the ProDoc. There was no evidence of any “legal”, global platform entity, beyond the project itself.</p> <p>The evaluation considers the value and outcomes from the project were due to the build-up and work done at multiple sites engaging many stakeholders, specifically the regional forums</p>

Sr. No.	Outputs	Achievements and Evidence	Comments
		<p>countries were represented at the Global Efficient Lighting Forum in China, the final large scale activity of the project.  <i>Sources:</i> Project documents, MTE report, interviews and communications from en.lighten.</p>	<p>mentioned, prior to the large global policy dialogue forum held at the end of the project. Such a large forum would have been inefficient use of resources and ineffective if undertaken earlier. The global dialogue had excellent participation and discussions. It broadly endorsed the en.lighten principles.<sup>76</sup></p>
1.2	<p><b>Output 1.2:</b> The nature of policy dialogues among stakeholders promoting consensual activities policy sets.</p> <p><b>Indicator</b> - The quality of policy dialogues and related activities, conclusions and resolutions.</p>	<p>There were many policy dialogues, especially regional workshops and events, which were used to promote EEL, as reported above. These policy dialogues and technical support provided contributed to the anticipated consensus around efficient lighting for national policy.</p> <p>en.lighten created an agreement for partners that contained the intent that they would work towards the phase out of inefficient lighting. It is noted that they were not legally binding and countries appeared to take it in the spirit that no one supported “inefficient” lighting. It has been mentioned in Table 2, that the intention of the global consensus for phasing out incandescent lamps was not appropriately formulated and such a legally binding measure is not required to attain most of the benefits of more efficient lamps, as the evidence around the world shows a high degree of consumer rationality. When the more efficient lamps have consistently improved in quality and as prices dropped, and, appropriate information provided by labels, rational choice shifts the users from IL to EEL, as most appropriate. But overall the national stakeholders (a total of 73 countries participated in different activities, see Annex 2) did agree to the <i>general road map</i></p>	<p>This output was largely achieved, and shown in Table 2 and Figure 2. From documented sources and feedback the evaluation finds that en.lighten has contributed directly to the output for the use by stakeholders. The outputs were seen to be directly linked to the outcome - relevant policy and behaviour changes in subset of the countries targeted. Beyond the policy and behaviour changes, plans for implementation were made and implementation is in progress, in a number of countries discussed below.</p>

<sup>76</sup> Evaluation Office: The project team comments highlighted the regional approach especially in promoting Minimum energy performance standards (MEPS)

Sr. No.	Outputs	Achievements and Evidence	Comments
		<p><i>supporting positive legal measures and institutions to increase the rate of adoption of EEL.</i></p> <p>The low rate of responses to the survey was a partial indication of the weak ownership across the network due to the large spread of the project stakeholders.</p>	
1.3	<p><b>Output 1.3:</b> A communication plan for supporting the market transformation efforts for EEL is produced and utilized for project purposes.</p> <p><b>Indicator:</b> Communication plans and communication outputs.</p>	<p>An excellent communication plan was implemented for supporting the phase out and assisting in market transformation efforts for EE lighting</p> <p>The project outputs include many communications oriented products. They include a communication tool-kit developed during the first year, and many outputs, listed separately.</p> <p>The outputs are listed in M&amp;E reports, seen by the evaluator. In the examples seen the numbers and quality of communications products were high in terms of relevance and usefulness. Omissions are noted under item 3.4 below.</p>	<p>Largely delivered through multiple outputs.</p> <p>A large sample is listed in the project web site <a href="http://www.enlighten-initiative.org/">http://www.enlighten-initiative.org/</a></p> <p>A table produced for the evaluation is not added here as it would take up 8 pages.</p>
2.1	<p><b>Output 2.1: A team was in operation, called the COE</b></p> <p><b>Indicator:</b> Entity or team, performed tasks defined, produced outputs defined and supported progress towards all direct outcomes</p>	<p><i>The evaluation considers understood the CoE, as a virtual centre of excellence. The core CoE was the project team, and an "extended COE" was the team plus seconded staff plus some key partner staff. The COE was also used to refer to the network of experts. It was not a legal entity. It was in operation and performed well in many areas, to coordinate activities related to policy dialogue for EEL promotion. The COE and performed the 9 priority actions as specified for the COE (see Table 9). The core team, and the COE, deserve credit for significant outputs and outcomes, even though it was handicapped by being short staffed all through and suffered from long and laborious hiring processes and budget limitations.</i></p>	<p>This was largely achieved, but not as stated in the original LFA.</p> <p>Table 9 (follows) discussed what was mandated for the COE and what was delivered.</p>
2.2	<p><b>Output 2.2:</b> A network of technical institutions is established and enhanced for lighting products quality improvement</p> <p><b>Indicator-</b> A network of institutes for EEL quality improvement in operation, one year after project starting</p>	<p>No formal network of institutes for EEL quality improvements came into operation. This was clearly over ambitious in the time frame and for the resources. The project did not have sufficient budget to "enhance – lighting product quality improvements" at a <i>network of technical institutions</i>.</p> <p>There was a formal arrangement with the Chinese national laboratory (NLTC) (Annex A1.3), which was useful and effective for some technical outputs and outcomes. Four Task Forces were established to provide guidelines</p>	<p>Somewhat or partially achieved through the partnerships.</p>

Sr. No.	Outputs	Achievements and Evidence	Comments
		on a number of issues, including product quality improvement.	
2.3	<p><b>Output 2.3:</b> Guidelines for harmonisation of quality and performance-based standards developed.</p> <p><b>Indicator and target:</b> Guidelines established and are available and timely (between the first and second year of project implementation).</p>	<p>Technical guidelines for EE lighting quality improvement and for setting performance-based standards were established. Benchmarks used by different countries and standards bodies were collected and made available for countries to use. The materials for EE lighting quality improvement began to be available during the second and third year of the project and were a main component of the final Tool Kit, produced in the third year.</p>	<p>This was also originally formulated to be over ambitious in the time frame and administrative challenges faced in implementation. Largely delivered with one flagship document and several additional reports and outputs.</p>
2.4	<p><b>Output 2.4:</b> Capacity<sup>77</sup> enhanced in GEF programme countries for the policy and institutional support required for EEL</p> <p><b>Indicator-</b> Number of EEL market staff trained for quality and performance</p>	<p>Staff from national agencies trained for testing and confirming to quality and performance-based standards was not a significant output in scale. Contributions were made to training of a number of persons (the exact number cannot be specified) with the inputs of the Chinese laboratory partner at events and by undertaking quality and performance tests in and for selected countries. The budget limitations prevented additional efforts.</p>	<p>The level of achievement noted achieved mainly through partnerships and reasonable for the resources.</p>
2.5	<p><b>Output 2.5:</b> Guidelines for quality certification and labelling schemes are formulated for energy-efficient lighting products.</p> <p><b>Indicator:</b> Technical guidelines established and available (between the first and second year of implementation).</p>	<p>The guidelines were produced through the Task Forces established by the COE. The quality of the guidelines was reviewed for the evaluation and also the views of partners were sought on the field missions and in the survey and their feedback. The respondents were generally positive, except on 3.4 below, where responses were more mixed.</p>	<p>This output was largely achieved. Some deficiency in the coverage of issues specified in output 3.4 on mercury.</p>
2.6	<p><b>Output 2.6:</b> A best practice catalogue elaborated and made available to relevant</p>	<p>Operational toolkit for EE lighting programmes, design and implementation developed in the year 2012. The Efficient Lighting Toolkit – December 2012.</p>	<p>This was largely achieved, with the deficiency noted above in output 2.5.</p>

<sup>77</sup> Increased capacity of partners would be an outcome, but the training materials produced and numbers trained are the outputs to discuss here.

Sr. No.	Outputs	Achievements and Evidence	Comments
	stakeholders <b>Indicator:</b> Status of toolkit for EE lighting programmes, design	Additional technical material produced for guiding countries for off grid lighting; for developing NAMA projects for the UNFCCC; and stakeholders, as listed in the project web site. The toolkit, together with support provided at the regional level and at the national level are “operational capacity building material for energy-efficient lighting programmes design and implementation”. Effective reach to over 70 countries and other stakeholders is considered to be good delivery on this output.	
3.1	<b>Output 3.1:</b> Policy toolkit accessible to countries online and support provided to country programmes for capacity building <b>Indicator:</b> Status of toolkit availability	The above tool-kit, as developed by the COE, was made accessible on the web to all; there was remote support provided for questions from countries; it was discussed and disseminated through the workshops and at the final global forum. A series of “Webinars” or web based seminars were also delivered by experts linked to en.lighten. It began with 2 in 2012. Then there were 6 in 2013, which covered different sections of the Toolkit. Again, there were another 5 in 2014. These outputs remain available and can be built upon in successor projects. Assessment of the quality of the products was made through reviews and also using feedback from the users and partners consulted. The quality was on the whole good and the products were appreciated for the purposes intended.	This was largely achieved in terms of reach of the targeted audience and also in terms of the quality of the products.  There was a weakness that was sometimes noted in the focus or tailoring of the information to subgroups of the audience.
3.2	<b>Output 3.2:</b> Technical assistance provided to new countries to develop their programs  <b>Indicator:</b> Number of countries that were provided support to by en.lighten to enable EEL programs to be launched.	Technical assistance of different levels of resource intensity was provided directly by the project working with sub-groups of partners to over 70 countries.  Country data collected and used for over 100 policy oriented country level assessments (CLA) and shared at workshops and also available on the website was a useful tool for communicating the potential energy and costs savings that can accrue for the country through policy changes.  The country reports on the web provide a useful compendium of information on the country related to EEL, laws, policies, MVE and so on. It is a handy tool for keeping track of national progress and for inter-country comparison. See also text box on ECREEE for assistance provided in West Africa to	This was achieved at different levels for up to one hundred countries. The feedback from countries suggests this was mostly achieved, while always more could have been done with additional resources.

Sr. No.	Outputs	Achievements and Evidence	Comments
		countries, and the example of Chile provided in Annex A1.1.	
3.3	<p><b>Output 3.3:</b> Public Information and Awareness Campaign Plan Implemented.</p> <p><b>Indicator:</b> The number of communications, methods, availability of information and awareness material</p>	<p>There is considerable evidence of multiple communications outputs which served to raise awareness; material and training provided to build capacity.</p> <p>The Global Policy Map developed provides an overview of energy efficient lighting policies by country for all countries that en.lighten engaged with. This open-source tool to enable users model the potential savings that a country could realize by a rapid transition to energy efficient lighting, forecasts the energy and carbon dioxide emission savings potential of regulations relative to a business-as-usual scenario. A user can select options most relevant for the various lighting technologies. This is a useful tool providing agency to countries to make their own analysis of options. The references made to the project and the feedback (though limited) suggest the plan was well implemented and fair success was achieved in reaching policy actors and decision makers.</p> <p>The low rate of responses to the surveys could suggest the limitations from the large spread of stakeholders; the electronic tools used, led to weak ownership across the network; the time lags between their involvement and the evaluation.</p>	<p>The feedback from countries suggests this was mostly achieved.</p> <p>The project itself did not engage with the larger public but focused its communication to government officials and experts.</p> <p>The team reported that consumers were involved in some of the national level work and through non-government organizations but there is low evidence of the project engaging with consumers or users, which is considered as a weakness.</p>
3.4	<p><b>Output 3.4:</b> CFL disposal strategy and action plan reviewed across countries and best practices recommended.</p> <p><b>Indicator and target:</b> The guidance produced; awareness of material &amp; feedback from experts and countries.</p>	<p>The evaluation examined (see Annex A3.3) the quality of discussions on mercury contamination, collection and disposal in the toolkit and other project publications and found it highly inadequate. While fully acknowledging that en.lighten did emphasized the “integrated approach” that includes environmentally sound measures in disposal, the evaluation found that the project products were sometimes inaccurate with a tendency towards the point of view, that the mercury in lamps did not pose significant hazard to environment and human health.</p> <p>Also some interviewees commented that the project unduly followed the industry view, while the project team asserts that a great effort was put into building consensus between all parties.</p> <p>The PIR stated as early as 2012 that this activity was completed and closed.</p>	<p>There was no evidence of this being achieved. The toolkit or other project publications do not provide evidence of the fact that <b>adequate reviews for CFL disposal strategy and action plans were reviewed across countries and best practices recommended.</b></p> <p>The detailed review of this issue is provided in Annex A3.3</p>

Sr. No.	Outputs	Achievements and Evidence	Comments
		Individual survey responses and interviewees suggested very little action on this has taken place in the countries. The evaluation finds the outputs here to be most uneven and moderately unsatisfactory.	

80. Besides the outputs specified above, for the project, the ProDoc had listed an expanded set of priority actions for the COE. The evaluation has understood these actions to be additional elaborations of Component 2 and Output 2.1 (A Centre of Excellence capable of coordinating Project's policy and technical activities selected and enhanced). The Table 9 below summarizes the findings of the COE performance along the additional nine priorities laid down.

**Table 9: Priority actions set for the COE (ProDoc, page 31)**

	Priority activities – COE	Purpose	Evaluation Findings
1	Sub-standard lighting products a wide spread problem.	Mandatory testing and labelling of all products in the market and development of minimum energy performance standards. to keep low quality products out of the market	This was a common and critical problem in the CFL markets for over a decade prior to the project <sup>78</sup> . This was appropriately a priority focus of the COE.  The reports and recommendations emphasized a suite of reinforcing policies - establishing minimum performance standards, a testing regime, labelling of products, and enforcement - as required to keep low quality products out of the market and increase the confidence of the user. This was always emphasized and was a core to policy recommendations.
2	Develop common regional test procedure to assure product quality given the importance of external trade	Most producing countries use international (IEC) reference standard. Some importing countries could also recognize foreign test centres and mutual recognition agreements can	The "development" of regional standards is not a technical exercise but one of policy, to be adopted by governments.  The economic benefits of regional standards were always highlighted by the COE in many presentations, especially for regional audiences. The partnership with GELC was critical for test procedures. Developing regional standards and tests to save on costs was a recommendation made by en.lighten. This was strengthened

<sup>78</sup> For a very thorough discussion on quality issues see USAID, 2007, Confidence in quality: Harmonization of CFLs to Help Asia Address Climate Change; especially the sections on State of Asia's CFL Market, and on What Makes a "Poor" Quality CFL. It summarized the three main challenges that countries faced were sub-standard CFL in quality; the lack of any common product quality standards; and the lack of consumer awareness regarding quality, with low quality CFLs comprising over 50% of the market.

		enhance efficiency.	when en.lighten partnered with Australia and the pre-existing lites.asia programme, as common regional standards had been a priority goal for lites.asia and countries in the Asian region.
3	Develop common performance quality standards for regions and countries	Harmonization based on expert views can improve quality.	This was attended to. Through the work of the Task Forces via the production of the Toolkit, this sets out examples of existing national, regional and global standards for EEL, with examples of common standards and their evolution over time. <sup>79</sup>
4	Better information to consumers	The role was to develop “the best possible label”; and “make this label operational”, while “keeping local conditions in mind”	The COE dealt very thoroughly with all possible labelling schemes, examples were given of EEL, EU and other labelling schemes. The ProDoc did not anticipate that there is no single, best label and nor is it applicable across all countries. The project developed useful guides to such labels for countries to select. The deficiency noted is that the project did not make use of consumer groups as a targeted stakeholder group and so attention to and feedback from the consumers, the main target group, was low. Stakeholder views indicate that limited engagement with the consumer level might have been due to the budget constraints of the project.
5	Develop an incentives framework	Our understanding is that the COE should support “incentives” which encourage the use of higher quality, tested and labelled products.	The various incentives that can be provided for promoting sales of EEL nationally were reviewed and complete suggestions were provided in the toolkit produced by the project.
6	Secure funding for testing and MVE	Governments require funding and technical assistance to ensure market compliance. COE to secure funding for product testing, and support for countries which have expressed an interest in establishing national accredited laboratories.	The COE achieved a degree of product testing for countries through the partnership developed with NLTC and GELC, China (see Annex A1.3).  The COE assisted countries to secure funding for EEL programme scale up and they have provisions for national testing (see Annex 2).

<sup>79</sup> Evaluation Office: as per the project team comments regional standards were agreed (NELS/RELS) to in West Africa, central America, Pacific Islands

7	Technical assistance to improve manufacturing capacities	Assistance to local manufacturers to help improve the quality	This is too large a task for this platform to be undertaken within its budget. Such support has been included in the larger national EEL projects, where countries have secured additional GEF funding, for example in Vietnam.
8	Exchange of information and technical expertise	Countries need technical assistance to set up infrastructure (testing facility, development of standards, training of laboratory personnel) to certify performance; for recycling CFLs and dealing with end-of life	<p>COE provided technical support to countries within its resources but it was not resourced to set up new infrastructure.</p> <p>The project outputs table was produced for the evaluation but is not added here as it would take up 8 pages. A large sample is listed in the project web site – <a href="http://www.enlighten-initiative.org/">http://www.enlighten-initiative.org/</a></p> <p>Largely delivered through multiple outputs, and one omission is noted.</p> <p>This was highly inadequate on recycling CFLs and dealing with end-of life. The toolkit, Section 5: Safeguarding the Environment and Health, can be used to represent the support provided by en.lighten on recycling CFLs and dealing with end-of life<sup>80</sup> Some of the stakeholders interviewed believed this was one example where the participation of manufacturers negatively affected the outputs of the project, as any levies for collection and recycling would reduce profits and/or increase costs and affect sales.<sup>81</sup> Then again, industry representative’s view during the evaluation process was that “..the industry partners have always stressed the importance of an integrated approach including environmentally sound measures and including MVE” emphasizing “the European approach on Waste Electrical &amp; Electronic Equipment and Restriction of Hazardous Substances”.</p> <p>Considering the differentiating views discussed above and the quality of the mercury related outputs, the evaluation concludes that COE did not cover the recycling aspect sufficiently (as also indicated in table 8 output 3.4)</p>

<sup>80</sup> The en.lighten project had a very standard approved statement on mercury, which was used on all reports including the toolkit. “Like all fluorescent lamps, CFLs contain mercury, which complicates their disposal. Mercury is a hazardous substance in fluorescent lamps. The en.lighten initiative will support countries in setting up environmentally sound management approaches for spent lamps.

- The average mercury content in a CFL is about 3 mg – roughly the amount it would take to cover the tip of a ball-point pen. By comparison, older thermometers contain 500 mg of mercury – the equivalent of more than 100 CFLs.
- Experts emphasize that mercury is also emitted from coal-fired power stations. Studies indicate that the level of emissions from power stations attributable to inefficient lamps is far higher than those linked with the disposal of CFLs and other efficient lamps”.

<sup>81</sup> Evaluation Office: Also the following publication has been considered in the evaluation findings: Closing the loop: Implementing a sustainable collection and recycling solution for Lighting products, Rob Koppejan, November 2014

9	Inform on technological trends	Markets in developing countries are often lagging in information on new technologies.	There were workshop sessions where technology trends were discussed. But this issue was not adequately addressed in the tool kit, especially on LEDs and some of the reports and interviewees suggested that the COE was not able to deal adequately with this.
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81. The evaluation arrives at the finding that the COE made excellent efforts at meeting the many demands placed on it. The COE is seen to have **attended to all 9 specified activities** in the execution. The attention and resources allocated to each activity varied by their differing natures. Overall, the COE was seen to have been executed well and efficiently addressed the specified tasks, with the notable exception of deficiencies noted on task number 8, while tasks 6 and 7 were attended to as well as possible within resource constraints.

82. The complete list of outputs of en.lighten, in numbers and coverage, is impressive and speaks to the efforts of the en.lighten team. The reports are also well laid out and appropriate for the audiences that they are aimed at. The communications and outreach efforts did achieve the formal targets as set (or as adjusted in table 2). The assessment has been done against intended outputs, noting that some additions and modifications were not identified in the ProDoc but were important project outputs delivered during implementation. The **project delivered – largely or mostly - on 10 of the 13 outputs**. Thus the **delivery of outputs is rated as Satisfactory(S)**. Shortcomings were identified in terms of deficiencies in dealing with mercury contamination, gender, and the weak consideration of differential impacts of suggested policies on different stakeholders and for some countries with lower levels access to electricity, or, with lower recycling rates, or those with a high percentage of renewable energy for electricity.

### 4.3 Effectiveness: Attainment of objectives and planned results

#### 4.3.1 Direct outcomes from the reconstructed ToC

83. The reconstructed LFA and ToC, provide for four direct outcomes (Table 2, and Figure 2, with the note that Direct Outcome 4 largely substitutes Outcome 3) and they are summarized in Table 10 below.

**Table 10: Achievement of Direct Outcomes**

	As in Table 2 and the TOC	Achievements and comments
1	DIRECT OUTCOME 1: <b>Agreed global road map</b> (interpreted to mean support by countries for a common but not identical approach and agreement on the benefits and methods for reaching the EEL goals. ) <b>Indicator:</b> resolutions	The evaluation has reviewed the resolutions adopted by national representatives' countries at the regional meetings such as in Latin America and West Africa; and, at events sponsored by en.lighten, such as the Global Forum meeting. The number of countries who have shown commitments, policy changes, and "agreed to" the en.lighten recommendations is indirect evidence, and is high. A good and stronger indicator (see outcome four below) is the project contributions leading to the development of a number of national and regional projects (under implementation or project approval stage. They include examples such as Chile, Bolivia, Peru, and others, with the full list provided in the Annex 2.

	adopted by countries at workshops and at subsequent events for reaching the goals.	Achieved.
2	<p><b>DIRECT OUTCOME 2:</b> An international Centre of Excellence (COE) is operational and effective.</p> <p><b>Indicators:</b> Availability of timely and cost-effective technical backstopping responding to the needs of EEL lighting technology improvement and countries with whom EEL products quality improvement initiated.</p>	<p>The COE was operational, (Output 2.1 that the COE, <i>as an operating team</i>, was established and delivered other outputs, see Tables 8 and 9) and continues with new staff under follow on funding (see Table 1). The COE was able to work <i>jointly</i> with multiple partners to develop adequate knowledge products, which were valued by, used by and linked to the global EEL network, beyond delivering outputs, shown in Tables 8 and 9.</p> <p>It was also able to engage with new partners who provided (leveraged) additional resources for the goal.</p> <p>The evaluation provides on Table 9, the COE performance on priorities specified; and in Table 8, all project outputs, which are also attributable to the COE performance. Overall, the COE was seen to have executed tasks relatively well with partners, with some notable exceptions (see table 9).</p> <p>The level of this outcome is bounded by the COE resource envelope and additional needs would only be met through follow on projects on EEL, as successors to en.lighten.</p> <p>Partially achieved.</p>
3	<p><b>DIRECT OUTCOME 3:</b> <b>Markets transformed.</b></p> <p><b>Indicators:</b> the market changes used here and combined under capacity built as the fourth outcome below.</p>	<p>The evaluation notes the changes in market compositions in Table 11, with a doubling of sales of CFL during the project period, 2010 to 2015, as a fact. However, it is unable to state that this change is attributable to en.lighten. The evaluation considers that en.lighten made a small and non-measurable contribution to this change.</p> <p>Achieved (direct attribution to the project cannot be made unambiguously)</p>
4	<p><b>DIRECT OUTCOME 4:</b> <b>Country level capacity increased</b></p> <p>This was defined as an additional outcome in the ToC, so not to preclude evaluation findings that could support the statement in row 2 above.</p> <p><b>Indicators:</b> Two indicators are used. First, supportive legal and regulatory framework adopted in the participating countries; the level of</p>	<p>The fact that a large number of policy makers were exposed to the direct communication products, the distilled set of experiences, good practices, and clearly communicated steps in the policy process required nationally to secure the benefits, was expected to improve their capacity to act. This outcome could not be directly observed for the entire project, due to limitations of time and resources. However in the two countries visited (and reported as cases in the Annex 1) almost all persons interviewed said that the regional workshop, the national reports and workshops, highlighted practical steps, the potential gains, the importance of Monitoring, Verification and Enforcement (MVE) and the need to build testing capacities, are all elements that changed perceptions and behaviour. Similarly the reports from West Africa confirmed similar outcomes. The evaluation in Asia<sup>82</sup> reported that the “feedback from meeting participants indicates a high level of satisfaction”, and “an <i>intention</i> to apply the information gained” but acknowledged that the extent to which this <i>actually occurred</i> and the impact on country’s lighting policies and programs is difficult to judge. It added that the en.lighten initiative “raised awareness of the</p>

<sup>82</sup> Lites asia UNEP MVE Project Evaluation Report, page 8. Italics added.

<p>awareness of the targeted end users raised; capacity of the key local stakeholders on required policies built.</p> <p>Second, increased resources available to countries to undertake market transformation (for example en.lighten assistance led to new GEF grants to support implementation of such national policies and plans.</p> <p>Target: those set in row 3.2 of 14 countries, was kept in view.</p>	<p>importance of MVE in realising the potential benefits of the lighting energy efficiency programs” even when already implemented. It gave valuable practical experience to the countries on implementing MVE. Beyond the citations made, the evaluation noted similar changes towards a more supportive legal and regulatory framework in other participating countries; noted evidence that the level of awareness of the targeted end users was raised; and the capacity of some key local policy actors was enhanced. This finding is verified from multiple sources including the responses from countries on the support provided to them<sup>83</sup>, such as project documents; outcomes such as the MTE; the asia.lites evaluation; the reports on West Africa and on the Middle East; and the interviews and discussions with stakeholders.</p> <p>The second indicator for this direct outcome is the number of newly approved GEF supported projects to implement EEL initiatives in 13 countries (see Annex 2). These 13 countries have progressed with contributions from en.lighten, to prepare national plans to implement efficient lighting strategies, allocated resources for the work and also sought allocations by GEF for implementation.</p> <p>For the “how” questions, when analysed along the network weight of linkages, it is seen that 7 (of the 13) countries, had been both “Partner” and “Initiative” countries (see Annex 2). The assumption made is that greater linkages create greater possibilities of influence by en.lighten. Fewer countries, 5 of 13, were only Partner countries, and only one (of the 13) was in neither group (Argentina), but participated in workshops, through which it was influenced. The influence trend was also seen in the responses received to the survey – 4 (out of 7) were Initiative countries and two were only partners (even here in the case of Egypt, it received additional support on recycling CFL lamps, was one of only 5 countries who had sent representatives for training at AMBILAMP, Spain). The responses to the survey also suggest a difference in the response of partner and initiative countries – where the latter had more support and support that was more specific to the country, while the former had some participation at a workshop sometimes, access to web based information and other more general publications.</p> <p>Achieved.</p>
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84. To summarize the Table 10, the outcomes achieved from the activities and outputs confirm the reconstructed ToC. The level of achievement of the direct outcomes as indicated above grants a Satisfactory rating. The most significant Outcome (global

<sup>83</sup> The evaluation examined other linked evaluation reports, followed a “purposive” enquiry along among selected “strong” links to the project network – such as key people, key organizations, networks and projects. It used the earlier evaluations such as MTE, and others in the UNEP and UNDP database for evaluation reports of projects on efficiency in lighting. The evaluation also made use of the evaluation undertaken by the Department of Industry, Innovation and Science, Government of Australia in May 2016, of the Australian grant to UNEP en.lighten to manage the lites.asia network in early 2014, and an additional grant of in June 2014, to support countries in additional countries of Asia.

roadmap) was achieved. Outcome 2 was satisfactory in most dimensions, but was considered as not fully achieved due to the lapses discussed under weaknesses in the analysis and recommendations on the mercury issue (see also table 8 output 3.4 and table 9. The rating of the project suffered due to its inadequate consideration of consumers and the lack of consideration of gender and weaker populations in the analytical work. In addition the low participation of representatives from developing countries in the governance (PSC), and, in the task forces and expert groups, combine to lower the rating on effectiveness of the COE. **The overall rating on achievement of direct outcomes is Satisfactory (S).**

#### 4.3.2 Medium-term outcomes

85. The Theory of Change diagram (Figure 2) presented the likely or anticipated medium term outcomes in four positive categories: incandescent lamps (ILs) phased out; lower GHG emissions from lighting; lower mercury emissions due to reduced coal use; and, the improved welfare of people along sustainable development goals. This was provided there were the impact drivers and assumptions as additional positive factors external to the project. The evaluation was unable to identify or to confirm that any new countries phased out IL because of en.lighten, although there is a possibility that there may have been some countries<sup>84</sup> which have done so. At the same time, global phase-out in all countries seem unlikely and overly ambitious. The evaluation notes positively that the share of ILs in the lighting markets globally has dropped sharply (see Table 11) and that CFL sales have doubled in the same period. Hence the lower GHG emissions from lighting; lower mercury emissions from the associated coal consumption (with caveats); and, improved welfare of people due to greater affordability of light at lower costs, have indeed come about as suggested in the ToC and should continue. Yet, the evaluation restates there is no simple way to *measure the extent to which the project has contributed to the medium-term outcomes, beginning with the change in share of IL to EEL* as this requires a comparison of the changes in the sales of lamps with the project, to the sales growth that would have happened in its absence, or without the project (this is discussed in Table 2, Row A and in paragraphs 51-56 in the ToC section).
86. Following the ToC diagram, the evaluation had noted the possibility of an unintended or “Unanticipated Negative Outcome” – increased levels of toxic mercury in the waste stream, and that has also happened as Table 11 shows the numbers of CFL in use globally has almost doubled from seven to fourteen billion installations (with similar changes in specific countries). That implies mercury emissions from used lamps, often handled as household waste and thrown into dumps, has also increased (despite the fact that there appears to be improvements in terms of the amount of mercury content per lamp<sup>85</sup> the exact amounts cannot be estimated as the extent of improved lamps in

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<sup>84</sup> The evaluation does not consider the “legal” phasing out of IL as an important outcome by itself as the impacts depend largely on the shift in the market towards more efficient lights and the rate of change. Second, technological directions are highly uncertain and there are new varieties of incandescent lamps being developed in research laboratories that are competitive in efficiency with other EEL in the market.

<sup>85</sup> Evaluation Office: Industry partner input during the report review process: “mercury levels per lamp have dropped considerably as a result of global adoption of new mercury dosing techniques required to fulfil the requirements of the most stringent market (i.e. Europe – RoHS)”

the market is not known) in the same period.<sup>86</sup> Whether any new countries have actually adopted a suitable CFL disposal strategy and action plan due to en.lighten is not known. All respondents consulted during the evaluation believed that there has been no improvement in collections in their country. By itself the project could not overcome the negative trend on mercury, but it is rated poorly for the inadequate communications and technical efforts made to either review or reduce this negative outcome. The insufficient coverage of mercury contamination warrant **reducing achievement of medium-term outcomes from highly satisfactory to Satisfactory (S)**<sup>87</sup>.

### 4.3.3 Likelihood of impact based on reconstructed TOC

87. The evaluation assessed the likelihood of impact as the extent of contribution of the project today and in the future to reduce global greenhouse gas emissions and mercury releases. The reconstructed ToC discusses the project results to provide four direct outcomes, with achievements discussed in the previous section. Given the emphasis in the project on contributions to policies and capacities, if that had been the only components, impacts could have been harder to assess. But the project also used some of its resources to support impact drivers in the ToC, with the knowledge inputs and the efforts towards enhanced financial resources for EEL. The project made links to national plans for energy use, efficiency and CO<sub>2</sub> emissions and highlighted the positive impacts on national economies, and promoted incentives – positive ones such as subsidies and standards and negative ones through monitoring and verification of performance, to change behaviour of market participants. The combined effect of the outcomes and drivers shape how countries plan for new actions for EEL. An assessment of the likelihood of future impact, using the ToC, suggests a high likelihood that the observed direct outcomes - which have already supported the medium term outcomes in Figure 2, of reductions in IL sales and increase in EEL (see Table 11), and which are accompanied by lower GHG emissions from lighting, lower use of electricity for lighting, and, increased consumer welfare from lower costs and increased access for those without - are taking place.
88. Beyond the fact that there is a progression to the medium-term outcomes in increasing numbers of countries, the assumption made that lighting technology keeps advancing towards lower costs and higher efficiency continues to be borne out. And countries continue to take additional steps to enhance positive drivers for the diffusion of EEL with incentives, information and regulations. The likelihood of future contributions from the project has increased, and the global platform for lighting may provide a useful model for driving efficiency in other products.
89. The evaluation also considered the likelihood that the intervention may lead to unintended negative effects that could be related environmental, social, and economic aspects. The increased likelihood of negative effects from mercury is a concern as the number of mercury containing lamps has doubled worldwide and there is little evidence as yet of concerted efforts by countries to safely isolate toxic waste streams and to promote the collection and disposal of such waste. Globally, a number of positive

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<sup>86</sup> There is a longer section dealing with mercury issues in Annex A3.2.

<sup>87</sup> This is a technical interpretation of the rating system used by the EO. See also the next rating.

developments are the increasing concern and attention to mercury pollution and the Minamata Convention about to become operational. **The progress to impacts from the direct and medium term outcomes would be Highly Likely(HL)**, but the concerns over mercury contamination reduce it from highly likely to **Likely (L)**.

#### 4.3.4 Achievement of project objectives and results

90. The goal in the ProDoc has been discussed to be over ambitious and it did not reflect the limits of the project's size and scope, which bounded the scope of activities, outputs and outcomes possible. For example, the goal statement<sup>88</sup> set out to achieve improvements in four user sectors – the residential sector, and also in industrial, commercial sectors and, in public lighting as in street lights and other public use, but each sector has its own unique characteristics, and the different needs are best met by specialized products. The project focus was limited to the demand and use in the residential sector, within which its focus was largely on CFL, the dominant replacement light source at the time for the sector, both for on and off-grid use. Based on the evaluation findings several countries had asked for support on public lighting, and some on LED, but the project did not have the resources to provide support for all demands and all technologies. The design underestimated the time and resources required in each country to define new policies, enact appropriate legislation, create entities that can implement the new mandates, not to mention the political process of getting national acceptance of all measures required, especially banning incandescent lamps. It has been discussed that the global market was already moving towards greater use of CFL, replacing Incandescent bulbs in the residential sector. The statement to globally accelerate such change has a good feel to it but there is no useful way to measure whether the project had the resources or the ability to achieve that. The table below is provided by the en.lighten team on their estimates on the actual changes in the global stock of lamps during the project period.

**Table 11. Estimates of the installed global stock of lamps by year.**

Lamp Type <i>Units in million pieces</i>	2010	2011 (est.)	2012 (est.)	2013 (est.)	2014	2015 (est.)
<b>Incandescent</b>	11,880	10,654	9,427	8,201	6,974	5,748
<b>Halogen</b>	1,639	2,166	2,694	3,222	3,750	4,278
<b>CFL</b>	7,667	9,015	10,363	11,711	13,058	14,406
<b>LFL</b>	10,854	10,881	10,909	10,936	10,964	10,991
<b>LED</b>	127	580	1,033	1,485	1,938	2,391
<b>HID</b>	772	813	854	895	936	977
<b>Total:</b>	<b>32,939</b>	<b>34,110</b>	<b>35,280</b>	<b>36,450</b>	<b>37,620</b>	<b>38,791</b>

Source: The estimates were provided to the evaluation by the UNEP project team.

<sup>88</sup> "Acceleration of the global commercialization and market development of energy-efficient lighting technologies in industrial; commercial, and residential sectors as well as in public lighting"

91. The composition of the global lighting market has changed to greater use of EEL, as seen in Table 11. The evidence shows that the en.lighten goals are being achieved but its contributions to any percentage of the numerical changes in the sales of EEL cannot be estimated. The data shows that between 2010 and 2015 the total number of lamps went from 33 billion to almost 39 billion. Within that total, the number of ILs have dropped from 12 billion to almost half that and their share of total lamps also dropped from around 30% to 15%. For CFLs the numbers grew from 8 billion to 14 billion pieces and their market share has gone up from 23% to 36%. The total numbers of LFL have remained the same. Finally LEDs, started at only one hundred million pieces and have reached 2.4 billion pieces, with the market share going from 0.3% to almost 6%.
92. The numbers for CFL and LED (newer technology) show the positive overall global market trend as shown in the ToC and the market composition numbers appear reasonable. But the evaluator is unable to agree that the changes in composition, globally and in the countries, with whom en.lighten had linkages and provided support, can be unequivocally attributed to the project. There is no basis to conclude that all of the change was the result of en.lighten, though the project is likely to have contributed towards some unknowable, small fraction of the shift. The evaluation concludes that the project **has contributed in a small way** to the above changes, not simply in the composition of lights, but more **importantly by increasing technical awareness and bringing together best practices from a large set of experiences**. It can also be stated with confidence, that in the future, when the larger national investments in EEL, triggered by en.lighten, have been completed, a more substantial but still unknown fraction of the national and global shift to EEL would have been the contribution of en.lighten. The overall rating for Effectiveness, which incorporates the achievement of direct outcomes (**Satisfactory**) and medium-term outcomes (**Satisfactory**) as well as the likelihood of impact (**Likely**) and the achievement of the project objectives (**Satisfactory**) is **Satisfactory**.

#### 4.4 Sustainability

93. This section is broken into four aspects of sustainability: socio-political, financial resources, institutional framework, and environmental sustainability, as required by the UNEP Evaluation Office. The project produced a set of outputs that have enhanced capacities, information available on best practices, and reduced some of the negative externalities faced by users. These can help move the trajectory upwards as shown in the TOC diagram (the difference between the two trends is exaggerated to make prominent the change with and without en.lighten). The rate of progress to impacts at both the global level and individual countries will ultimately depend on larger technological trends and political processes both nationally and globally, but they are positive. Negative influences could occur, as in the ToC, should unanticipated negative health impacts occur due to mercury. The commitments and resources for efficient lighting are plentiful given their multiple economic and GHG benefits. Hence the evaluation is of the view that almost all the actions initiated by en.lighten are **likely** to be sustainable.
94. On the other hand, the evaluation questions posed - the "potential for replication" and "if the project has played a catalytic role" - need to be addressed at a higher, meta, level. The global platform in itself was not in the nature of an "innovation" that needs to be

catalysed and replicated. Succession planning and implementation after the project was not formally recorded in the ProDoc and there were gaps in capacity building noted. But the project retained close contacts with “key stakeholders” such as GEF, UNDP, other global actors, donor agencies and to countries that responded more positively to the plans and policies suggested. In addition, it drew together a set of actors, working collectively with subsets of interventions, and produced mostly excellent knowledge outputs. Replication is underway by UNEP and GEF in a large way (see Annex 2) and similar efforts also continue by other actors and networks. On balance, the answer here is very positive – the project approach has a high potential for replication (with corrections discussed later), and it has already catalysed further actions in many countries, and institutions. The overall sustainability derives both from factors intrinsic to the project, and also, because the impact drivers and assumptions in the TOC, deriving from national and global contexts, are all in the positive direction. **The evaluation would rate the overall sustainability of the project outcomes to be highly likely.** But in accordance with the UN Environment Evaluation Office guidelines, the overall rating cannot be higher than the lowest of all the four sustainability ratings, discussed below, and so it is reduced to **Likely(L)**, due to the lowered rating on environmental sustainability.

#### 4.4.1 Socio-political sustainability

95. National teams with the support of the COE were, in many cases, able to secure high-level stakeholder awareness and political buy-in – beginning with the fact that the shift to EEL has a number of economic benefits. The approaches met the assumption made in the ToC. The levels of ownership by the main stakeholders nationally are not uniform, but in almost all countries the market data shows sufficient progress to allow for the project results to be sustained. The level of awareness and interest by key stakeholders in government was seen to be high, and the project contributed directly to the capacity building of some of the project partners, via workshops and technical support
96. The larger question of socio-political sustainability can be gauged from other similar projects, such as the portfolio of over two dozen GEF projects with an EEL focus. A 2003 GEF review found that “certification and labelling” for supporting market transformation has been successful when sustainability is ensured by government commitments. The case of Chile shows that not all government commitments can be assured for all time to come, yet certain features stand out in almost all EEL projects reviewed earlier. First, the steps that need to be taken are not too challenging for many countries; second, there have been demonstrated high success rates in many countries; third, the successes show that the rate of economic return is very high; and fourth, the shift has noticeable effects on reducing peak power demand, costs to consumers and also to deliver on national commitments on GHG reductions. Given all these benefits there are as yet no known cases of governments backing away from the required actions once initiated. The rating for socio-political sustainability is **Highly Likely (HL)**.

#### 4.4.2 Sustainability of Financial Resources

97. The project did not directly provide for funds to secure the future financial sustainability of the prioritized actions but the project has worked with many countries for securing subsequent GEF financing. Positively, the drivers in the ToC “incentives to market

changes” have continued to improve with the ongoing technological changes, thereby supporting the movement for actions in increasing groups of countries and the assumption in the ToC – “political and national support from governments and private sector has been positive”; “national requests to GEF implementing agencies for work on national standards, testing, MVE increased” are valid. The rating for financial sustainability is **Highly Likely (HL)**.

#### 4.4.3 Sustainability of institutional frameworks

98. This project was not meant to directly modify governance structures, legal and accountability frameworks etc., even though it was stated in the LFA (see Table 2) that by adding to technical skills and filling in information gaps, some national authorities would adopt policies to phase out inefficient lighting and start-up market development activities for EEL. The interventions were aimed at increased awareness of options, leading to political commitment, financial and human resource allocations by countries and global actors towards the choices. At the national levels, the project concepts have been developed into full project proposals and work is underway within national plans. Thus, while the project did not directly provide resources for changing institutional frameworks, it has contributed to desired changes in many countries. The rating for institutional sustainability is **Highly Likely (HL)**.

#### 4.4.4 Environmental sustainability

99. This evaluation concludes that the shift towards EEL *supports positive changes in GHG emissions*. The change in usage and its future will largely be dependent on the rates at which new technology is developed and diffused, where continued cost reductions and increased performance will be the decisive factors driving the markets. The theory of change that is used suggests that the sustainability of the outcome, specifically, the increased use of more efficient lighting over the coming decades, is ultimately dependant on the ongoing rate of the rapid technological changes taking place in this sector<sup>89</sup>, with the changes themselves driven by factors outside the scope of en.lighten, UNEP or GEF. At present and for some years, fluorescent lamps (which require some mercury) are being overtaken by LED lamps in efficiency and a range of other attributes, which has already led to a decline in fluorescent lamp sales in the richer countries and for many special applications including small lamps for remote households unconnected to the grid. Positively, the increase in new mercury emissions from lamps should decline globally and it should be a smaller environmental hazard in the future. But, its continued discharge into the environment with billions of fluorescent lamps in annual sales and other currently in use, requires UNEP and its partners to increase attention to the issue of safe collection and recycling of these lamps that is recommended in the evaluation. LED lamps also have other, though less toxic, materials

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<sup>89</sup> The International Energy Agency estimated in its World Energy Investment (WEI) 2016 that energy efficiency investments continue to grow and increased globally by 6% from the previous year. It found that new residential lighting standards since 2005 have improved the efficiency of lightbulbs so much that the cost of lighting has continued to fall, and has resulted in decreased costs for lighting for users, despite increases in electricity prices of up to 50% in some countries. This is shown as the lower rising curve in the ToC versus the higher curve for EEL that the en.lighten initiative aimed to contribute to.

and there is some concern for their health effects, which should also be highlighted<sup>90</sup>. The rating for environmental sustainability is reduced to **Likely(L)**.

#### 4.4.5 Catalytic role and replication

100. The project has played a catalytic role in building the capacity of national stakeholders for actions involving institutional and policy changes. It contributed to national replication activities through pilots and policy dialogues. Replication is also underway with a second and expanded phase. Finally, promoting EEL is not a one-time exercise, where countries can then move on to other tasks. Over the next decades, efforts will continue and be needed to keep abreast of changing technologies. The technological change by itself is not shown as an assumption in the ToC as it is considered a fact, while the rate of use of the technology depends on the assumptions and the key impact drivers. The rating for catalytic role and replication is **Highly Satisfactory (HS)**.

### 4.5 Efficiency

101. In keeping with the OECD/DAC and UNEP practice, the evaluation assessed efficiency while noting several limitations.<sup>91</sup> The cost-effectiveness of the project is established by comparing the GEF cost for the global platform against its earlier funding of national projects only. The GEF has supported over 40 national projects on EEL alone, or where EEL is included within a larger ambit. Many individual national projects have used larger amounts of GEF resources than this single global project. If the costs are divided by the number of countries proceeding to national projects with GEF funding they are in the similar range as project preparation grants that have been provided by GEF and so the project is judged to be cost effective. Alternative arrangements considered would be ongoing national projects only and/or a series of regional projects. It is considered that the global platform is an efficient complement to national activities and many regional activities. Moving to the translation of inputs into outputs, it has been referred to at several places that the project team delivered a considerable number of outputs (see Tables 8 and 9) with often high quality, though with deficiencies, due to resource constraints. There were other indicators of efficiency such as the adaptations made in timing of several activities, leveraging and working with regional centres, with the testing center in China and in leveraging additional resources. The project activities were delayed by a total of two years but many of the delays were due to poor preparedness. The events were found to be well sequenced, a sequence that contributed

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<sup>90</sup> An adequate review of LED technology and its possible health impacts are beyond the scope of this evaluation. But research articles such as, Yu-Man Shang, Gen-Shuh Wang, David Sliney, Chang-Hao Yang, and Li-Ling Lee, 2014. White Light-Emitting Diodes (LEDs) at Domestic Lighting Levels and Retinal Injury in a Rat Model, *Environ Health Perspect*; DOI:10.1289/ehp.1307294; suggests that chronic exposure to high-intensity light was found to result in light-induced retinal injury and they recommend a "precautionary approach with regard to the use of blue-rich "white" LEDs for general lighting".

<sup>91</sup> Efficiency is the extent to which the program converted the resources and inputs such as funds, expertise, and time, to achieve the maximum possible outputs, outcomes, and impacts, with the minimum possible inputs. While cost-effectiveness is the extent to which the program achieved its results at a lower cost compared with alternatives. The evaluation has noted elsewhere that overall effectiveness could have been increased with greater resources and improved design.

to the results. The evaluation does not find that the project could have been more efficient so as to avoid time extensions and it does not consider the project delays to have significant negative effects on the outcomes and impacts, beyond the delay incurred. The quality of project management and supervision was found to be high and the levels of high (though uneven) stakeholder participation and cooperation contributed to the project results.

**Table 12: Estimated costs (GEF component)**

GEF Budget Component US\$	Estimated cost	2010	2011	2012	2013	2014	2015	2016
Personnel Component	3,080,000	224,044	751,714	969,697	725,986	521,406	275,519	41,784
Sub-contract component	300,000	81,004	114,167	525,243	4,573	256,802	-	-
Training component	800,000	45,121	193,883	-	58,022	992	-	-
Equipment& premises	50,000	-	-	-	-	-	-	-
Misc. component	770,000	1,560	57,487	65,514	52,967	180	-	-
Total GEF	5,000,000	351,730	1,117,251	1,561,454	841,548	779,380	275,519	41,784

Source: Project team

**Table 13: Budget and Actual Costs of GEF funds by component**

GEF Budget Component US\$	Estimated cost	Total	% ratio - actual/plan
Personnel Component	3,080,000	3,510,150	114%
Sub-contract component	300,000	981,789	327%
Training component	800,000	298,018	37%
Equipment& premises	50,000	-	0%
Misc. component	770,000	178,708	23%
Total GEF	5,000,000	4,968,665	99.37%

Source: UNEP

102. The project is considered by the evaluation to have been very efficient in its use of funds and in the achievement of outputs and outcomes with the given resources, while under several design and larger constraints outside the scope of the project management. This is arrived at through several different measures – qualitative assessments of processes and monitoring systems used; views of the partners; estimates of costs incurred by activity, and GEF comparable numbers; and also on the basis of the evaluators’ wider experiences of other similar projects. A few examples would have to suffice here. The use of the project of many existing mechanisms and activities to involve partners and to extend its reach was very effective and contributed to a large reach by the project at low costs per stakeholder reached.

103. It has been stated several times that due to constraints outside the control of the project management the project did suffer from delays and so scores less well on

timeliness. But it is our view that within the nature of the en.lighten project concept, its aims and outcomes achieved, and the potential value of the many outputs to further use, the delays of up to 18 months in the project timeline was not too significant a penalty. Based on the observations of activities, the efforts by the project to create efficiencies by using regional networks, and its use of BMZ and AusAID resources, the project is rated as efficient in its management and use of resources. Besides the delays mentioned, the evaluation finds the high degree of deviance between the GEF budget and the expenditures by component in Table 13, without clear explanations to also be negative. It is suggested here, that given the challenges from the original LFA and the necessity to deviate in the allocations of resources, project management could have potentially been improved with a complete restatement of the LFA and revisions to the anticipated expenditures based on the real experiences, after around 18-24 months of initiation. **The rating for efficiency is Satisfactory (S).**

#### 4.6 Factors affecting performance

104. The evaluation discusses below the factors and processes that affected the project performance under seven categories specified: project preparation and readiness; implementation and management; stakeholder participation; communications and public awareness; country ownership; financial planning and management; and finally, supervision and guidance. While the project was delivered competently in many aspects, it did suffer in some notable areas, often due to factors beyond the control of the project managers.
105. First, an example is provided of en.lighten engagement in West Africa (under partnerships), where en.lighten worked with over a dozen partners and additionally leveraged funds; the partnerships in Latin America and China are discussed in the Annex 1, where each of them were highly effective. These and other networks and partnerships were at the core of the en.lighten effort, and many were successful, while a few were less so (discussed again under stakeholders and partnerships, section 4.9). Factors that are suggested by theory to improve knowledge transmission require close engagements with key interest groups such as policy makers, industry actors, experts and others who influence the policy process and provide opportunities for policy actors and decision makers to discuss the guidance. The output tables (8 and 9) show en.lighten delivered on a large number of such engagements. Additional factors that contributed to good performance include the timing of the engagements, their relevance for the audience, clear and effective communications, as well the authoritativeness and independence<sup>92</sup>, which were all important.
106. A thread that runs through the project are certain core constraints on the project – some stemmed from initial decisions during the design and approval process, which limited what was feasible. Principal among them were the limited resources from GEF for this global project; second, the decision not to have a partnership with UNDP as planned, which had the maximum experiences until then on EEL among the GEF agencies; third, the nature and agreements with two private sector partners; and fourth,

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<sup>92</sup> It has been noted that the independence was compromised to a degree because the source of funds and expertise required the project not to be able to balance different interests of the sponsoring partners.

the many weaknesses in the ProDoc and project design, including goals that were over ambitious. Further, the documents did not speak of, or use, the concepts behind the “platforms” and COE; provided no theoretical framework; and were weak in the wording of the LFA, the indicators, and again over-ambitious targets. These initial constraints were exacerbated with delays in the UNEP internal administrative processes, especially on hiring staff for the COE. They made coordination of the work across many countries more difficult and hampered the attainment of some results. The evaluation judges that very good efforts were made by the project team to overcome the constraints imposed on it, delivering highly satisfactory in many dimensions. The project team overcame some limitations imposed by adaptations to the time line and through new partnerships for resources.

#### 4.6.1 Preparation and readiness

107. The project design had several positive elements – often the relatively simple set of statements critiqued here, provided a clear focus on a number of required actions, without being encumbered by wider concerns. The project employed one main tool – a globally networked COE, supporting many countries, working with multiple partners, and with the joining together of many networks that operated previously at smaller scale, to create economies of scale from a global platform. The above positive elements allowed the project to be relatively efficient at its tasks. But the evaluation determines that the preparation and readiness of the project could have been much better, beginning with the design. Gaps in the preparation and readiness include the lack of a thorough review of lessons from similar projects already completed. Two that are especially noteworthy will be mentioned. First, is the Efficient Lighting Initiative (ELI), a highly successful precursor to en.lighten covering 7 countries, executed by the IFC/World Bank and funded by the GEF, and the information available in the final evaluation and in the project documents of ELI. The ELI evaluation document discusses in considerable detail why the evaluation did not believe the positive changes noted in the 7 countries before and after ELI, could all be attributed to the intervention. They are almost identical to the views presented in this evaluation. It is concluded here that if the author of the ProDoc and the many reviewers, and those involved in the project team defining the MTE had taken note of these issues, corrective processes could have been adopted.
108. The other important documents that appear not to have been noted for past experiences include the GEF reviews of its own experiences with earlier private sector partnerships, which were the precursors to this project under the “Earth Fund”, and the reviews of its efforts in this direction, which was made at the same time as the commencement of the project (see 4.1.3). Given the reasonable size of the preparation grant, simply having lists of similar projects, which confirmed awareness, the planning documents could have gone further to create a critical review, a synthesis of the findings of earlier experiences on EEL, and engaged in wider national stakeholder consultations, which would have provided the project with a stronger base at its commencement. The inclusion of private sector partners without making the rules for participation clear was another limiting factor. Given the deficiencies in the design noted, it suggests inefficient use of resources for the design phase. Additional reviews of key frameworks that had been set in the design, could have been revised subsequently during implementation, especially during the first years, and could have led to formal corrections. The weaknesses in the design, preparation and readiness, created an upper limit on

performance, and, in addition the long-time taken for staffing the COE after approval, lower the rating for the project preparation and readiness to **Moderately Satisfactory (MS)**.

#### 4.6.2 Project implementation and management

109. The project implementation and management were very competent in many dimensions and also suffered in some notable areas. The project team, even when short staffed, was able to deliver a very large number of the outputs defined for the project. Almost all outputs were of high professional quality. The reviews of the project administrative documents, trip reports and the outputs show highly demanding roles for the project team members that were mostly handled competently and efficiently. There were also deficiencies that were noted and include observations by some PSC members that “planning and preparation of PSC meetings could have been more efficient and with greater preparation”. Some national stakeholders wished for faster and more specific response and greater engagement. Many reports were not sufficiently nuanced for the varied national circumstances. The task force assembled for reviews and guidelines of key policies for EEL missed adequate representation from developing country partners and some of the meetings to develop the guidelines were inadequately prepared. This was a challenge stemming from the initial design where the ProDoc provided for a seemingly generous team of 6 persons for the COE, but 3 of whom, including the co-ordinator, were only funded part time; 2 others were to be part co-financed; the technical expertise was fully co-financed, and there were no resources allocated for any legal governance entities that were suggested.
110. Positively, the findings demonstrate several examples of “adaptation to complex reality” that faced the project as it was implemented and where it moved away from the prescriptions of the ProDoc. The project team had to develop a partnership model on the fly and move rapidly to project execution. The lack of preparation and guidance received, and the slow start given the administrative challenges within UNEP on recruitment and other areas of execution, such as travel, hampered the project. The project moved to rapid engagement with potential partners at multiple global conferences and at the Conference of Parties (COP) to Convention on Climate Change meeting of 2010, in the first year of the project, with very few staff. But it allowed large numbers of organisations and individuals to be more aware of the project and to agree to become partners. It also correctly assessed the regional entities as a key entry point and partners (see paragraph 55 on the ToC; for examples see text box on ECREEE, and in Annex 1 on three partners), to then engage with national partners on a regional basis. The early development of key communications products provided the project with a degree of credibility thereby attracting more partners to the network. Among the partners attracted to the work of en.lighten were new funders such as BMZ, which was critical to in depth engagement with 16 West African countries leading to positive outcomes. The increase in its credibility, with the new partnership with NLTC, China, allowed the project to add important technical elements to its outputs and to add substance to the policy guidelines for MVE. This supported another new partnership with Australian aid and for working with another pre-existing network, lites.asia. The new and additional co-financing from BMZ and Australian aid, allowed it to overcome the lack of control of a large part of the global budget (non-GEF funds), which had created difficulties for the project management in allocating and utilising the resources stated to be available in the

ProDoc. Finally, there was a well-attended global conference organized at the end of the project, which increased its value, given the build-up of the partner network, and, the activities and outputs preceding the global policy dialogue, which would have been ineffective if undertaken earlier. Overall the evaluation finds the **project implementation and management to be Satisfactory (S)**.

#### 4.6.3 Stakeholder participation, cooperation and partnerships

111. Engagement with multiple stakeholders was a core and critical element of the project and was of many types and with different roles (for the typologies see Tables 3 and 4). The project documents spoke of – building upon “existing and related activities” of the GEF”; to create “an umbrella” for new national projects; working with “lighting actors”; and others. Networked partnerships are a common feature of many technology related initiatives, where it is important to bring common, verified and expert knowledge to a committed group, to bring about the desired changes, by sharing common visions and action plans. At the same time, the members or nodes of the networks are not uniform; each node is not always connected to all other nodes/members of the network; and the quantity (number), quality (intensity) and types (closeness to core) of interactions between the nodes and the platform, through direct and indirect communications and relationships, using different channels of communication, degrees of formalisation, etc. will always vary. And in large complex networks there will always be many low-intensity relationships that are difficult to keep track of and to distinguish. Figure 3 is a schematic representation of a network configuration where en.lighten occupied one of the central and larger nodes depicted and engaged with multiple other nodes and also sub-networks, such as in regional groupings.
112. The evaluation dealt with the challenge by making the assumptions that higher intensity interactions would have higher significance for the conversion of outputs to outcomes. Higher intensities would be associated with the funding agency partners, given legal and fiduciary obligations; and also indicated by the allocation of resources to partners and topics made by en.lighten. The evaluation used the limited resources available to examine causal links demonstrated in a sample of high intensity links<sup>93</sup>.



**Figure 3: Schematic map of a network configuration**

<sup>93</sup> One feature of complex networks is that they are highly resilient to changes in network characteristic and behaviour if few links or nodes are added or removed at random, as the network tends to share similarities across the links and this provides a degree of confidence that the evaluation of selected links in depth would display features common to en.lighten as a whole.

Source: UNEP at <http://web.unep.org/chemicalsandwaste/>

113. The gains from partnerships went in both directions. The team at the COE gained from the partnerships, as the number of persons in the COE ranged between 4-6 persons, of whom 2 were seconded from partners. The COE worked with the Economy Division management structure, where a management team reviewed and guided progress at three monthly intervals and provided some links to other UNEP work on chemical wastes. Next in importance are the members of the Project Steering Committee<sup>94</sup>, providing funds - the financial partner, GEF with the two private sector co-financing partners, followed by the GEF implementing agencies. At the next level, is the combined task force with 73 members<sup>95</sup>, and as a group, they worked jointly with the COE on the development of technical sections, and assisted the COE in the knowledge content for the production of the toolkit and reports. After that is a more diffuse group of partners such as policy makers, experts, regulators, financiers, NGOs, environmental organizations, many at national levels, some of whom overlapped in the task forces, workshops or other outputs.
114. The members of the PSC, the task force partners, and the countries and organizations that “collaborated” **directly** with en.lighten was considered as “direct or strong partnerships”. “Strong partners” would be expected to have greater “ownership” in the project outputs and outcomes, whereas “weak or distant” partnerships – such as a participant at one meeting, or a user of the web site, cannot be expected to have similar degrees of ownership, but could derive benefits from the participation. The evaluation examined the standard partnership agreement en.lighten signed with the first group of 66 “partner” countries. They were more in the nature of an agreement by en.lighten and the country to cooperate and work together on the EEL goals, and offered the possibility of recognition for the country as a partner in the global effort, but they did not oblige the countries to any specific actions. The evaluation does not consider that agreement as being a significant step towards *implementing EEL policies globally* but it was an important first step for the project to build a network, create awareness and to amplify the en.lighten message. This link and the network so established had the positive effects of showcasing the COE and platform, but the depth of linkages with all the 66 countries was not equally strong, which is a negative aspect.

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<sup>94</sup> Twelve person were listed as members of the PSC in the report “Achieving the Global Transition to Energy Efficient Lighting Toolkit” published in 2012. An analysis of individuals who were present at PSC meetings, showed up to 25 persons who participated at some of the meetings. At an initial PSC meeting terms for membership and roles were proposed to be clearly laid out. If that was done, the evidence was not seen. On the other hand the review of the PSC meeting minutes show that the membership, participation and roles, appear to have been fluid and not tightly defined.

<sup>95</sup> 73 persons were listed by the en.lighten team as members of the four TF and they were sent emails to participate in the survey undertaken. But project documents listed 45 persons initially in 2011. The project output “Achieving the Global Transition to Energy Efficient Lighting Toolkit” published in 2012 listed 50 persons as belonging to the task force. It is not known when the memberships changed.

### Example: Partnership with ECREEE for West Africa

The Economic Community of West African States (ECOWAS) was a regional member of the en.lighten Efficient Lighting Partnership, and was designated in February 2013 as a "pilot region." ECREEE is the ECOWAS Regional Centre for Renewable Energy and Energy Efficiency and is a specialised agency of ECOWAS. Its objective is to contribute to the sustainable development of West Africa by improving access to modern, reliable and affordable energy services, improving energy security and reducing negative energy related externalities. Its work includes mitigation of technical, legal, institutional, economic, financial, policy and capacity related barriers for renewable energy and energy efficiency markets and match the en.lighten objectives focused on lighting. ECREEE was established in 2008 by the ECOWAS Council of Ministers. The work in West Africa with ECOWAS and ECREEE was funded as new co-funding by the German agency BMZ (see budget Table 16 and more details Annex 4 for more details) and was assisted by GIZ.

ECREEE also has a "Supporting Energy Efficiency for West Africa (SEEA-WA)" programme, which has multiple partners. The programme is financed by a grant from the European Commission Energy Facility, and also support from ADEME (France) and the UNDP-PREP programme, which also supplements ECREEE resources. In addition, the Austrian Energy Agency (AEA), with around forty institutions as members; Alternatives pour l'Energie (AERE), a consulting bureau with broad experience both in energy efficiency issues and in development of energy policy in West Africa; ENERGIA, a gender and energy network, which has over a dozen NGOs and associations as members and is itself a part of the ETC Foundation; and the European Copper Institute (ECI), a trade organisation active in EU energy efficiency programmes; are all stated to work with and under the coordination of ECREEE. Two of ECREEE financial partners ADEME (France) and the UNDP were also partners in the en.lighten project. At the ECREEE workshop on efficient lighting there were 90 participants, with meetings, discussions and plans made with the ECOWAS members of the Regional efficient lighting strategy working groups, the standards and label committee, Ministers, experts, government officials from the 15 ECOWAS member countries, and National standardization agencies. As well as global partners - Collaborative Labelling and Appliance Standards Program (CLASP) and the World Bank. In addition, new links were forged with SNV from the Netherlands, Association of Illumination Professionals), UNIDO, and others. These partnerships

This example is provided to illustrate how the en.lighten project worked with expanding networks of partners and stakeholders, among whom the intensity of interactions varied as it should. Here for example UNDP, ADEME, and GIZ are involved, and two of the three also have their own efficiency projects in other regions, such as Latin America. The additional funds provided by BMZ allowed for deeper and wider involvement of en.lighten

115. All direct/strong partners are also all important stakeholders in some aspects of the project. There were also multiple (hundreds of) other stakeholders as discussed below under stakeholder analysis. Both the types and the numbers of interactions that en.lighten had with its "network" of over 200 defined members – staff, UNEP and DTIE, GEF, the GEF implementing partners, the 70 plus national coordinators, a similar number of Task Force experts, contractors and so on, and also an even larger number of unspecified members naturally varied.

**Table 14: Some Project Partners and their involvement in the project**

	Name	Some comments.
1	GEF	Project finance and the most important member PSC. It wished to have a flagship global project, with private sector financing under its "Earth Fund" initiative. No interviews were possible.
2	ADEME	Project Co-finance. The co-financing was subsequently found unacceptable for reasons not explained, but the agency remained within the network and participated in some activities.
3	OSRAM	Private sector manufacturer of EEL; project co-finance, provider of expertise, data, information and knowledge, and a member PSC. Many

		interviewees commented positively on the technical expertise provided by the private manufacturers. Some also suggested that the key role of the private sector partners in financing, governance and in the task force had a negative aspect in allowing their views to dominate, especially on mercury and recycling. <sup>96</sup>
4	Philips	Private sector manufacturer of EEL; project co-finance and provider of expertise, data, information and knowledge, and also a member PSC. Similarly to OSRAM, many interviewees commented positively on the technical expertise provided by the private manufacturers and some also suggested that the key role of the private sector partners also had a negative aspect in allowing their views to dominate, especially on mercury and recycling.
5	AusAid	Project Co-finance for Asia and Pacific. The additional finance was provided for an en.lighten support to an Asian network, lites.asia, that predated en.lighten. AusAid was contacted and their evaluation report on en.lighten was used.
6	BMZ	Project Co-finance for West Africa. See text box on West Africa. They were contacted and so were the technical partners GIZ.
7	NLTC	Project Co-finance, testing and training, and member PSC. Here en.lighten partnered with NLTC to create the Global Efficient Lighting Centre (GELC) as a UNEP affiliated Centre of Excellence. (See Annex A1.3 for more information on the contributions by GELC, an outcome of en.lighten. Together they worked with a number of country partners to support and enhance en.lighten outcomes, especially on testing and MVE). See Annex A1.3, which discusses the visit to NLTC/GELC and the contributions and the role played by this critical partnership.
<b>Participation in the PSC and cooperation on project activities</b>		
8	UNDP	Implementer of the largest number of GEF supported country lighting projects. The design originally stated it was "a joint effort by UNEP and UNDP" but the approved document limited it to be a UNEP managed project. UNDP was a partner in the PSC, en.lighten worked with a few ongoing UNDP projects such as Russia on EEL. Later it was found by en.lighten that it would be more efficient and effective to focus on countries without ongoing and large national EEL programmes as its own contributions were more limited. In the countries visited, and in the headquarters, the partnership and awareness of UNDP and UNEP

<sup>96</sup> OSRAM provided written information on 24 August 2016, in response to the field visit in May provided additional details: It dedicated one full time employee to the initiative during the whole period. Additionally, it said - especially during the beginning phase elaborating the idea, the concept, the approach, the integrated approach and its 4 parts, colleagues of the whole company have been involved intensively. Staff worked on the task forces and came from the following departments: Corporate Communications, Governmental Affairs, Standards and Regulations, Environmental and Health, Market Intelligence, Collection and Recycling, Sustainability, Controlling and Accounting. OSRAM provided project personnel, consultants, travel expenses, expendable equipment and administrative support. An OSRAM colleague from OSRAM Canada was delegated to work in the en.lighten project team as communication manager, and was supported by OSRAM. OSRAM had also supported the establishment of the AMBILAMP University with knowledge and donations. OSRAM participated at several UN conferences to stress the en.lighten initiative and its ambitions, and covered the preparation, participation and post-processing time and travel costs. Examples include different COPs (16, 17, 18, 19, 20, 21), SE4All Forum in New York and Copenhagen, Global Efficient Lighting Forum., China; and it prepared, participated in national and regional efficient lighting strategies workshops -Central America, Tunisia, Chile, Ecuador, South Africa, ECOWAS, and the Pacific. OSRAM also prepared and participated in regular Project Management Team meetings and Project Steering Committees.

		staff on their common activities was found to be high.
9	World Bank and IFC	Largest financing agent in efficient lighting, with two networks financed and a GEF agency.
9	EBRD	Some GEF supported country lighting projects. Participated in a few events.
<b>Cooperation within projects and with their partners</b>		
10	Asian Development Bank	In their specific lighting related projects in Asia. Participated in some events.
11	USAID	In their specific projects, such as in Asia, where it had earlier supported work on EEL and cooperation via its expert partners. Their documents and common events with en.lighten were reviewed.
12	GIZ	Partnered in Asia and West Africa directly and was involved in LAC in some of the events and interviewed. See BMZ above.
<b>Cooperation for regions and linking to their networks and partners</b>		
13	ECREEE	ECREEE (see also text box) is a specialized, regional West African organization, serving ECOWAS countries on EE and RE policies from 2010. ECREEE, and so ECOWAS, were co-sponsors and partners with en.lighten for the work in the region. This was financially supported by BMZ. The Centre adheres to the regulations of ECOWAS. The institutional structure of the Centre includes National Focal Institutions (NFIs) in each of the 15 ECOWAS member states. The work in West Africa, which also included off grid lighting, was also supported in cooperation with the German technical agency, GIZ (interviewed for the evaluation). The partnership with the regional entities and countries was one example of a strong network, strengthened by the additional technical and financial resources from Germany.
14	Economic Community of West African States (ECOWAS)	The regional West African inter-ministerial organization and a partner with the project for the region. The (ECOWAS) was formed in 1999 and has fifteen member countries from the region, consisting of: Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The support contributed to the ECOWAS Process and Strategy on the Development of the Sustainable Energy for All (SE4ALL) Action Agendas, the National Renewable Energy Action Plans (NREAPs) and National Energy Efficiency Action Plans (NEEAPs).
15	La Organización Latinoamericana de Energía (OLADE)	OLADE supported and en.lighten participated in the Regional Workshop in Latin America and the Caribbean, in cooperation with OLADE, at Santo Domingo, 4 August 2011. Government representatives from 26 countries in Latin America and the Caribbean participated and agreed to the "Santo Domingo Declaration" to phase-out incandescent light bulbs. The declaration by itself was not a critical outcome but a number of countries such as Chile and Uruguay expressed strong interest in working with en.lighten on national initiatives. More detailed work was begun in several countries, which led to strong partnerships with countries such as Chile.
16	Lites.asia	This was a pre-existing network for Asia and Pacific supported by AusAID and USAID; then managed by en.lighten. The financial contributions of AusAID for work in Asia, the prior work done by lites.asia; and the pre-existing network of countries, experts, publications and events provided a valuable contribution to the extension of en.lighten work in Asia and deeper engagements in the region.

		Extensive documentation and web site reviewed.
17	TERI, India	Subcontracted to report on lighting in South Asia, held workshop for South Asia. Their report is used and referred to in the task force, and toolkit, yet their negative findings on inadequacies on handling mercury waste in India at the time was not followed up. In 2016 there are new court ordered programmes for collection and recycling underway in India.
18	Lighting Associations	Global, regional and national associations of lighting manufacturers were sometimes partners –in supporting specific tasks and were almost always involved as stakeholders. As one example, it partnered with the Global Off-Grid Lighting Association (GOGLA) in its work on efficient lighting for regions without grid electricity.
	The above provides a number of examples of partners who played key roles in the project. A complete list of all specialist organizations; regional entities, experts and others who were partners <sup>97</sup> are available on its web site and publications and runs to hundreds of names.	

Source: Various project documents.

116. It is important to note here, that while the UNDP is listed as a partner and participated in the PSC, the PIF had stated an even stronger relationship. The PIF stated that the design was for “a joint effort by UNEP and UNDP” but without any clarification, the final ProDoc, at approval, stated this to be a UNEP managed project, with UNDP as a partner, with no further explanation.<sup>98</sup> It was said at UNEP DTIE, this change was done to keep en.lighten management and reporting simpler and it was agreed between the agencies, that UNEP would implement the global initiative while UNDP would focus on the ongoing and future national initiatives. The evaluation found this to be a weakness as the project did not have the same degree of linkage with previously funded GEF projects managed by UNDP, as could have been anticipated with joint ownership. The evaluator finds this change in the plans to have been done at a late stage, by UNEP with GEF, without any evidence of new agreements with UNDP. This was a missed opportunity for the global platform and its goal of bringing together all major actors and experiences. That UNEP and UNDP are working more closely together in the successor project (see Table 1 and Annex 2) is a very positive development and is commended.

117. The ProDoc had named four “sponsoring partners” – UNEP, GEF, Osram and Philips. The project added the World Bank and UNDP to the PSC, increasing the

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<sup>97</sup> The OECD DAC Glossary of key terms in Evaluation and Results Based Management defines Partners as “The individuals and/or organizations that collaborate to achieve mutually agreed upon objectives”. It defines “Stakeholders” as a larger group which has “a direct or indirect interest in the development intervention”. Stakeholders include both partners and beneficiaries, and a project may select a subset that is the target group – or specific individuals, organizations or groups for whose benefit the development intervention is undertaken. The evaluation has taken the view that all partners in en.lighten were also potential beneficiaries. The target group as stated in the goal statement includes all developing country governments. Within the government their different departments relevant for actions on EEL were the primary targets for partnerships but the partnerships included multiple other organizations in each country. See the methodology section on how the evaluation dealt with the long lists of partners, stakeholders, and beneficiaries; and how the evaluation uses network concepts in tracing some key causal relationships to establish en.lighten contributions to the outcomes.

<sup>98</sup> The current task manager did not have the information for the choice made. It was stated by UNEP – “Note however that the collaboration with UNDP is happening in U4E (en.lighten’s follow-up/scale-up)”. UNDP was asked about this, and they believe this step reduced the degree of cooperation.

partnerships and network members. At the first presentation at COP in 2010, a number of countries signed a document stating that they were interested in a partnership and to receive UNEP en.lighten support to move towards greater use of EEL. In 2011, at three workshops in three continents attended by national and regional organizations the membership of the network went past 100 organizations, a mixture of national ministries, regional organizations, multilateral organizations, and members of expert groups, which is a mixture of partners, stakeholders and beneficiaries. The en.lighten web site lists 22 partners by the end of the project and even then the web site does not include many others.

118. However, as a global network and platform project, while a wide range of stakeholders were engaged over time, it was still a small fraction of the potential population. Given the large network and the ambitions of en.lighten, while constrained by resources and time, it was natural that the participation and engagement with any individual stakeholder varied considerably. As the stakeholders had individual interests and concerns, beyond their common interests, the global outputs could not always deal with specific issues and priorities, where they deviated from the “average”. The example of mercury and waste has been discussed and this together with the prior completion of an EEL project, made the requirements of Uruguay challenging to meet. On the other hand Chile provided the perfect case for the en.lighten premise, where the factors of timing, together with local relevance, effective communication tools, authoritativeness and the global knowledge base were critical for the outcome. Despite many achievements, the weaknesses noted reduce **the rating of the stakeholder participation, cooperation and partnerships to Satisfactory (S).**

#### 4.6.4 Communication and public awareness

119. The project has taken multiple steps to increase awareness about the processes, and also the results, through publications, workshops, websites, webinars, and similar mechanisms. See list of outputs in Tables 8 and 9). The efforts made, the number of communications products and their overall quality were some of the strengths of en.lighten. At the same time one of the strengths, a relatively clear, consistent and simple message focusing mainly on the macro-economic benefits of the switch from IL to CFL also contributed to two weaknesses mentioned earlier: 1) an inability to adapt the message to individual country circumstances (see also para 62-63)<sup>99</sup> and 2) a relative lack of focus on the complex issues of toxicity, recycling and closing the material loop, which is a key message of UNEP in its parallel work under green or circular economy, and under chemicals and waste projects. A strength of the project noted was a high level of visibility and awareness of the platform among global and national policy actors in the relevant sectors. This was marred by the low priority given to communications for the

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<sup>99</sup> Evaluation Office: based on the project team feedback the global project aimed to adapt toward country level need by conducting: 1) Country Lighting Assessments, which were available for approx 150 country; 2) Country Policy Assessments which were available for approximately 150 countries, showing the status of policies; 3) Off-grid Country Lighting Assessments available for approximately 100 countries, adapting to the needs of countries that have a large portion of lighting coming for off-grid lighting; and 4) supporting pilot countries/regions in over 25 countries to develop national/regional roadmaps. A detailed list or evidence of all the efforts were not provided for the evaluation team.

wider public and to specific subgroups (see section 4.1; outputs Tables 8). The weaknesses noted reduce **the rating of communication and public awareness to Moderately Satisfactory (MS)**.

#### 4.6.5 Country ownership and driven-ness

120. Some national stakeholders commented that they were not sufficiently involved in the project development and overall trajectory of the initiative (see earlier discussion under partnerships). Given the sprawling nature of the global platform and networks, it was not unexpected that a number of partner countries could not obtain the support that they needed; the public awareness efforts varied considerably between countries; and some issues were not covered in adequate depth. Where there was adequate emphasis on stakeholder participation, public awareness and inputs tailored to specific national needs, they promoted positive country level outcomes. This was combined with low participation of representatives from developing countries in the governance (Steering committee), task forces and expert groups lowering the effectiveness. Country ownership and driven-ness were often most apparent when there were specific small allocations for country level work as in Chile and Uruguay (see Annex 1). Even here, the needs and work done in Uruguay were not well matched with the global focus, yet the small contribution was effective in contributing to further efforts in Uruguay on the questions related to mercury in lamps. The participation and cooperation with NELTC, China, was a successful example where partner strengths in testing was used for the benefit of network members (see Annex 1). The rating of the country ownership and driven-ness is **Satisfactory (S)**.

#### 4.6.6 Financial planning and management

121. The project implementation and management, including financial, were noted to be competent within the larger constraints imposed by GEF and UN Environment Economy Division procedures.

**Table 15: Expenditures by year: GEF allocations only**

	ProDoc Budget	2010	2011	2012	2013	2014	2015	Actual Total
<b>GEF Budget</b>	\$5,000,000	\$1,052,500	\$1,407,500	\$1,307,500	\$1,232,500			\$5,000,000
GEF Budget revised			\$2,108,270	\$2,298,519	\$1,232,500	\$1,127,217	\$347,944	
Unspent funds		\$700,770	\$991,019	\$736,265	\$390,952	\$347,944	Nil	Nil
% underspent		67%	47%	32%	32%	31%	0%	0%

122. Source: UNEP Figures

**Table 16: Leveraged financing**

	ProDoc Budget	2010	2011	2012	2013	2014	2015	Actual Total
AusAid					\$2,547,160			\$2,547,160

BMZ					\$258,732			\$258,732
NLTC I					\$265,521			\$265,521
NLTC II							\$276,625	\$276,625
UNEP	\$68,000							\$68,000
<b>Others</b>	\$2,800,000							\$3,416,038

Source: UNEP Figures and contracts

123. Financial management was assessed under the completeness of financial information, communication between financial and project management staff and compliance with relevant UN financial management standards and procedures. The evaluation found the financial information was mostly thorough but much delayed. Co-financing details concerning private sector partner contributions was not available. The evaluation found that the communications between financial and project management staff clear and appropriate and did not note any deviations from established practice (though the last was not a priority for the evaluation). Hence this is rates as **Satisfactory (S)**.<sup>100</sup>

#### 4.6.7 Supervision, guidance and technical backstopping

124. The evaluation noted that the achievements were possible through the high dedication and competence of the project staff. The documents reviewed showed the project team and the separate task management team at UNEP to have undertaken their respective tasks with competence and in compliance with GEF processes. Two other supervision and guidance mechanisms were provided for the project. The first was an Economy Division management group that reviewed progress every three months. As the evaluation was not provided with any record of discussions or actions by the management group, it makes no comment. The evaluation reviewed all minutes and discussions at the PSC meeting held annually. They showed a high degree of enthusiasm initially and then the energy levels and contributions appeared to decline. It provided for information exchanges between members but there were insufficiently clear guidance from the PSC on future directions that could be noted in the minutes. It was reported in interviews that there were severe budget constraints in the final year of the project but discussions of issues or their resolution was not noted in the meeting minutes. The rating here is **Moderately Satisfactory (MS)**.

#### 4.6.8 Monitoring and evaluation

##### M&E design

125. Monitoring of progress was laid out in the ProDoc and built into the project design with ten on-going mandated reports specified by month, quarter and annual for reviews of progress. There was a detailed monitoring scheme for outcomes where the project had allocated US\$30,000 per year for monitoring progress on market changes;

<sup>100</sup> The evaluation office conducted an additional survey in June 2017 to fill in any gaps concerning the evaluation of the financial management aspects. Table A9 in annex was compiled based on the survey findings.

US\$10,000 per year for outcome one; US\$60,000 for reviewing the COE effectiveness; and US\$15,000 for the outcomes at selected countries, for a total of US\$235,000 for this important work<sup>101</sup>. There was also a separate mid-term evaluation and a final evaluation, each was budgeted for, at US\$50,000 each, set aside on a separate line<sup>102</sup>. The monitoring plan suggested covered each outcome, and, their outline was excellent and the resources allocated for monitoring were generous and the responsibilities for the ongoing monitoring were the responsibility of the team. It is our view that they could have provided highly valuable guidance to the project and to the subsequent evaluation as provided for.

126. The deficiencies in project logical framework and indicators have been fully discussed in the revisions made for this evaluation (Table 2 and section 3 for the ToC) and ideally, the plans and resources allocated would have been sufficient for the deficiencies to have been noted and rectified. It has been discussed that the deficiencies in the indicators included unrealistic time frames and that would have been obvious in any systematic review, while as some other information such as the baseline of sales and their trend would have remained more challenging. The evaluation has discussed that the key stakeholders were not closely involved in the design and execution of the project and also that gender, human rights and Environmental Economic and Social Safeguards, had not been a part of the project design. **The evaluation rates the M&E plans as laid out to be Satisfactory(S)**<sup>103</sup>.

### M&E plan implementation

127. The evaluation reviewed all project documents made available and noted almost complete compliance with the reporting requirements as laid out in Appendix 8 (page 85) of the ProDoc. The periodic reports were all regularly completed and provided considerable information on the project and its progress. They were found complete, accurate and provided realistic assessments of progress and challenges, as seen by the project manager. There were no monitoring reports seen that met the specifications as laid out in the monitoring plan (see above) and as costed. Nevertheless the evaluation can confirm that the required information was produced and was used to improve project performance and to adapt to changing needs, except that needs and performance were not being most appropriately measured.
128. The evaluation has discussed several weaknesses and strengths of the project design and implementation. A review, as suggested in the design, could have improved effectiveness. But it is also found that the project focus on simplified statements of activities, outputs, outcomes and goals, the good use of the PIR reports, and, implicit understandings by a competent team, allowed the project to deliver a very high level of outputs, and very often results close to the desired outcomes, but with a penalty in reduced effectiveness. The processing of workflows, outputs, financial and

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<sup>101</sup> ProDoc pages 87-91 in Appendix 7, Costed monitoring plan.

<sup>102</sup> There are discrepancies in the amount for the MTE and the TE between the budget page on 67 and 68, and the notes on page 84. Also the specifications laid out as the monitoring plan for four years costed at a total of US\$235,000 has not separately detailed in the approved budget tables, pages 67 and 68.

<sup>103</sup> The deficiencies noted in the above footnote are considered to have been oversights and they could easily be corrected during implementation.

management issues during implementation were noted to be compliant with UNEP and GEF procedures and so were found satisfactory. The internal systems and reports flagged delays, their reasons and steps to be taken to remedy the situation, such as recruitment and shortage of resources, but they failed to report back whether in fact the challenge identified had been remedied and corrective actions taken.

129. A planned MTE was conducted (September 2013) and was managed by the UNEP Evaluation Office. But this terminal evaluation found no evidence that the focus and findings of the MTE provided any useful information for the project management<sup>104</sup>. The MTE was broadly appropriate in its conduct, except that it missed the observations made here on the weaknesses in the LFA and goal statements (as discussed here in the development of Table 2 and in the ToC section). The MTE also missed following up on the facts that the budgets had major reallocations, staffing challenges clearly noted in the PIR, and, challenges in managing the multiple partnership, discussed in the PIR and at the PSC. It missed making simple recommendations to improve the data being collected on project outputs and outcomes and for improving the monitoring data by examining if the plan laid out was followed and if not, whether that was appropriate. The evaluation found the M&E as implemented is fully compliant and satisfactory on all mandated periodic reports but deficient in its usefulness, deficient in producing the final report and accounts, and so **Moderately Satisfactory (MS)**.

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<sup>104</sup> The ToR for the MTE did not consider gender; the MTE found ESES criteria N.A.; it mentioned mercury as did the ProDoc and said that the outputs and outcome on mercury had been achieved in 2013. It found 10 of the 14 outputs had been completed and two out of the three original outcomes had been achieved; and rated all evaluation categories for the project at the highest level except for country ownership, which was rated one lower, and found the delays to have been made up subsequently. It did find one deficiency in the UNEP administration on delays in staffing. The MTE made two recommendations in 2013, with which we concur, first that the project lessons should be well documented and second, to sharpen measurements of indicators.

## 5 CONCLUSIONS, RECOMMENDATIONS & LESSONS LEARNED

### 5.1 Conclusions

130. The evaluation considers the overall approach of the project to foster partnerships to collectively address the global challenge of greenhouse gas emissions through efficient lighting; by building a global network/platform and sharing knowledge, to be highly appropriate and a necessary and useful step. The evaluation found the project highly relevant to UNEP, GEF and global and regional priorities on climate change mitigation. The normative work, standards setting, and the global components of learning lessons, sharing and building supra-national coalitions to promote energy efficient lighting (EEL) for climate change are among the comparative advantages of UNEP. The principles of action were built on the lessons from earlier GEF funded projects in this area, and also other experiences. The project was well linked to and aware of other global, regional and national initiatives with regard to the promotion and transformation of the market towards efficient lighting and most of the other similar initiatives were also aware of en.lighten and many were involved in the en.lighten network. This was seen in its high relevance to global, regional and national environmental issues. Based on the details provided in the evaluation, the achievements of many of the planned outputs and outcomes, the project is rated as **Satisfactory**.
131. The evaluation has reported on the evidence that en.lighten activities and outputs have contributed to a reduction in market barriers that have faced users of energy efficient lighting through national actions in a number of countries. The UNEP Economy Division did establish a “Centre of Excellence” (COE) composed at its core by the project staff, supplemented by the technical and operational support provided by the different partners and stakeholders. The COE, as a unit in Paris, continues to be operational and it does support the overall project objectives. Its effectiveness could be enhanced if budget and staff constraints could be reduced. The project interventions such as the regional workshops, national support to selected countries, the web site, and the support provided by the “Centre of Excellence”, were all in keeping with the specified outputs in the ProDoc. They have been relevant and useful to different network members.
132. Most participating countries and regions agreed on some elements of “the road-map” created by en.lighten, and so the changes can be attributed to the project. The degree of alignment and agreement depend on how the suggested “road map” is perceived. If it is perceived as a “map” with multiple paths to a similar destination, with travellers choosing to arrive at their own time, then the countries and regions have indeed agreed on such a journey. Their agreement stems from the multiple economic, energy and GHG benefits of the transformation of lighting markets, with increased use of EEL. The progress made has contributed to the overall project goal.
133. The project deliverables include a large number of different outputs. They include publications, country assessments, and studies, regulatory tools, partnerships, networks developed etc. The outputs produced such as the publications/toolkits/guidelines have been utilized by countries, at the regional level, and by other partners and experts in their work as one set of reference materials. The successful uptake from the project analysis recommendations where they have occurred is largely due to the relatively large positive economic gains for all countries and their populations, with some smaller losses, borne

potentially by smaller and weaker sub-groups. Given the small size of resources available to the global project, direct training beyond policy capacity by the project among the programme countries and regions was not high, but the resources used and the training delivered was seen to be useful. The global components of the project were the key contributions of the project to the capacity building at the national and regional level, because the project was well aware and often did link up in terms of knowledge, with other relevant global, regional and national initiatives. They can mostly be utilized further during the next phases of the project, provided they are kept updated and current. The sustainability of project directions does not require further UNEP support, but the ongoing UNEP support through the successor project of the tools and goals, can contribute to the ongoing process of the shifts to more energy efficient products in lighting and other sectors.

134. The evaluation found the project team to have done excellent work under the constraints of the design, and additional constraints during execution, which include: the slow speed of work within UNEP (set up with the goal of high compliance to rules and not for speed); ineffective guidance from the PSC and the pressure to demonstrate timely “results”, even when the project preparations were inadequate. The project team deserves praise for the speed with which it delivered the outputs and for leveraging existing regional networks, thereby ensuring that the outputs of the global platform were delivered in a relatively cost efficient manner. It is also commendable for the COE to have delivered the large numbers of outputs, almost all with good production quality and reasonable technical quality, and to have engaged in its work with an extensive list of partners.
135. There were also some significant shortcomings, which stemmed primarily from constraints imposed from the design stage, which in turn imposed certain rigidities and degrees of inflexibility to country situations, both in the planning and execution; and reduced the ability to pay adequate attention to some key stakeholder groups, to gender dimensions and to the potential for unintended consequences of mercury emissions from the expansion of CFL in the waste stream. The inadequate attention given to gender and to the high additional costs of collection and recycling of waste products, and weak consideration of user groups, and sub-groups of countries and people for whom the averages did not apply, stem primarily from the constraints on the project stemming from the initial design, the lack of a theoretical framework, resource constraints to address varying needs of different partners, which could not all be met unless some of the constraints were eased.
136. The project could potentially be visualized as a pilot global platform or programme for UNEP than a single project<sup>105</sup>. This is suggested by the successor programme of work, which has been approved by GEF under guidelines for programmatic approaches. So from the design stage, there were external requirements of the funder, which the project design was contorted to match up with, and perhaps could not escape from. It was also never clear if it was seen as a large, medium or small project (programme). In similar platforms that the evaluator is aware of, a global platform is considered small at one to three million dollars, of medium size at the level

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<sup>105</sup> UNEP had supported only one earlier national project on efficient lighting before en.lighten.

of funds secured for en.lighten. Most often small to medium sized programs focus primarily on policy and knowledge networks; facilitate communication, advocate policy change, and generate and disseminate knowledge and good practices in their sector. And, also important from a governance perspective, as the size increases, such platforms are often provided the resources to have independent legal structures for guidance and execution. As the funding grows larger, platform programs do also provide additional technical assistance at the country level (or similar) to support policy and institutional changes and build capacity to catalyse further actions and investments. If en.lighten is viewed from the cash resources provided by GEF (5 million US\$), it was a small to medium sized platform, but was too often viewed and portrayed as having all the resources required of it.

137. The en.lighten team undertook all the tasks normally undertaken by a larger platform, with the impression that it had four times the resources that it actually had, but as the balance was in-kind, this constrained its execution and governance. This naturally created the challenges noted, with low staff resources and high demands in the COE, together with excessive reliance on the support of the two private sector partners for all technical expertise. Beyond meeting the perceived needs of the GEF in the design, the weaknesses of governance provided a set of constraints that were difficult for the project team to fully overcome. The dropping of UNDP as a named joint partner in the project, when UNDP was and remains the GEF agency with the largest national portfolio on the topic of energy efficient lighting, could not be compensated for by adding one person from UNDP to the Project Steering Committee (PSC). Coordination was found to be more difficult, again due to the binding constraints on the project stemming from the initial design weaknesses, ongoing resource constraints, the reduced flexibility from the private sector partnerships, all together, reducing the ability to respond to additional and varying needs of different sub-groups. The judgement made by the evaluation is that good efforts were made and that they were moderately satisfactory. Coordination modalities relied largely on inter-institutional representation in the Project Steering Committee and this modality appeared to lose momentum over time. The discussions at the PSC were less focused and programmatic as the project evolved. Representation in committees is insufficient for achieving coordination and lesson learning has to be active and not passive. The project documents do mention many other projects in lighting taking place in other countries and being supported by PSC members. In the early period, years one and two, there were both efforts by the project team to link with ongoing projects on lighting efficiency supported by GEF, and this was notable in Russia, implemented by UNDP and in Vietnam, implemented by UNEP. Over time, such efforts declined as it was seen to be less effective than working with new countries - those without ongoing GEF funding for efficient lighting, and yet who were also keen for national reasons to allocate resources to the effort and to plan for future international support.

138. The constraints mentioned, together with the focus on outputs and results, across many countries, and the emphasis on delivery timelines and efficiency led to the narrowing of focus and over simplification of the message. The facts that energy efficiency activities can promote many additional policy objectives besides GHG reductions, such as on other environmental emissions, financial savings from peak reduction, job creation, energy security, increased supply for poor families, are some examples, which were often, or not consistently, addressed. This led to a simpler

message, perhaps as it is often advised, a simple and focused message can be more instrumental in changing the behaviour of listeners in the desired direction. There was clear evidence that it succeeded in the adoption of all suggested policies in at least in one of the country visited, Chile. The Annex 2, provides a list of other countries that also found the message persuasive and there would be other countries following over time.

**Table 17: Overall evaluation ratings**

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
<b>A. Strategic relevance</b>	The objectives were highly consistent with the global priorities of UNEP and GEF, related to climate change. Factual evidence, country requests, the perceptions of key stakeholders confirm that the project was highly relevant to the many countries, but not to all. The strategies adopted during implementation, often through regional networks, allowed for South-South interchanges of experience and cooperation. But human rights and gender related issues were not well articulated and sufficiently taken into account. The weaknesses reduce the rating. See section 4.1 and sub-sections 4.1.1 to 4.1.8	S	S	conkurs
<b>B. Achievement of outputs</b>	The project delivered on many outputs and many were knowledge products. The outputs are listed in Table 8 and in Table 9, which had been specified for the COE. It delivered largely or almost fully on 10 of the 13 specified outputs. It only delivered partly on two outputs – technical training provided and support for national laboratories. Its delivery on one output – “CFL disposal strategy and action plan reviewed across countries and best practices recommended” was found to be inadequate and poor quality. The evaluation found budget and time limitations, prevented further tailoring of reports, workshops and support to individual country needs where they differed significantly from the “average” country. See section 4.2 for details.	S	S	conkurs
<b>C. Effectiveness : Attainment</b>	The evaluation judges the overall effectiveness of the project along this dimension to have been “Satisfactory”	S	S	conkurs

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
<b>of project objectives and results</b>	based on the three criteria below and discussed in section 4.3			
1. Achievement of direct outcomes	<p>As listed in Table 10, section 4.3.1 –The four direct outcomes were mostly achieved. Most important ones (outcome 1 and 4) indicating that many governments taking up and replicating similar activities; the technical assistance needed for those countries for quality improvement was met at the adequate level and timely manner; and supportive legal and regulatory frameworks in many of the participating countries were adopted and levels of awareness raised, except on the collection and recycling of wastes.</p> <p>These outcomes would contribute to some of the additional EEL products sold per year at the completion of the project.</p>	S	S	concur
2. Likelihood of medium term outcomes/impact	<p>The achievements of medium term outcomes are discussed in section 4.3.2 with examples. The likely medium term outcomes were observed along four positive categories: incandescent lamps (ILs) phased out; lower GHG emissions from lighting; lower mercury emissions due to reduced coal use; and, the improved welfare of people along sustainable development goals. The evaluation noted positively that the share of ILs in the lighting markets globally has dropped sharply (see Table 11), with the doubling of CFL sales in the same period.</p> <p>This implies mercury emissions from used lamps, often handled as household waste and thrown into dumps, has also increased in the same period (there have been small improvements in lamp manufacturing, reducing the mercury content in higher quality lamps but information on the global market composition by mercury content is not available to the evaluator). By itself the project could not overcome the negative trend on mercury wastes, but it is rated poorly for the inadequate communications and technical efforts</p>	L	L	concur

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
	made to either review or reduce this negative outcome.			
3. Achievement of project goal and planned objectives	The achievement of results along the ToC suggests that the project has achieved the overall objectives.	S	S	concur
<b>D. Sustainability and replication</b>	The evaluation rates the overall sustainability of the project outcomes to be likely. Over all is rated as per its weakest sub criteria (in this case likely) The overall rating is derived largely from factors extrinsic to the project. The high rating is also influenced by the ToC and the view that the impact drivers and assumptions in the TOC, have all been in the positive direction, supporting sustainability.	L	ML	As per the Evaluation TOR all the dimensions of sustainability are deemed critical. Therefore, the overall rating for sustainability will be the lowest rating of the separate dimensions.
1. Financial	The project did not directly provide funds to secure the future financial sustainability, and it was not its role as designed. It supported engagements for further financing in several ways - reports and workshops, and by direct technical support to countries to develop proposals for GEF financing. Positively, the impact drivers in the ToC –direct support and engagement with national governments; the links and priorities of national and regional institutions” were seen to operate. And; the assumption in the ToC – “political support from participating countries” were all seen to hold. Given the ongoing GEF financial support, the economic benefits, this is high.	HL	L	Based on the evaluation report the project’s direct outcomes have overall low dependency on external funding. However the outcome 2 remains dependent on external funding. This grants a Likely rating
2. Socio-political	The socio-political support at the national level stems from the very high country specific gains at the macro and micro levels. The approaches met the critical assumption made in the ToC.	HL	HL	concur

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
3. Institutional framework	This project did not attempt to directly modify governance structures, legal and accountability frameworks, etc. but focused on providing technical skills and filling in information gaps, for a country led policy and legislative process. The assumption was that the core missing elements were the skills and information available to national authorities. The support for the process of policy stakeholder engagement and consultations and some cooperation and learning between countries were the additional factors supporting the outcomes, such as a change in capacity and in “policy behaviour” nationally.	HL	HL	concurr
4. Environmental	The evaluation view is that the shift towards EEL supports positive changes in GHG emissions, the major driver for the sustainability of this environmental benefit comes from the rates of changes in the technology for lighting, extrinsic to the project. The low priority given to the toxic wastes has lowered the rating.	L	ML	The issue of toxic waste is considered a critical factor that might influence negatively on the sustainability of the benefits deriving from this project
5. Catalytic role and replication	The project has played a catalytic role in collective capacity building of national stakeholders for actions involving institutional and policy changes; contributed to national replication activities through pilots and policy dialogues. Replication is also underway with a second and expanded phase. The efforts need to be continued to keep abreast of changing technologies, which is taking place.	HS	HS	concurr
<b>E. Efficiency</b>	The project is considered to have been very efficient in its use of funds and in the achievement of outputs and outcomes with the given resources. This is arrived at through several different measures – qualitative assessments of processes and monitoring systems used; views of the partners; estimates of costs incurred by activity, and GEF comparable numbers; and also on the basis of the	S	S	concurr

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
	evaluators' wider experiences of other similar projects.			
<b>F. Factors affecting project performance</b>				
1. Preparation and readiness	The evaluation determined that the preparation and readiness of the project could have been better.	MS	MS	concur
2. Project implementation & management	The project implementation and management were very competent in many dimensions but suffered in two notable areas- see section 4.8	S	S	concur
3. Stakeholders participation, cooperation and partnerships	Key stakeholders' engagements were a critical element of the project. But as a global network and platform project, the range of stakeholders who were engaged over time, while large was still a small fraction of the potential population. Some national stakeholders commented that they were not sufficiently involved in project trajectory and development.	S	S	concur
4. Country ownership and driven-ness	Country ownership and driven ness were often most apparent when there were specific small allocations for country level work as in Chile and Uruguay.	S	S	concur
5. Communication and outreach	The project has taken multiple steps to increase awareness about the processes, and also the results, through publications, workshops, websites and similar mechanisms. At same time weaknesses of the communications were low priority given for the wider public and specific sub-groups; inability to often adapt the message to individual countries; and a lack of focus on the complex issue of toxicity, recycling and closing the material loop See paragraphs 133-136	MS	MS	concur
6. Financial planning and management	The project implementation and management, including financial, were noted to be competent within the larger constraints imposed by UNEP Economy Division procedures.	S	MS	Based on the Evaluation Office assessment of the sub-criteria presented in the table A9 (in Annex 4)
7.	The evaluation noted that the	MS	MS	concur

Criterion	Summary Assessment	Evaluation Rating	Evaluation Office Rating	Evaluation Office comment
Supervision and backstopping	achievements were possible through the high dedication and competence of the UN Environment staff but the <b>two other</b> supervision and guidance mechanisms provided for the project did not work well to mitigate the many challenges noted in the evaluation.			
8. Monitoring and evaluation	Monitoring of progress was built into the project design with on-going review of progress. A planned MTE was conducted. However, the focus and findings of the MTE did not add any useful information for the project management.	MS	S	As per sub-criteria below
a. M&E Design	It was broadly appropriate except that it missed the fact that one key indicator, the project contributions to global sales of EEL, could not be determined as proposed.	S	S	
b. Budgeting and funding for M&E activities	There was an evaluation plan, with a time frame and an explicit and adequate budget.	S	S	concur
c. M&E Plan Implementation	The monitoring and processing of workflows, outputs, financial and management issues during implementation were noted to be satisfactory. The evaluation found the M&E as implemented be compliant on all mandated periodic reports but deficient in its usefulness, and deficient in producing the final report and accounts. Opportunities to review deficiencies in the design, a higher quality MTE could have improved effectiveness. See section 4.7.2	MS	MS	Concurs with the rating based on the paragraphs 127-128 while noting that deficiencies in Evaluation Office managed MTE process is not as such lowering the project's M&E rating.
<b>Overall project rating</b>		<b>S</b>	<b>S</b>	

## 5.2 Lessons Learned

139. Several key lessons emerge from this evaluation. The first of them is the importance of the project design to the performance of the project, some of which are fully within the agency control. In this project, better and more thorough desk-based

reviews of previously documented experiences of similar initiatives, including their completion and evaluation reports, would have greatly improved the results framework and that would have allowed for more effective execution.

140. Second, no matter how good the original design, larger number of variables as for example countries and partners, in this project, necessarily increase complexity and the greater the complexity, greater is the possibility of future contingencies, not easily planned for and hence a greater need for flexibility and adaptive management. For such flexibility the scope of periodic reviews should be expanded and teams should be encouraged to develop modified frameworks for discussion and approval instead of the common assumption that the LFA as designed is the final word.
141. Third, agencies must develop clearer idea of their own strengths and weaknesses, and design their work to leverage their strengths while taking steps to compensate for weaknesses. UNEP's comparative advantage can be said to be in knowledge generation on systemic environmental issues and assessments, with a strong scientific track record, and for sharing this widely. The GEF agency with the largest experience of private sector engagement is the IFC/World Bank and the UNDP has the largest number of national activities on energy efficiency at the national level. While each of them was invited to send a representative to the PSC, that was insufficient for full partnership. Within UNEP, its information and scientific assessments are spread across the organization, and so additional efforts are needed with formal work and budget arrangements, to link activities with the respective knowledge sectors incorporating them within project boundaries and there by overcome management constraints.
142. Fourth, additional budgets and protocols must be provided to enhance collaboration and coordination across multiple partners, as that is fundamental to any global platform. They do not just happen on their own, but must be designed for, budgeted and facilitated, and the incentives for cooperation must be created. The pressure on narrowly focused projects for quick outputs, with limited budgets and time, will always constrain discussions and reviews, scientific quality assurance and quality control protocols, and lead to unreliable outputs, which in turn, can impair the credibility of UNEP's work.
143. The TE of this single project also echoes lessons highlighted by the United Nations Evaluation Group<sup>106</sup>. Project planners, designers and manager should note that almost all interventions with significant resources, in any sector that is addressed by the UN, are likely to have an impact on vulnerable groups including women and children and so this should be taken into consideration when preparing such a plan. Also, especially for UNEP, almost all pressing environmental issues require the integration of socio-economic factors with environmental science; and when the topic is about the diffusion of any new technology, there is a need for a more comprehensive approach and use of wider institutional capacity. Good planning requires higher allocations of budget for such designated activities and for integrating the evaluations of wider issues. This requires thinking through the additional costs, timing implications, and capacity for implementing

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<sup>106</sup> United Nations Evaluation Group, 2014. Integrating Human Rights and Gender Equality in Evaluations; August 2014, New York.

human rights & gender equality methodologies and allocating resources for them (considering UNEP ESES guidelines).

### 5.3 Recommendations<sup>107</sup>

1. Heads of Branches in the Economy Division should ensure that multi-stakeholder projects develop processes that allow for broadening the partnerships to additional manufacturers either at the project design stage or during the inception phase of a project, as especially with Light-Emitting Diode [LED] technology a number of new actors have emerged and this would widen linkages and reduce the influence of any single manufacturer. The selection of partners should be done based on well-defined criteria.
2. Heads of Branches in the Economy Divisions should ensure that Project Managers and Fund Management Officers record financial contributions (cash and in-kind) with complete transparency of budgets, total resources and their use, partner contributions and progress reports, in all multi-stakeholder projects/efforts, and in particular if involving the private sector. It must be required that all the above details on any co-financing – if listed in the project document, and utilized in a significant manner by the project, must be available to the project manager, partners and evaluations in the same level of detail and clarity as the Global Environment Facility contribution and used with identical management systems. This should also be undertaken by the team managing the successor United for Efficiency (U4E) project and other upcoming initiatives with multiple partners.
3. UN Environment/Economy Division must examine whether the on-going and future projects, expanded to cover energy efficient appliances are sufficiently resourced for the much larger demands on the Centre of Excellence for expertise on a number of additional sectors. Considering that en.lighten focused only on lighting technology in the residential sector and it was still found to be difficult to tailor outputs and support to individual country needs or technology options, it is critical to ensure that the project team and the expert network, the Centre of Excellence, is adequately staffed both in numbers, skills and knowledge required for the expanded services. A possible tool that can be used would be to track technical assistance demands and link it to plan activities of the COE to match the 'supply' with the 'demand'.
4. Heads of Branches in the Economy Division should contribute expertise across the branches. Appropriate involvement of Chemicals and Health Branch (mercury) and Resources and Markets Branch (lifecycle approach) in the on-going and future projects on energy efficient lights and appliances and where products involving new technologies are being promoted should be ensured. Such involvement should ensure that adequate scientific determination is made of potential negative consequences of new technologies as well as related processes, inputs, components and the final product, for any population group and to the environment. This is consistent with UN Environment's Environmental, Social and Economic Safeguards policy. Where such risks are identified, established UN Environment principles for appropriate actions must be followed. Should this require reallocations for the current budget the Economy Division is encouraged to follow up with Global Environment Facility as necessary to achieve this.

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<sup>107</sup> This section is aligned with executive summary using the name 'UN Environment' and current revised division names.

5. Heads of Branches in the Economy Division should review processes and practices concerning hiring and guiding experts. The work by expert groups that review current knowledge and arrive at findings and recommendations require a higher degree of care in managing the often-disparate individual views shaped by different experiences, expertise and interests. As the discussion concerning the mercury issue has proven, the UN environment processes should support transparent presentation of the differentiating views on technical issues based on which recommendations are made.

6. The Project Manager(s) for the successor projects should strengthen the Centre of Excellence by expanding and building a stronger roster of experts/expert organizations, to better cover different regions and languages, and specific areas of expertise, as well as to utilize experts and expert organizations from the developing countries. In addition, the fact that financing of implementation was a major barrier to moving from knowledge to action, the involvement of financial institutions and their experts, at earlier stages of the project, could improve the incentives for national policy enforcement.

7. The Project Manager(s) for the successor projects to enlighten and the Head of the Branch, are advised to consider the human rights and gender dimensions of the new project(s) in the same way as they should be considered in the design, implementation and management of every intervention by UN Environment. The successor projects should undertake an expanded stakeholder analysis, ensuring that human rights and gender analysis is conducted adequately, even if this is done after the start of the new project. All future data on the project activities, outputs and outcomes should cover appropriate data on human rights and gender aspects, disaggregated as required. The expanded stakeholder analysis and participation must include consumer groups, and those involved in recycling and waste disposal. The detailed requirements can be seen in the UN Environment policy and strategy documents that guide programming.

8. UN Environment, with the support of the Evaluation Office, should review the extent to which a more systematic review of project and programme evaluation documents can be used at the design stage and in subsequent execution, so that the lessons from the past can be incorporated more appropriately. Mid-term Evaluations should provide an opportunity for useful and relevant feedback that was inadequate in this case and the process should be improved by making its timing flexible, with clearer specification of the kind of information that is required, according to the needs of the project as determined jointly by the Project and Task Managers and in consultation with the Project Steering Committee, and thus adapting standard pre-existing templates of the Evaluation Office as most appropriate. The team managing the United for Efficiency (U4E), successor project should work with the Evaluation Office to begin planning the evaluation of the current project six to nine months before its end. This practice could be incorporated in all future projects in planning, Project Implementation Reports and milestones, as a part of normal "good practice".

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## ANNEX 1: COUNTRIES AND PARTNERS VISITED

### A 1.1 CHILE

#### Mission dates: 3 -5 October 2016

The organization of the meetings in Chile were arranged jointly by the Fundacion Chile, which is an autonomous public sector research entity, which undertook the project work for en.lighten in the country, working closely with the Ministry of Industry Energy and Mines (MIEM). Fundacion Chile is a not for profit national organization and is also the Executing Agency for the subsequent UNEP GEF project “Delivering the transition to energy efficient lighting in Chile” begun at the end of 2015. The list of persons who participated in meetings and discussions is provided at the end. The notes are based on the meetings and discussions held in Montevideo and the documents referenced here.

#### The Context and background

As the OLADE/ECLAC reported<sup>108</sup> “Traditionally, the Chilean government’s initiatives to promote energy efficiency have not been a priority, and have not been a part of State policy”. It added that there have been sporadic attempts to promote energy efficiency but “they have not been long-lasting or had major impact”. Chile began its first significant efforts on energy efficiency (EE) in 2003 spurred by a cut off in imports of natural gas supply from Argentina. There are two main electricity grids in Chile: the Central Interconnected System (SIC or Sistema Interconectado Central), which serves the central part of the country; and the Norte Grande Interconnected System (SING Sistema Interconectado del Norte Grande), which serves the desert mining regions in the North. Chilean authorities had conducted many awareness campaigns in 2007 and 2008, as a way of addressing the energy crisis. The government at that time believed that energy policy and especially efficiency could not be left to market forces alone. The efforts initially faced major difficulties. The plans and implementation efforts showed a lack of national technical capacity.

In 2010 there was a change when the centre-right opposition won the elections. The new minister for energy returned to more orthodox views that the government did not need to be engaged in efficiency programmes and the programmes stalled.

#### The en.lighten project

Following the regional meeting for Latin America and the Caribbean (LAC) in 2010, en.lighten agreed to provide small funding support for work in Chile to examine the scope and opportunities for a national EEL programme, to build on the earlier national efforts. An output of the Small-Scale Funding Agreement (SSFA) that was provided by en.lighten<sup>109</sup> was a published strategy document, in 2013, and a national workshop on follow up. This highlighted the benefits

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<sup>108</sup> ECLAC and OLADE, 2010, Energy efficiency in Latin America and the Caribbean: situation and outlook, Santiago, April, pages 74-75

<sup>109</sup> Estrategia Nacional de Iluminación Eficiente (ENIE) 2013 – 2017, Documento a Consulta Pública, desde 1º de Septiembre de 2013

to Chile from joining the UNEP programme to develop and implement a National Efficient Illumination Strategy (ENIE). It estimated the annual economic benefits to be USD 486.4 million per year, with the time period within which the investments were to be repaid at only three months. It estimated that annual electricity consumption could be reduced by 2.8 TWh or almost 5% of the national electricity consumption. It further estimated annual reductions in greenhouse gas emissions of 1.2 million tonnes of CO<sub>2e</sub>. On other environmental emissions it estimated there would be reductions in the emission of “77 kilograms of mercury, 2,500 tonnes of sulfur dioxide and 4,600 tonnes of nitrous oxide” to the atmosphere due to the reduced combustion of coal<sup>110</sup> that could result from the reduction in electricity used<sup>111</sup>. It suggested presenting a NAMA in efficient lighting in the residential sector.

The investment required for the implementation of the National Efficient Lighting Strategy 2013-2017, currently underway is USD 8.9 million. The activities are being implemented under an integrated approach, organized into four strategic axes, which mirror the en.lighten recommendations:

- Minimum Energy Efficiency Standards (MEPS) that ensure the efficiency and quality of energy-saving lighting products
- Supporting mechanisms and policies that restrict the provision of inefficient lighting and promote demand for energy-saving products
- Control, verification and control (MVE) programs to dissuade distribution of nonconforming products
- Environmental sustainability actions including the establishment of maximum mercury limits and the implementation of programs for the collection, recycling and proper disposal of waste from used lamps

The four priority objectives of the National Efficient Lighting Strategy 2013-2017 are:

- Promote technological innovation by enabling the adoption of efficient lighting products
- Progress in meeting the goal of reducing energy demand by 2020
- Contribute to the reduction of emissions of greenhouse gases
- Control mercury levels in lighting products and ensure proper disposal at end of life

The plans for Chile were presented and shared at the Global Forum in Beijing in 2014<sup>112</sup>.

## Outcomes

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<sup>110</sup> The International Energy Statistics show that in 2013 Chile used around 11,000 kilo tonnes of coal for electricity generation; source <https://www.iea.org/statistics/statisticsearch/report/?country=CHILE&product=coal&year=2013>

<sup>111</sup> En.lighten also prepared a Country Lighting Assessment (CLA) for Chile. The benefits in the CLA and the strategy document were relatively close. A possible anomaly is in the calculation of mercury emissions in the CLA for before and after transition where the mercury released when recycling compact and linear fluorescent lamps is shown to decline by one third. As the figures above show a large increase in the same type of lamps, it is not clear why emissions from lamps should go down.

<sup>112</sup> Enlighten Chile - Ana María Ruz, Fundación Chile– Chile: National Efficient Lighting Strategy (ENIE), 2013 – 2017, at <http://www.enlighten-initiative.org/GlobalForum/Program/Presentations.aspx>

The visit confirmed that an en.lighten outcome is the new project, approved by the GEF July 8, 2015, and by the UNEP Project Approval Group (PAG) on October 30, 2015 “to promote the rapid uptake of high energy efficient lighting technologies through the transformation of efficient lighting products markets, thereby reducing electrical demand and consumption and the related greenhouse gas (GHG) emissions” (reference UNEP Project Cooperation Agreement (PCA)) for a total budget of US\$11,905,556 of which GEF contribution was approved for US\$ 2,485,713.

## Findings

Seven key questions had been set for the evaluation by UNEP and this addresses the relevant questions for Chile and other pertinent information.

In Chile, there is evidence that en.lighten activities and outputs contributed to a positive change in government policy for reduction in the market barriers and additional policies required to increase the rate of use of energy efficient lighting. The shift in government policy is clearly attributable to certain direct outcomes of the en.lighten project listed in the ToC.

Chile has been declared a success in several publications. One recent publication<sup>113</sup> states that “Chile’s efficient lighting strategies have enabled it to reduce its annual emissions by 1.2 megatons of carbon dioxide, save 2.8 terawatt-hours (an amount equivalent to four 100 megawatt thermal plants) in annual electricity consumption, and pocket \$486.4 million in annual savings”.

In principle Chile has agreed to follow the road-map to transform the national lighting market as suggested by en.lighten. UNEP DTIE and the successor project (U4E) to en.lighten is executing the newly approved GEF project to implement national programmes. Such follow on work at the country level is also a direct outcome of en.lighten. This should lead to the intermediate or medium term outcomes, in line with the overall project goal of en.lighten.

The Centre of Excellence developed by en.lighten was shown to be operational, effective and efficient during the time period of the project 2010-2015 for the work required in Chile. The interviewees provided the view that the COE supported all their requests and was suitably engaged. It also remains operational, managing the new project with new staff, for the much expanded GEF approved national EEL efforts. The current effectiveness of the COE is beyond the scope of the evaluation. But the national respondents contacted expressed general satisfaction for the support provided by UNEP.

The previously produced publications/toolkits/guidelines are being used. They are also being modified to take into account new developments such as LED lamps, and, for additional applications beyond residential use to include commercial and public lighting.

The work in Chile remains in contact with many LAC countries where work on EEL continues. The Chile team mentioned links to some en.lighten partners, such as GELC and the work done

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<sup>113</sup> UNEP, 2015. Narrowing the Emissions Gap: Contributions from renewable energy and energy efficiency activities, with the Norwegian Ministry of Foreign Affairs, see pages 24-25. The confirmation of the numbers is well outside the resources available for the evaluation. The same document also discusses the challenges and limitations in arriving at such estimates and supports the methodological limitations in attribution of results, in pages 13-14.

on quality and MVE, with GELC support. They also mentioned that they were not clear on the future role of OSRAM, which has announced that it will withdraw from the LAC region and is also exploring options for the sale of the company.

The most critical reason for the successful uptake of **en.lighten findings and recommendations were found to have been from its economic analysis, undertaken by en.lighten as the Country Lighting Analysis**. This showed substantial economic and environmental gains for the country. In addition, the presentation of the analysis at a national workshop was persuasive to the energy minister, that “free markets” by themselves could not generate the same benefits and that the markets needed support from the government to identify higher quality products, to inform consumers with labeling schemes, provide incentives to consumers and to ensure that the market is not “polluted” with low quality products that discourage the consumer.

The discussions confirmed the en.lighten project was effective, within its resource limitations, to build capacity in the country on testing, quality and MVE. The global components of the project which contributed to this capacity building element at the national and regional level, was largely provided through the partnership with GELC.

The project intervention has been highly relevant to the UNEP mandate, comparative advantages and priorities and is aligned with GEF priorities. In Chile and in other countries, en.lighten made use of many (not all) lessons from earlier GEF funded projects in this area.

The Chilean stakeholders were fully aware of, and able to link to, and coordinate with other global, regional and national initiatives in EEL, as they determined to be relevant and useful to their national efforts. Thus while the overall capacity was relatively high, en.lighten contributions were highly influential in contributing to the outcomes.

As discussed above, en.lighten outputs - publications, country assessments and studies, regulatory tools, partnerships, and networks developed are being utilized during this expanded phase of work on EEL. The sustainability of project achievements could be promoted in the future by ensuring detailed attention is given to issues of health and added environmental toxicity

## **DOCUMENTS REVIEWED**

En.lighten, Country Lighting Assessment – Chile. Available at <http://map.enlighten-initiative.org/>

Enlighten and Ana María Ruz, Fundación Chile– Chile: National Efficient Lighting Strategy (ENIE), 2013 – 2017, at <http://www.enlighten-initiative.org/GlobalForum/Program/Presentations.aspx>

UNEP project cooperation agreement, GEF Full Size Project Delivery, signed November 2015 with Fundacion Chile.

UNEP, National Efficient Lighting Strategy Introduced for Chile, Santiago, Chile, 29 August 2013.

UNEP GEF PIR - Delivering the transition to energy efficient lighting in Chile Fiscal Year 2016 (1 July 2015 to 30 June 2016)

## **People interviewed:**

1	Enrique Garcia	Divn. Planification
2	Elena Chifflet	Divn. Planification
3	Ricardo Cramer	Coordinador de Control Ambiental. Gerencia de Medio Ambiente (GMA)
4	Marcelo Padilla	Division de Eficiencia Energetica, Ministerio de Energia
5	Ana Maria Ruz	Fundación Chile
6	Karien Volker	Fundación Chile
7	Astrid Hanrot	Fundación Chile
8	Francisco Leiva	Fundación Chile

## A 1.2 URUGUAY

### Mission Dates: 29 - 30 September, 2016

The visit to Uruguay and Chile were organized together for cost efficiency. The meetings in Uruguay were arranged jointly by the Basel Convention Coordinating Centre, (BCCC-SCRC), Uruguay and the Ministry of Industry Energy and Mines (MIEM). BCCC-SCRC is an entity jointly operated by the Ministry of Environment and the national Technological Laboratory of Uruguay (LATU), and it is hosted by LATU. LATU signed the SSFA with the UNEP enlighten team and BCCC undertook the project work for enlighten in the country. BCCC-SCRC worked closely with the Ministry of Industry Energy and Mines (MIEM) in the tasks. The list of persons who participated in meetings and discussions is provided at the end. The notes are based on the meetings and discussions held in Montevideo and the documents referenced here.

### The context

Uruguay began its first significant work on energy efficiency (EE) with a GEF funded (US\$ 6.89 million) project approved in 2003. The World Bank (WB) was the executing agent for this EE project<sup>114</sup> with MIEM. The World Bank board approved the project in 2004 and the project closed at the end of 2011. The GEF/WB/MIEM project objective aimed "to increase the demand for and competitive supply of energy efficient goods and services" and it had several components. The project addressed energy efficient lights (EEL) within the other components promoting energy efficiency.

In EEL, the GEF/WB/MIEM project had achieved several goals related to enlighten between 2009 and 2011. A law was passed in 2009 to provide for compulsory EE labelling program for all light bulbs sold in the country. A directive to stop the purchases of incandescent lamps and the less efficient T12 tubes by the public sector was passed. Within the same project, the UTE (the main electricity generator) gave away<sup>115</sup> 2 million CFL lamps to households in 2008, where two CFL designated as Energy Efficiency Class "A" were exchanged for 2 incandescent lamps (MIEM report 2012 and discussions at UTE). This was accompanied by a strong campaign to promote EEL and the efficiency label. The steps taken contributed to the increase in the use of CFLs in Uruguay from 2009. A firm was hired to monitor indicators and to produce two reports; the first in 2010 covering results from 2008 and the second in 2012 covering results from 2009. These reports covered the penetration of EEL, the incidences of labelling, the effectiveness of training and educational activities related to Energy Efficiency, and the savings and emissions reductions that would result from a national EEL programme<sup>116</sup>.

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<sup>114</sup> World Bank, 2003, GEF Project Brief, Latin America and Caribbean Region, March 31, 2003 and evaluation by IEG at <http://lnweb90.worldbank.org/oed/oeddoelib.nsf/DocUNIDViewForJavaSearch/8525682E0068603785257A38004C81F3?opendocument>

<sup>115</sup> The free give away of 2 lamps per household was financed by UTE in order reduce the growing peak demand for electricity.

<sup>116</sup> Additional details on the earlier Uruguay programme and its structure is available at ECLAC and OLADE, 2010, pages 257 -267.

## Uruguay and en.lighten

The en.lighten team arranged the first regional presentation of the project aims and work plans at an annual regional meeting of LAC countries organized by the Latin American Energy Organization (OLADE). OLADE already had a work programme to promote energy efficiency in the region (see ECLAC/OLADE, 2010). OLADE planned a meeting of the national officers in charge of Energy Efficiency Programs and representatives of the Climate Change Offices of the Latin American and Caribbean countries, along with representatives of the public and private sectors. The UNEP en.lighten team supported the OLADE meeting, which was held in the Dominican Republic, on August 2011<sup>117</sup>. The participants agreed to support energy efficiency programs in all sectors, given their proven economic benefits, and allowing for resources to be made available for projects of social benefit and productive and economic development. They said, it provided “an excellent opportunity for countries of the region to contribute to global climate change mitigation efforts. Few actions may reduce carbon emissions as easily and with as many substantial economic benefits as energy efficiency programs.” They considered the “transition to the complete phase out of inefficient lighting”, as one of the most effective, fastest and financially convenient way to tackle climate change and prove the advantages of energy efficiency<sup>118</sup>. Among the benefits noted was the decrease in energy demand in peak hours, contributions to energy security and avoiding important and costly investments in new energy generation. They also noted that “a large number of countries of the region have already developed successful initiatives to phase out general use incandescent lamps”. The en.lighten team was encouraged to build on this, and designed several recommendations in order to move forward and agreed to work in collaboration with OLADE, to provide the required technical assistance to interested countries in the region. The delegates supported this and recommended that the ministers in the region promote the transition to more efficient lighting in all countries as an important element of low emission development strategies. They urged that national governments promote the necessary political consensus for the region to join en.lighten and to make a “continuous evolution towards the most efficient lighting technology all the time, through an integrated approach, and phase out the most inefficient lamps as soon as possible”.

The Uruguayan Director of the Basel Convention Coordinating Centre (who is also a staff member at the Ministry of Environment) learnt of the commencement of the en.lighten project

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<sup>117</sup> The presentations and other inputs provided by en.lighten for the OLADE/UNEP Joint Fourth Latin American and Caribbean Seminar on Energy Efficiency include 2 presentations in Session 5 : The UNEP en.lighten initiative towards the transition to efficient lighting - Introduction to the en.lighten initiative, Gustavo Mañez (UNEP en.lighten); and National and regional potential of efficient lighting in Latin America and the Caribbean, Harry Verhaar (Philips); and also 3 presentations of national experiences in Session 7, from Argentina, Mexico, Ecuador and Cuba. Finally the en.lighten team presented the vision for the Roadmap for the transition to efficient lighting in session 8: with four presentations from international experts and with the contribution of experts on environment and health aspects of efficient lighting - "Aspectos Ambientales y de Salud de la Iluminación Eficiente", by Hans Peter Grieneisen (INMETRO, Brazil), Pablo Reali (DINAMA, Uruguay) and Michael Bender (Mercury Policy Project, USA). See above at [http://www.enlighten-](http://www.enlighten-initiative.org/NewsEvents/RegionalWorkshops/TransitiontoefficientlightinginLatinAmericaandtheCaribbean.aspx)

[initiative.org/NewsEvents/RegionalWorkshops/TransitiontoefficientlightinginLatinAmericaandtheCaribbean.aspx](http://www.enlighten-initiative.org/NewsEvents/RegionalWorkshops/TransitiontoefficientlightinginLatinAmericaandtheCaribbean.aspx)  
<sup>118</sup> Declaration of the participants of the IV Latin American and Caribbean seminar on energy efficiency, at the IV Latin American and Caribbean Seminar on Energy Efficiency; OLADE, (in partnership with the United Nations Environment Programme (UNEP) and the National Energy Commission of the Dominican Republic, on August 3 –4, 2011.

from UNEP at the conference in 2010. She was keen to participate as she was concerned about the issue of mercury contamination and the safe disposal of mercury in CFL.

The profile of mercury use in Uruguay is very different to many countries with low national sources for emissions. The mining and burning of coal is one of the largest contributors to dispersed mercury pollution globally<sup>119</sup>. But there is no coal used for power generation in Uruguay, hence anthropogenic emissions of mercury cannot be reduced through lower use of electricity by using EEL. This is an issue more relevant in some Asian countries, which rely greatly on coal for large proportions of their energy supply. There is also no gold extraction or artisanal and small scale mining in Uruguay. Mercury sources in Uruguay include one chlor-alkali plant, which is to be converted to a new technology not using mercury. After that imported fluorescent lamps, electric switches and controls, mercury use in the health sector, and the waste from the products become the main sources for mercury. Uruguay developed a national mercury inventory in 2010 and also joined the UNEP Mercury Partnership in 2011. Uruguay participated in a UNEP study<sup>120</sup> which had estimated annual total mercury releases to the environment within a minimum of 2.201 Kg. and a maximum of 3.616 Kg. The chlor-alkali sector was the most significant category, with 1.140 Kg/year<sup>121</sup>, followed by dental amalgam with 550 Kg/year, two sectors with exact estimates. For imported products using mercury the range of the estimates were very wide, for electrical switches - between 66.9 Kg and 836 Kg/year and for lamps - accounted for between 10 and 60 Kg/year. The report states that the collection and storage of mercury-containing waste “emerges as a crucial issue in these studies, since in many developing countries there are no favourable conditions for the effective and economically viable long-term storage of mercury”.

MIEM on the other hand, had been interested in en.lighten to move beyond what they had achieved under the earlier GEF/World Bank project, within which the Law on National System of Energy Efficiency, with labeling for lamps was established in 2009, together with several additional steps mentioned earlier. MIEM was interested to move to labels and standards on LEDs and for public lighting. They were less interested in the en.lighten focus on CFL and on residential lighting.

An agreement was reached between the national stakeholders and en.lighten and a Small-Scale Funding Agreement (SSFA) for US\$47,000 was entered into between enlighten and the Technological Laboratory of Uruguay (LATU), in May 2012. The Basel Convention Coordinating Centre (hosted by LATU), worked jointly in cooperation with the Ministry of Environment. This SSFA agreement was similar to the ones reviewed in other countries where en.lighten entered into such agreements. The SSFA specified four main activities - the preparation and planning; an inception workshop; a strategy development process; with a final workshop and adoption of measures, for completion by February 2013.

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<sup>119</sup> Globally, anthropogenic emission of mercury is predominantly from combustion coal, followed by artisanal and small-scale gold mining. Other large sources of emissions are non-ferrous metals production and cement production. (United Nations Environment Programme, Global Mercury Assessment, 2013)

<sup>120</sup> See UNEP, 2012; it reports on the study undertaken by UNEP DTIE Chemicals to find solutions to the safe mercury storage problem in Argentina and Uruguay.

<sup>121</sup> For the chlor-alkali waste, UNEP 2012, reported that it is difficult to separate the elemental mercury from the accumulated waste sludge. The government has determined to change the technology used in the plant so that mercury is not required.

The work done followed the guidelines specified in the SSFA<sup>122</sup>. It established a national coordination structure ensuring stakeholder involvement from the government agencies and private sector for the development of a national efficient lighting strategy. It collected information on the market characteristics, stocks and use in a national survey, from which the benefits of the transition was calculated. The survey updated the energy use data of 2006 to the new date of 2013. In Uruguay all 100% of lamps are imported. The enlighten support allowed for the tracking of CFLs sales, the use of EE Labelling and monitoring of regulations. The market characteristics seen in Uruguay between 1998 and 2013 showed that IL sales had dropped by almost 50% from around 16 million units to 8 million over that period, and, CFL sales had gone up by around 100%, from around 1 million to 2 million units during the same period (Mena 2016, page 4). This does not show any significant change during the en.lighten project.

Earlier, policies had been modified to reduce taxes for imported CFLs and LEDs from 18% to 2% (all lamps in Uruguay are imported). The surveys showed that while the numbers of IL remain high, even after the drop mentioned above, they are normally used by consumers where the lamps are turned on for short times and so both consumers and the government did not feel that a ban on IL would result in significant savings but would instead impinge on consumer choice. An exception to low use of IL is the use of IL in outdoor lighting for many residences, where the residents are concerned that the more expensive EEL could be stolen and thus negate the potential economic benefits.

The SSFA also allowed for a review of the utility (UTE) experience of free give-aways of two CFL. UTE had undertaken one program in 2008 where 2 million CFLs had been exchanged with families able to exchange 2 incandescent lamps with 2 CFL per residential consumer. The UTE repeated the programme in 2013, where 2 CFLs delivered to each residential consumer, for a total of another 2 million.

### **Outputs of en.lighten**

The SSFA was used by Uruguay to: prepare a national report following the en.lighten prescribed template; undertake national workshops; perform a survey to review the need and acceptance of implementing Minimum Energy Performance Standards (MEPS); and Uruguay also participated in the regional seminars where en.lighten provided additional inputs and networking opportunities.

Uruguay was provided with a country lighting assessment (CLA) as in all en.lighten partner countries. The Uruguay CLA follows the same template as reviewed for other countries. That makes necessary adjustment to the local condition difficult – for example, 95-100% the Uruguayan electricity generation has been from renewables in the past 10 years – in addition to older hydropower plants, new investments in wind, biomass and solar have raised the share of renewables and Uruguay does not use coal. Given that there is no coal used for electricity generation in Uruguay, it is not apparent to the evaluator, how the On-Grid Country Lighting Assessment, Uruguay, undertaken by en.lighten, estimated a reduction in Mercury emissions

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<sup>122</sup> These guidelines were common to each SSFA examined. This provided for efficiency of administration but at some loss of relevance to the country as the country situation was not fully taken into account.

from EEL. It is our view, in the case of Uruguay and all countries<sup>123</sup>, which use little coal for electricity generation; there would be increased emissions of mercury with the increased use of FL.

Uruguay also gained information on lamp quality, including amounts of mercury in the FL imported into the country, through the work of GELC, the enlighten partner in China for testing<sup>124</sup>. The testing of mercury in lamps remains beyond the capacity of the testing infrastructure available in the country as the equipment is too expensive but other lamps characteristics can be tested at the local University laboratory in the engineering faculty.

#### **Current<sup>125</sup> status and follow on work:**

1. Uruguay is a partner of the Global Mercury Partnership, also managed by UNEP.
2. The Dirección nacional de medio ambiente (DINAMA) has launched the Project for the “Rational Management of Mercury-containing products in Uruguay” along with UNEP, UNIDO, and the Basel Center in Uruguay. This has developed an inventory of CFLs and calculations of national Hg emissions (where the other principal emissions are from a chlor alkali plant which is being converted to stop using mercury) in order to take additional future actions. The above project provides for reviews of options to develop pilot projects to study collection modalities for spent FL, and a facility to convert and store the used mercury safely.
3. There is a new GEF approved project<sup>126</sup>, managed by UNDP “Uruguay: Environmentally Sound Lifecycle Management of Mercury-Containing Products and their Wastes (2014 – 2017)”<sup>127</sup>, This GEF-supported UNDP project implements a lifecycle approach to manage and phase-out/phase-down a number of mercury-containing products and wastes, including lighting products, dental amalgam, and mercury-containing medical devices. It is examining collection, decontamination technologies and mercury storage, especially the decontamination of used lamps and other mercury-containing devices.
4. A pilot project to collect spent CFLs and linear fluorescent tubes is under development by the utility UTE. The project being undertaken by BCCC-SCRC aims to develop a pilot project for the treatment of mercury waste; set up one treatment facility; develop a collection network and work with waste collecting organizations; and establish a legislation framework which includes extended producer’s responsibility (EPR) and maximum limits on mercury per lamp (the draft legislation was shown).

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<sup>123</sup> M. J. Eckelman and others, 2008, point out that countries that do not use much coal for electricity production, but rely largely on renewables or oil for electricity would not have a compensating benefit of reduction in mercury that offsets the increased mercury emissions from Fluorescent lamps. This is shown to be the case in most areas of Africa and Latin America, figure 3, page 8568.

<sup>124</sup> Six samples from Uruguay were tested by the Global Efficient Lighting Centre (GELC). All the lamps passed the safety test. For the performance test results on Lamp power, Power factor, Efficacy, Lumen maintenance and Mercury content, ranging from one to four models did not meet the relevant national or international standard set for the measure.

<sup>125</sup> At the time of the evaluation data collection

<sup>126</sup> See GEF, 2013.

<sup>127</sup> The project, “launched in late 2014, anticipates eliminating at least 330 kg of mercury as a direct outcome of the project and lead to changed practices resulting in sustained mercury reductions of approximately 72.5 kg of mercury per year”, see UNDP, .

5. In developing plans for the collection and recycling Uruguay is examining the experiences in other countries. The ministry of environment is reviewing technology options for mercury disposal and possible impacts on the health of poor and vulnerable. They estimated that almost all waste (at least over 80%) in Uruguay is managed by informal collectors, with little technology and most end up in dumpsites, rather than well managed land fill.
6. The UTE staff showed some of the possible containers and bins designed to offer safe waste collection service to receive the lamp waste handed back by users.
7. It was discussed that a major problem that is unresolved and needs work is to determine what could be the most suitable safe and cost effective disposal strategies and how it would be designed for small and remote habitations. Some of the calculations suggest that the total collection and disposal costs could be as high as the current selling price of a CFL (see DINAMA and others, 2011). The high cost of recycling and disposal makes the policy makers hesitant to move quickly on the legislation for EPR. The pilot programme may test options at around one dollar per lamp for collection and recycling.
8. The stakeholders commented that the en.lighten support allowed for ongoing engagement with national stakeholders on EEL and the related issues of mercury emissions; it supported continued engagement with regional and international stakeholders and experts; it allowed for further review of the national EEL strategy and status; it allowed for an updating of the market data for EEL of 2010 and 2012 to 2014; and the specialized study done by GELC on lamp provided new information on the quality of the EEL available in the national markets and their performance as compared to other international standards and benchmarks (source discussions and C Mena, 2016. Work is underway to develop labels for LED lamps.
9. To the above extent, en.lighten contributed to institutional capacity building; and assisted and supported the ongoing initiatives and efforts in Uruguay to enhance national public policy on EEL. But for some of the reasons above Uruguay has decided NOT to implement the MEPS as recommended by en.lighten for the time being.

## Lessons

The Uruguayans suggested that global platforms only add value to the extent they can consider and respond to local needs. En.lighten showed a degree of flexibility that was appreciated. At the same time many elements of its global outputs were not sufficiently attentive to differing national situations and needs. Its access to global and regional expertise allowed the Uruguayans to obtain some of the needed inputs from the wider network provided through the COE.

The stakeholders in Montevideo described and provided examples of how UNEP and UNDP can and do work together. The views were that a key requirement is that the problems be clearly defined at the global level while making room for local adjustments.

## Findings

The evaluation was tasked to deliver findings on seven key questions set for the evaluation. The findings from the field visit and interviews as they pertain to the key questions conclude this short note on Uruguay.

The initial work, and the activities that en.lighten focused on had already been largely undertaken in Uruguay in an earlier GEF supported national project. Hence, while the en.lighten outputs were seen to have influenced and contributed to additional policy awareness, especially on the future development of a national MVE programme, and for work on mercury emissions, the evaluation did not find that the project made a direct contribution to any reduction in market barriers and to the continued increase in the rate of use of energy efficient lighting. There is no evidence that there was a higher rate of use of EEL products in Uruguay because of en.lighten.

The discussions and presentations by the Ministry indicate the use of en.lighten outputs and concepts in new presentations prepared by the ministry. Beyond that, there is now an agreed road map developed in the country that augments steps to be taken on EEL. The progress in awareness of the actions supported by en.lighten is a degree of progress commensurate with the level of inputs provided by en.lighten and is in line with the overall project goal.

The “Centre of Excellence” at DTIE was seen to have provided support in the country in accordance with the overall project objectives. The publications/toolkits/guidelines have been utilized - in the country, as evidenced by Ministry outputs and as confirmed in discussions. It is seen that en.lighten contributed to discussions and actions at the regional level, with and for a number of partners, who had belonged to networks that en.lighten planned to work with. As stated above, the reasons for the successful partnership rested on the strong national interest in Uruguay to address questions that had not yet been addressed in the national programme and the achievements were commensurate with the small investment by en.lighten. En.lighten was not equally successful in adjusting its analysis to the narrowly specific needs of Uruguay on mercury, LED and public lighting. That and the costs of added testing limited the uptake of findings on lamp quality and recommendations for increased MVE.

There were small and limited capacity building efforts by the project in Uruguay as its resources were limited for national actions. The global components of the project contributed in the capacity building in the national and regional level by linking to additional experts and organizations with knowledge on EEL. The small and limited interventions appear to have lower sustained outcomes as compared to the much larger project on EE.

The project intervention has been highly relevant to the UNEP mandate. The new administrative structure of UNEP, providing for a regional representative at Uruguay (also responsible for Chile) increases the comparative advantage of UNEP for being more sensitive to local needs and in providing support for priorities that intersect the global mandates with national needs, and this is seen in the follow on work on mercury. The project is fully aligned with GEF priorities and in fact built upon the foundations laid by an GEF funded project in this area.

The work supported by en.lighten in Uruguay was well linked to, and the Uruguayan team was well coordinated with, national stakeholders and with other global and regional initiatives with regard to the promotion and transformation of the market towards efficient lighting. This was also observed from the interviews with the local UNEP and UNDP professional staff in Montevideo, who were fully aware of the national work on lighting and on the issue of mercury emissions.

As discussed above, only some of the en.lighten project deliverables - the outputs, publications, country assessments and studies, and regulatory tools – were directly relevant for Uruguay. Some were not directly relevant because of the earlier work that had already been undertaken.

The partnerships and networks developed can be utilized further in Uruguay as there appeared to be considerable appreciation for the inputs provided. The sustainability of the project achievements with regards to EEL can be promoted in the future by ensuring that Uruguay remains a valued partner in the future work.

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**People interviewed:**

<b>ORG</b>	<b>Name</b>	<b>Organization</b>	<b>Area</b>
MIEM	Carolina Mena	Área de Demanda, Acceso y Eficiencia Energética	Demand area, Access and Efficiency
MIEM	Beatriz Olivet	Asesora Dirección Nacional de Energía	National Energy Advisor
DINAMA	Griselda Castagnino	Coordinadora Proyecto Mercurio	Mercury Project Coordinator
DINAMA	Anahir Cenoz	Asistente Proyecto Mercurio	Assistant Project Mercury
DINAMA	Judith Torres	Jefe de Departamento Control de Cadenas Productivas, flujo de Residuos y Sustancias.	Head of Supply Chain Control Department, bearing wastes and substances flow.
PNUD	Magdalena Preve	Unidad de Políticas y Programa	Policy and Program Unit
UNEP	José Dallo	Director Oficina Subregional para el Cono Sur	Director Subregional Office
UTE	Claudia Cabal	Gerente de la Unidad de Gestión Ambiental	Manager of Environmental Management Unit
UTE	Ricardo Kramer	Subgerente de la Unidad de Gestión Ambiental	Deputy Manager of Environmental Management Unit
UTE	Juan Carlos Patrone	Gerente de Mercado	Market Manager
UTE	Marcelo Gonzalez	Gerente de Sector Eficiencia Energética	Sector Manager Energy Efficiency
BCCC-SCRC	Gabriela Medina	Directora	Director
BCCC-SCRC	Virginia Santana	Asistente	Assistant
BCCC-SCRC	Natalia Maciel	Asistente	Assistant

## A 1.3 CHINA: National Lighting Test Centre (NLTC)/Global Efficient Lighting Centre (GELC)

**Mission Dates: 31 October – 2 November, 2016**

**BACKGROUND:** China has been one of the most significant countries in the developments in energy efficient lighting. In China, electricity demand increased at 8% per year over the 1990s and at 13% between 2000 and 2004. The rapid growth in electricity consumption generated largely by coal, contributed to a significant rise in air pollution and greenhouse gas emissions. This led China to make energy efficiency one of the 15 priorities of the 10th Five-Year Plan (2001-2005) and this has continued as a priority since.

Between 1997 and 2003 Chinese CFL production increased from a little fewer than 200 million units per year to over one billion, with major cost reductions. It became the leading exporter of CFLs to OECD countries and the USA. Without any regulatory guidance over most of the 1990s this contributed to inferior quality products getting to markets and growing consumer distrust<sup>128</sup>.

**Table A1: China Lamp Production**

Year	IL Manufacture	CFL Manufacture	LED Manufacture
1997		200 million	
2003		1,000 million	
2009			100 million
2013	3,890 million	4,150 million (80% of global production)	800 million
	National consumption of all lighting products: 9.66 billion in 2013		

(Various sources: UNDP/GEF, 2005; UNDP/GEF, 2014; and NDRC, 2014)

### CHINA GREEN LIGHTS, UNDP and GEF

<sup>128</sup> Source Nicolas Lefèvre, Philippine de T'Serclaes and Paul Waide, IEA, 2006. Barriers to technology diffusion: The case of Compact Fluorescent Lamps; p.17, October 2006.

The national “China Green Lights” programme was initiated by the Chinese government in 1996. UNDP and GEF also began early to support China on promoting the production and use of EEL, with the UNDP/ GEF supported project “Barrier removal for Efficient Lighting Products and Systems in China”, which was designed to enhance and be a part of the national “China Green Lights” programme of the Chinese government. The UNDP/GEF project aimed to “reduce lighting energy use in China in 2010 by 10% relative to a constant efficiency scenario” and also “to increase exports of efficient quality lighting products”, and there by contribute to “reduce energy use and GHG emissions worldwide” (UNDP, 2000).

The national Green Light Project was built on a roadmap with four pillars. Transform production capacity of Incandescent Lamp manufacturers; second, promotion of EEL, including subsidies and other promotions; third, support the development of a LED lighting industry; and fourth, capacity building with standards, testing facilities and quality certification programmes.

With the support of UNDP, to increase the supply of high-quality lighting products a minimum performance standard was adopted in August 2003, requiring all CFLs on sale to meet the standards. They were adopted to progressively remove the worst performing products from the market. In addition to the minimum standard, a more stringent, optional certification standard was created. A third standard, the REACH standard was created to give advance notice to manufacturers regarding the evolution of the minimum performance standards over time.

In order to support the implementation, measures were introduced to improve the consistency between lighting equipment test laboratories. Buildings standards for new buildings have also been implemented. By the end of 2004, mandatory Energy Standards for Lighting of Buildings were devised for 6 building types (office, commercial, and industrial buildings, as well as hotels, hospitals, and schools) and a voluntary standard was approved for residential buildings. In each case minimum luminance levels necessary in different areas of each building type and the maximum allowable power to supply that lighting level were set. Another measure was to survey the supply chain in the manufacture of efficient lighting products to identify opportunities to improve the quality and efficiency of end products. Finally, demand was increased by raising awareness and understanding among consumers, for example a label for products which meet the certification standard, so they can easily recognise the high quality lighting products. Specialised training programs were also used to raise the awareness of professionals. (Source: [www.cn-greenlights.gov.cn/english/e-index.htm](http://www.cn-greenlights.gov.cn/english/e-index.htm)). A DSM program for utilities was created, with a subsidy for certified products.

Numerous evaluations of the Green Lights project (e.g. UNDP, 2003) have been undertaken. The CFL (and other energy efficient light products) certification scheme was found to be one of the most successful elements in support of enhancing the diffusion of high quality CFLs. Through the bulk purchasing and DSM subsidy programs a total of approximately 3.8 million certified CFLs were purchased creating an initial demand for certified products. In addition, a new policy enacted by the Chinese government in December 2004 required the preferential purchase of labelled energy efficient models of products. The program started in 2005 and by the end of 2006 was rolled out to all levels of government- central, provincial, and local.

The certification scheme, was managed by the **China Standard Certification Centre (CSCC)**. Manufacturers paid for the cost of certification, which included mandatory product testing. Over time the stringency of the certification standard increased. The scheme benefited from the harmonisation of lighting product test procedures in the main testing laboratories of Shanghai

and Beijing. The process led China to cooperate with US test laboratories, in round-robin comparison tests. The UNDP support led the test laboratories to take part in the international Energy Efficiency Lighting (ELI) project of the WB/IFC and GEF, thereby gaining further recognition as rigorous and reliable test centres. The establishment of internationally recognised test laboratories is expected to further facilitate the export of high quality CFLs to other countries. China's Green Lights lighting product standards are more stringent than similar ones in the United States. China is also a member of the International CFL harmonisation Initiative.

It is estimated that there are approximately 1000 Chinese manufacturers of CFL, with many in remote provinces, so ensuring standards is an extensive task. It was said, the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), in charge of the enforcement of the standards, does not yet have the capacity to ensure the standards are respected everywhere. In addition while the two main test laboratories in China are effective, many provincial and local testing centres do not have the fully required competencies.

Over the past decade, a remarkable shift has occurred in the manufacturing of lamp products. Not only the three major lamp companies but also scores of smaller lamp companies worldwide have either set up directly-owned factories in China, or, contracted with Chinese factories to create products to their specification. In 1990 a lamp made in China was not likely to be of high quality. Product quality compliance level for CFL has improved from 77% in 2008 to over 90% in 2013. Today, the best quality lamps can and are being manufactured in China, due to the introduction of strict quality control processes by international corporations, and due to the increased global market awareness of Chinese manufacturers and government. Six firms are piloting low and micro mercury CFL, with 1.5mg of mercury. Even today, some low quality producers in China continue to generate volumes of unreliable product, but at the same time a substantial capacity for producing the highest quality products in the world also now exists in China. China produces nearly 85% of the world's compact fluorescent lamps, and is steadily gaining more orders for other types of efficient lighting products, including important emerging technologies such as light emitting diodes.

### **The World Bank/International Finance Corporation and GEF – The Efficient Lighting Initiative (ELI) Project**

The WB/IFC and GEF project Efficient Lighting Initiative (ELI) for lighting in 7 countries<sup>129</sup> made use of Chinese testing and certification. During ELI's final year of operations, IFC found that ELI

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<sup>129</sup> The IFC/GEF Efficient Lighting Initiative (ELI) was a \$15 million project covering seven markets: Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa. From its four years of operation (2000 - 2003), ELI was seen as a huge success and left behind three main legacies. First, it achieved significant and sustainable market penetration of efficient lighting technologies (this was ELI's primary focus). The ELI Process and Impact Evaluation Study, undertaken through the comprehensive four-year evaluation program details these impacts. Among the examples of ELI's impact is the market in Peru, where sales of compact fluorescent lamps (CFLs) increased by 500% since the start of ELI and in South Africa, sales of CFLs increased by a less dramatic 64%, and similar results were registered across the ELI countries. Second, ELI also built local capacity among agents of change, such as manufacturers, businesses, government institutions, utilities, banks, and NGOs, to continue the promotion of efficient lighting. ELI's third legacy, which was the ELI "Green Leaf" quality mark and product quality certification system, as the logo had gained worldwide recognition among manufacturers and consumers as a mark

had created considerable value for the quality mark in ELI countries, identified several instances of the ELI performance specification and quality mark being adopted beyond the ELI country markets, and found an apparent willingness among manufacturers of quality products to support the mark's continued existence<sup>130</sup>. It selected the **China Certification Center for Energy Conservation Product (CCCECP)** as the most qualified bidder to work with the IFC to allow the ELI logo and certification process to be maintained indefinitely through fees paid by manufacturers.

It was hoped that the proposed ELI Quality Certification Institute, with the quality mark and certification process, would continue to stimulate demand for, and supply of, high-quality efficient lighting products in developing countries. This effort was budgeted at \$1.44 million. The Chinese institute was chosen as almost all countries import lights from China and manufacturers with headquarters located outside of China typically procure components or place manufacturing orders in China. It was seen to link two landmark GEF projects Green Lights, China and ELI. It was designed to build on the seven country programs and to create a centralized source providing support on quality and testing<sup>131</sup>.

#### **UNDP-GEF Project: BARRIER REMOVAL TO THE COST-EFFECTIVE DEVELOPMENT AND IMPLEMENTATION OF ENERGY EFFICIENCY STANDARDS AND LABELING PROJECT (BRESL)**

BRESL is funded by GEF with the total amount of USD\$ 7.8 Million. 2008 – 2011. The participating countries include Bangladesh, China, Indonesia, Pakistan, Thailand, Vietnam. South Korea and Japan (under discussion) will be observers. BRESL is aimed at rapidly accelerating the adoption and implementation of energy standards and labels (ES&L) in Asia, and in so doing bring about energy savings from the use of energy efficient appliances. Products covered by BRESL include: refrigerators; room air conditioners; electric motors; ballasts for FLs; electric fans; compact fluorescent lamps; and rice cookers. The products may have some overlap with U4E, the successor project to UNEP en.lighten. BRESL also aims to transform markets of the targeted appliances, equipment and lighting products, and address the common barriers to, and concerns about, ES&L by the participating countries. The project also facilitates harmonization of test procedures, standards and labeling programs among the participating countries.

#### **THE NATIONAL LIGHTING TEST CENTRE (NLTC)/GLOBAL EFFICIENT LIGHTING CENTRE (GELC) AND EN.LIGHTEN**

The National Lighting Test Centre (NLTC), Beijing is a lighting laboratory specializing in energy efficient lighting products, accredited by the China National Accreditation Service for Conformity Assessment, the U.S. National Voluntary Laboratory Accreditation Program, and

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of high-quality efficient lighting. IFC's market research showed that markets for EEL were threatened by the existence of low quality products, whose poor performance gave them a bad reputation.

<sup>130</sup> Development of the Strategy for Building on the Quality Mark's Momentum, Annex A: Review draft of ELI Impact Assessment, and Annex B: Letter from ELI's Independent M&E Contractor commenting on the ELI Quality Certification Institute.

<sup>131</sup> Documents or information on the final outcome of the effort to build on the ELI logo and to make CCCECP a nodal test centre could not be obtained.

IECEE CB Scheme. It was established in 1975 by the Beijing Municipal government<sup>132</sup> to assist local manufacturers improve the quality of lamps. With over 40 years' experience in promoting energy efficient lighting, and working with manufacturers to improve product quality and establish quality control in the market, NLTC occupies a respected place in Chinese lamp manufacture, and product testing.

As an independent third-party laboratory, NLTC is well positioned to provide cost-effective solutions and quality control measures for its clients. It is an authorized supplier for governments around the world including the USA, Sweden, Australia and the Chinese government themselves. NLTC is accredited to provide technical service and support to high profile organizations, such as the ENERGY STAR in the USA. They also assist developing countries to establish national lighting test laboratories and have backed numerous leading lighting manufacturers in obtaining ISO/IEC 17025 accreditation. NLTC is focused on addressing technical issues and involved in applied research for emerging, energy efficient lighting technologies. For example, NLTC was involved in drafting the IEC standard for the measurement of mercury levels in fluorescent lamps, as well as the new IEC LED lighting standards. They also develop Chinese national standards and specifications for all kinds of lighting products, including addressing LED lighting product quality impact issues. In fact, NLTC is the nucleus laboratory of the International Energy Agency and takes the responsibility of the coordinating of LED lighting laboratories in Asia-Pacific region.

The en.lighten team determined that given the importance of China in the global supply of EEL, it would be important to build partnerships with Chinese organizations. Given the importance of lamp quality, and MVE in the en.lighten goals, it selected NLTC as a partner in this area and signed a Memorandum of Understanding (MoU) in 2011. This was renewed in 2014 operational until 2019. UNEP and NLTC established the Global Efficient Lighting Centre (GELC) as an autonomous entity within NLTC, working on the international mandate of en.lighten in 2011.

**Table A2: NLTC/GELC activities as a Partner of en.lighten**

	<b>NLTC activities and outputs as en.lighten partner</b>	<b>Documents/Comments</b>
1	The Director was a member of the en.lighten Expert Taskforces, and contributed to the development of the Toolkit.	En.lighten task force membership and Toolkit report
2	UNEP and NLTC establish the Global Efficient Lighting Centre (GELC) as a not for	MOU.

<sup>132</sup> Initially, the municipal government of Beijing was concerned about the quality of lamps and its effort was then followed by the Shanghai government with the second similar test facility in China. While today the NLTC is recognized and works at the national and international levels its unusual governance structure continues.

	profit, autonomous centre.	
3	One NLTC technical staff person was deputed to Paris and worked as a member of the COE.	Agreement and interview at GELC.
4	UNEP signed five small scale funding agreements (SSFAs) and two Project Cooperation Agreements (PCA) with GELC.	The SSFA were for Global Lamp quality checking test and report; SSFA for work plan to enhance; two for Vietnam EE lighting project support – production trainings and second for laboratory training.
5	SSFA for work plan to enhance capacities of lighting industry in Vietnam	Guidance was provided to local manufacturers to improve quality and manufacturing methods
6	SSFA for Vietnam laboratory trainings	Report. ESL production trainings and laboratory trainings
7	GELC undertook the quality testing of CFLs for 16 countries, including the mercury content, including Chile, Uruguay, Tunisia, Jordan, Central America (SICA) and West Africa (ECOWAS).	Undertaken within the SSFA for lamp quality checking test covered countries in Latin America, Middle East, North Africa and the South Pacific regions. This test allows national policy makers to better understand lamp quality and technical issues, and compare their own quality against other participating countries and the importance of testing and MVE.
8	Training in laboratory testing at GELC, Beijing which was attended by 18 policy makers from 6 ASEAN countries.	Interview.
9	Project Cooperation Agreement (PCA) for Southeast Asia and the Pacific MVE project support with lites.asia	Organized the Southeast Asia CFL and LED lamps quality Checking Test, including six countries in the Southeast Asia. This project supported to demonstrate the value of strengthening national quality control

		and testing systems.
	GELC and CETIME in Tunisia agreed in 2013, help CETIME to improve technical capacity.	Tunisia is an importer of lighting products and needed improved quality control capability to undertake testing and MVE of products. .
10	With local UNEP office it facilitated linkages the en.lighten related work and the Chinese government organizations such as MIIT, NDRC, and other stakeholders in China.	Interviews.
11	Assisted in the organization of the Global Efficient Lighting Forum in 2014. The forum brought together 300 participants from 60 countries and highlighted the en.lighten road map and policy recommendations and provided opportunities to show case experiences on EEL from China and other countries.	This was under one SSFA. The project documents and the en.lighten website have good details of the forum, all presentations, feedback and final communique. This was also guided by an Advisory Group, which allowed en.lighten to enhance its network with additional partners such as FIDE, Mexico; the Asian Development Bank; the European Commission; the Swedish Energy Agency; the South African National Energy Development Institute; the U.S. Department of Energy; and others.
12	Round Robin Testing – Russia. GELC organized tests between GELC and four lighting laboratories in Russia to analyze and compare the test results.	In order to strengthen Russia’s lighting laboratory capacity building and improve its MVE system through quality control,

	POST EN.LIGHTEN PROJECT
1	After the en.lighten project was completed NLTC and GELC continue to contribute to the successor U4E. The Director is a member of the PSC and task force. It is contributing to the new policy guide which will now include guidance on LEDs,

	controls, commercial, industrial, public and outdoor lighting.
2	It has provided support for LEDs in 6 countries), with policy guidance and training on monitoring, verification, and enforcement for lighting products, support and
3	Project Cooperation Agreement (PCA) for Peru on new EE lighting project on MVE
4	PCA for Chile EE lighting project support on building testing laboratory capacity

## Findings

This addresses the findings on the seven key evaluation questions as relevant to this visit. The visit to China was useful to provide a wider background to the history of technological change in lighting at one of the principal countries which has transformed global production and trade in EEL. It was impressive to see also the rapid rate at which technologies and the associated tests and standards are changing. In terms of the project, en.lighten activities and outputs were enriched and enhanced by the partnership with NLTC. The testing and quality areas are major contributions of NLTC to the en.lighten network and worked well to reinforce the policy messages to promote an increased rate of use of energy efficient lighting. The contributions and the value of this partnership is demonstrated by the number of testing programmes undertaken, the reports and the participation of the partners in workshops and training.

The story of the transformation of China as both a producer and user of EEL highlights how international agencies can work with national actors, when their interests align and in well-designed projects. The Chinese experience is similar to the broadly defined “road-map to transform lighting markets” that en.lighten promoted. The Chinese example is a clear success for EEL, both in transforming the manufacture, as well as the use of EEL. Thus organizing the final global conference in China, with several hundred participants, contributed well to the overall project goal.

The Centre of Excellence showed excellent judgement in operationalizing this partnership and making use of it to very effectively support the overall project objectives. Both from the interviews and from the analysis of web downloads, it is evident that the produced publications, tests, and guidelines have been of great interest. They have created a demand for national and/or regional facilities, which can undertake such work in the future. The successful uptake of the findings and analysis resulting from this partnership is due first to the choice made by the project, guided by past experiences of partner agencies such as UNDP. The partnership was successful also because of the local presence of UNEP.

In China, the evidence showed that the project was well linked to and coordinated with other global, regional and national partners and initiatives in its area of focus. The project outputs delivered with NLTC/GELC remain valuable. They provide some benchmarks on the status of lamps and their quality at the time the test was done. The bench marks, the tools and the

capacities with the partner remain available and can be utilized further, and in fact are currently being used during the continued phase of the project. The sustainability of this specific partnership is high in the near term. In the longer term continued value from the partnership will depend on the extent to which each of the partners continues their involvement – for UNEP on EEL and for NLTC/GELC – their current priority to work internationally. Given that there is continued technological change in EEL at a rapid rate, which will continue for at least one decade, the sustainability of the partnership is likely.

A review of the GELC web site suggests that it can be improved to ensure that all the links work and all project reports are made available. At the time of the evaluation the GELC web site usually provided an account of the activity but not the actual report.

## PERSONS INTERVIEWED

1	Nanqing Jiang	PMO; UNEP China
2	Rong Rong	Project Assoc.; UNEP China
3	Carsten Germer	UNDP
4	Yue Teng	UNDP
5	Shijun Liu	UNDP
6	Han Yang	UNDP
7	Shuming Hua	General Director, NLTC/GELC
8	Wang Jing	NLTC/GELC
9	Wang Zuguang	Foreign Economic Coopn Office, Min of Env Protection
10	Han Xu	Mercury Convention Implementation Divn, Min of Env Protection
11	Li Pengcheng	Energy Consv. Group, Resources & Env. Branch, China National Inst of Standardization (CNIS); and, Admin Quality Supervision Inspection Quarantine (AQSIQ)
12	Han Wei	Project Manager, China Standard Certification Center (CSCC)

## ANNEX 2: NATIONAL PARTNERS AND OUTCOMES

The project interacted with developing and transition countries in multiple ways. The participation by country nationals depended strongly on the nature of partnership agreements between the global platform and the country, and also by the nature of the events. The events included national workshops, where a large number of national representatives of different stakeholder groups participated, often with some involvement of international stakeholder organizations; representatives from the countries

The table below lists all countries that en.lighten had a more “formal” involvement with. There were 66 countries that are listed as partners (group 1 countries in the table A3). They were the first countries to sign a mutual cooperation and partnership agreement with the en.lighten team, (in 2010-2011). The agreement was to work together on phasing out IL and increasing the use of EEL. The agreement was on goals and intent and it did not make any commitments for specific actions by either UNEP or the country. The agreements signified and confirmed national interest in the programme of en.lighten. Subsequently, en.lighten designated 48 “initiative” countries (group 2 countries in Table A3). These 48 “initiative” countries received some specific additional support from en.lighten – via regional initiatives or direct national support, and for some countries, participation in both regional and national initiatives.

The table below combines the 66 “partner” and 48 “initiative” countries side by side in two columns. The countries that appear in both columns are coloured green and suggest a higher intensity of engagement with en.lighten. In the visited column the two countries visited for the evaluation are shown. In the survey column the national focal points who responded are shown. The final column lists, as an outcome of en.lighten, countries where the project contributions resulted in a national programme of action on EEL, supported by GEF and national resources.

**Table A3: En.lighten country network**

Total number of countries	Group 1	Partner countries (66)	Initiative countries (48)	Group 3	Visited for the evaluation	Responded to the survey	GEF funded EEL project - if any connected to enlighten and status <sup>133</sup>
1	1	Algeria					
2	2	Belize	Belize	1			
3	3	Benin	Benin	2			
4			Brunei Darussalam	3			

<sup>133</sup> These are considered as outcomes which can be attributed to the en.lighten project.

5	4	Bolivia					Starting
6	5	BurkinaFaso	Burkina Faso	4			
7	6	Cape Verde	Cape Verde	5			
8	7	Cambodia	Cambodia	6		Cambodia	
9	8	Cameroon					
10	9	Chile	Chile	7	Chile		Ongoing
11	10	Cook Islands					
12	11	Costa Rica	Costa Rica	8			To start
13	12	Cote d'Ivoire	Cote d'Ivoire	9			Ongoing
14	13	Dominican Republic	Dominican Republic (the)	10			
15	14	Ecuador					
16	15	Egypt				Egypt	
17	16	El Salvador	El Salvador	11		El Salvador	
18	17	Ethiopia					
19			Fiji	12			
20	18	Gambia					
21	19	Georgia					
22	20	Ghana	Ghana	13		Ghana	
23	21	Guatemala	Guatemala	14			
24	22	Guinea	Guinea	15			
25	23	Guinea Bissau	Guinea-Bissau	16			
26	24	Haiti					
27	25	Honduras	Honduras	17			
28	26	Indonesia	Indonesia	18			Starting
29	27	Iraq					
30	28	Jordan	Jordan	19			
31	29	Kiribati	Kiribati	20		Kiribati	
32			Lao PDR (the)	21			
33	30	Kuwait					
34	31	Lebanon					
35	32	Liberia	Liberia	22			
36	33	Maldives				Maldives	
37			Malaysia	23			
38	34	Mali	Mali	24			
39	35	Marshall Islands	Marshall Islands	25			
40	36	Micronesia	Micronesia	26			
41	37	Morocco	Morocco	27			Ongoing

42	38	Myanmar	Myanmar	28			Starting
43	39	Nepal					
44	40	Nicaragua	Nicaragua	29			
45	41	Niger	Niger	30			
46	42	Nigeria	Nigeria	31			
47	43	Pakistan					Starting
48	44	Palau	Palau	32		Palau	
49	45	Palestine					
50	46	Panama	Panama	33			
51	47	Paraguay					
52	48	Peru					Ongoing
53	49	Philippines	Philippines (the)	34			
54	50	Russian Federation					
55	51	Saint Lucia					
56	52	Samoa	Samoa	35			
57	53	Senegal	Senegal	36			
58	54	Sierra Leone	Sierra Leone	37			
59			Singapore	38			
60	55	Solomon Islands	Solomon Islands	39			
61	56	South Africa					Starting
62	57	Sudan					Starting
63	58	Thailand	Thailand	40			
64			Gambia (the)	41			
65	59	Togo	Togo	42			
66	60	Tonga	Tonga	43			
67	61	Tunisia	Tunisia	44			To start
68	62	Tuvalu	Tuvalu	45			
69	63	United Arab Emirates					
70	64	Uruguay	Uruguay	46	Uruguay		Work on Mercury emissions ongoing
71	65	Vanuatu	Vanuatu	47			
72			Viet Nam	48			
73	66	Yemen					

Source: Multiple project documents, evaluator created table

As some of the countries are in one group and not another, and some in both groups, en.lighten had different levels of interactions with 73 countries either as “partners” or “initiative” countries in its role as a global platform. This group of 73 countries does not include China where en.lighten established a strong partnership with a national testing laboratory, which continues to be involved with the successor activities. It also does not include some countries such as India, where en.lighten provided a SSFA to analyse the history, context and background for EEL covering South Asian countries – some of the countries of South Asia such as Nepal and Pakistan are included in the 73, while for example Bangladesh and India are not. No reasons were provided for the differing relationships. The sample examined suggests that where a country was designated both as “partner” and “initiative” country the intensity of interactions were higher, with inputs such as country focused investments of money, workshops and COE support.

Of the 73 countries that en.lighten interacted with, the evaluation had direct contacts with only 2 countries that were visited and 6 others who responded to the questionnaire, for a total of 8 countries. China was also visited, although it is not listed as a ‘partner’ or ‘initiative’ country.

## **PARTNER COUNTRIES**

The first group of 66 countries that are listed as partners signed a mutual cooperation partnership agreement with the en.lighten team, agreeing to work together on phasing out IL and increasing the use of EEL.

The agreement between the country “Partner” and UNEP/en.lighten did not make any onerous promises or commitments on either side<sup>134</sup>. The countries essentially chose between the two alternative:

- as a **PARTNER**, I will receive comprehensive technical support from the en.lighten Secretariat for the development a National Efficient Lighting Strategy. An Integrated approach for designing policy measures for the transition will be adopted according to my specific country requirements. I will also **receive International public recognition at Rio+20 in the form of an Efficient lighting Award (bold added)**.
- as a **PARTICIPANT**, I will receive guidance from the en.lighten Secretariat on the optimal design and implementation of lighting policies for the transformation to energy efficient lighting.

It does not seem likely to the evaluator that any country representative would have refused the partnership offer which carried with it a concrete incentive of an award, before doing anything; and, it also offered the promise of support for the development of a National Efficient Lighting Strategy, an Integrated approach according to specific

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<sup>134</sup> Request to Participate in the en.lghten Global Efficient Lighting

country requirements. That could be a reason why no country chose or is listed as a “participant” instead of as a “partner”. Possibly countries that had ongoing GEF funded lighting programmes, such as Vietnam, felt they could not sign up as a Partner and be supported yet again.

In the network model discussed earlier, it would suggest that the number and quality of links with many partners was not high. The evaluation considers the “partner” designation was a useful communication tool to highlight the “reach” of the project. The evaluation considers the value provided by en.lighten to the countries who were only partners was most likely small. On the other hand en.lighten gained more by being able to state that it had 66 partnerships.

## **INITIATIVE COUNTRIES**

The 48 Initiative countries above received some support from en.lighten – via regional initiatives or direct national support, and for some both. Of the 48 initiative countries, 39 had been self-selected as partners also. It would be anticipated that the weight of links/connections with the 39 countries would be the highest and hence if the premise was valid, there would be greater causal influence of the en.lighten project on these countries.

## **OUTCOMES**

The reconstructed LFA and ToC defined en.lighten outcomes to include new financing for actions. One source is the view and report of the national coordinators interviewed; from those who responded to the survey and other sources. Among the direct outcomes of the en.lighten project are the newly approved GEF supported projects to implement EEL initiatives in 13 countries (at the end of 2016, shown in Table A3 above). These 13 countries had progressed, with some contributions from en.lighten, to prepare national plans to implement efficient lighting strategies, allocated resources for the work and also sought allocations by GEF for implementation.

When analysed along the network weight, it is seen that 7 (of the 13) countries, had been both Partner and Initiative countries, which would have the greatest opportunity of being influenced by en.lighten. Fewer, 5 of 13, were only Partner countries and one was neither (Argentina).

The trend is stronger in the responses received to the survey – 4 were initiative countries and two were only partners (even here in the case of Egypt, it received additional support on recycling CFL lamps, one of only 5 countries who had sent representatives for training at AMBILAMP, Spain).

The responses to the survey also suggest a difference in the response of partner and initiative countries – where the latter had more support and support that was more

specific to the country, while the former had some participation at workshops sometimes, access to web based information and in other cases only access to the more general publications. UNEP had led only one national GEF-funded efficient lighting project in Vietnam (2011), prior to en.lighten. The table below shows that UN Environment now has over 15 million USD in GEF funding, with another similar amount in different stages in the pipeline.

Table A4 below was provided by the UNEP project team in March 2017. In this table the details of the successor project is provided in row one. At this time the number of approved or projects in the pipeline submitted for approval has increased to 21, not counting the successor global platform project.

**Table A4: Successor projects to en.lighten on efficient lighting and additional appliances**

	Country	Product(s)	Project components	Status	Cash budget (US\$)
1	Global <i>Establishing the Foundations of a Partnership to Accelerate the Global Market Transformation for Efficient Appliances and Equipment (UNEP)</i>	Lighting, refrigerators, ACs, motors, and transformers	<ol style="list-style-type: none"> <li>1. Policy and strategy framework to accelerate the transition to efficient appliance and equipment</li> <li>2. Setting a global baseline and projected savings for the transition to efficient appliances and equipment and perform a global assessment of countries' readiness for the transition</li> <li>3. Bringing appliance and equipment efficiency on top of the global agenda</li> <li>4. Expanding the scope of the en.lighten initiative</li> </ol>	Ongoing (to end Dec 2016 – extension requested till end 2017)	1,370,000 USD (GEF)
2	Peru (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Development of a national efficient lighting strategy, adoption of MEPS for lighting priority applications,</li> <li>2. Enhancement of MVE and testing capacities,</li> <li>3. Design of a CRSO and enabling legislation, and</li> <li>4. Increase of consumer awareness of efficient lighting products.</li> </ol>	Partly internally executed (417,000 USD). Ongoing (to end Dec 2016 – extension till end of	1,636,000 USD (GEF)

				June 2017)  Final stages of completing the National Efficient Lighting Strategy.	
3	Chile (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Development of standards for LEDs,</li> <li>2. Strengthening of MVE operations and practices, increase of lighting testing capacities,</li> <li>3. Approval of the environmental regulation on e-waste, development of environmentally sound management system for lamps, and design of a CRSO,</li> <li>4. Demonstration of lighting benefits (pilot in low-income housing).</li> </ol>	<p>Partly internally executed (695,000 USD). Ongoing (started in 2016)</p> <p><u>Duration:</u> 36 months</p> <p>This project is just starting. Launching workshop took place on 23 March 2016.</p>	2,485,713 USD (GEF)
4	Morocco (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Energy Efficiency Policy Enhancement</li> <li>2. Technology and Standards/ CFLs Quality Improvement</li> <li>3. Generation of demand for CFLs through applicable consumer financing and, as applicable, financial support schemes</li> <li>4. Information, Consumers Education, and Awareness Raising</li> </ol>	<p>Partly internally executed (48,000 USD).</p> <p>en.lighten hired a senior expert to</p>	889,091 USD

				draft the efficient lighting strategy.	
5	Ivory Coast (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Energy Efficiency Policy Enhancement</li> <li>2. Technical and Managerial Capacity Building for EE Lighting Market Development</li> <li>3. Lighting Product Quality Improvement</li> <li>4. Energy-Efficient Lighting Product Dissemination for Public Lighting</li> <li>5. Consumer Education and Awareness</li> </ol>	Partly internally executed (amount tbc). Ongoing (started in 2016)	884,091 USD (GEF)
6	Bolivia (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Development of a national efficient lighting strategy,</li> <li>2. Development of minimum energy performance standards (MEPS) for priority lighting applications,</li> <li>3. Strengthening monitoring verification and enforcement (MVE) capacities (starting from 0),</li> <li>4. Development of environmentally sound management (ESM) legislation and design of a collection and recycling system, increase of consumer awareness of efficient lighting products, demonstration of LED lighting benefits (pilot in the outdoor sector).</li> </ol>	<p>Approved/endorsed by GEF council in June, project implementation is about to start.</p> <p>Partly internally executed (897,146 USD).</p> <p><u>Duration:</u> 36 months.</p>	3,059,361 USD (GEF)
7	Pakistan (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Developing a National Efficient Lighting Strategy</li> <li>2. Strengthening monitoring, verification and enforcement (MVE) capacities in Pakistan to ensure an effective transition to efficient lighting</li> <li>3. Design for a "Lighting Funding Window" in Pakistan's Revolving Loan Fund (RLF)</li> <li>4. Accelerating the use of light emitting diodes (LEDs) and controls (Communication campaign, training of building managers, design/evaluation of a demonstration project)</li> </ol>	<p>Approved/endorsed by GEF council in June, project implementation is about to start.</p> <p>Project will be partly internally</p>	1,575,500 USD (GEF)

				executed.  <u>Duration:</u> 36 months.		
8	Global project (Global Leapfrogging Project) (UNEP)	U4E	Lighting, refrigerators, ACs, motors, and transformers	<ol style="list-style-type: none"> <li>1. Support to partner countries</li> <li>2. Increasing the ambition of the Global Partnership on Efficient Appliances and Equipment</li> </ol>	Project preparation  <u>Duration:</u> 36 months. CEO document about to be submitted.	3,100,000 (GEF)
9	Costa Rica U4E Child project (UNEP)		Lighting, ACs, and refrigerators	<ol style="list-style-type: none"> <li>1. Demonstration projects to replace conventional appliances with energy efficient appliances in high energy consuming public institutions.</li> <li>2. Training and information program for market actors on the country's obligations to only procure efficient appliances and on mechanisms for product compliance.</li> <li>3. Establishment of a revolving loan fund for the financing of large-scale replacement programs in the public sector.</li> <li>4. Development of capacities for environmentally sound disposal of appliances</li> </ol>	Project preparation  <u>Duration:</u> 36 months. CEO document about to be submitted for the November 2016 council.	2,000,000 (GEF)
10	Sudan U4E Child project (UNDP)		Lighting and air conditioners	<ol style="list-style-type: none"> <li>1. Development of a national strategy to advance energy efficiency in lighting and air conditioners as part of the National Energy Efficiency Action plan (NEEAP)</li> <li>2. Development of regulatory mechanisms, including minimum energy performance standards (MEPS) for lighting products and air conditioners</li> <li>3. Creation of monitoring, verification, and enforcement (MVE) system for the MEPS</li> </ol>	Project preparation  <u>Duration:</u> 36 months. CEO document about to be submitted.	1,770,000 (GEF)

			<p>4. Awareness-building of new MEPS</p> <p>5. Enhanced environmentally sound management</p>		
11	Kazakhstan U4E Child project (UNDP)	Motors, transformers and refrigerators	<p>1. Institutional, legal and regulatory framework and capacities for EE standards and labels (EE S&amp;L)</p> <p>2. Creation of monitoring, verification, and enforcement (MVE) system</p> <p>3. Boosting demand for energy efficient appliances and equipment</p> <p>4. Ensuring supply of products compliant with EE S&amp;L policies</p>	<p>Project preparation</p> <p><u>Duration:</u> 36 months. CEO document about to be submitted.</p>	3,500,000 (GEF)
12	South Africa U4E Child project (UNDP and DBSA)	LEDs and transformers	<p>1. Development of a national strategy to advance energy efficiency in:</p> <p>a) lighting with LEDs</p> <p>b) distribution transformers</p> <p>2. Development of regulatory mechanisms, including minimum energy performance standards for:</p> <p>a) LEDs</p> <p>b) distribution transformers</p> <p>3. Creation of monitoring, verification, and enforcement (MVE) for:</p> <p>a) LEDs</p> <p>b) distribution transformers</p> <p>4. Development of supporting policies to accelerate:</p> <p>a) the market development for LEDs</p> <p>b) the turnover of the distribution transformer stock</p> <p>5. Enhanced environmentally sound management for distribution transformers</p>	<p>PIF approved. PPG stage starting.</p> <p><u>Duration:</u> 48 months. Project implementation will not start before end of 2017 - early 2018</p>	10,000,000 (GEF)
13	Indonesia U4E Child project (UNEP and UNDP)	Lighting	<p>1. Support to local lighting industry to improve the efficiency of lamps and ballasts</p> <p>2. Regulatory mechanisms; and market monitoring, verification, and enforcement</p> <p>3. High efficiency lighting technology</p>	<p>PIF approved. PPG phase starting.</p>	3,895,873 (GEF)

			penetration	<p><u>Duration:</u> 48 months. Project implementation will not start before end of 2017 - early 2018</p>	
14	Myanmar U4E Child project (UNEP)	Lighting and appliances	<ol style="list-style-type: none"> <li>1. Minimum energy performance standards (MEPS) and labelling</li> <li>2. Market monitoring, verification and enforcement</li> <li>3. Supporting policies (Public awareness campaign, small scale demonstration projects, training for local lighting and appliance manufacturers)</li> </ol>	<p>PIF approved. PPG phase starting.</p> <p><u>Duration:</u> 36 months. Project implementation will not start before end of 2017 - early 2018</p>	2,223,578 (GEF)
15	Tunisia U4E Child project (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Regulatory mechanisms, including minimum energy performance standards (MEPS) for lighting products</li> <li>2. Supporting policies for high efficiency lighting technology deployment</li> <li>3. Strengthened monitoring, verification and enforcement (MVE) for lighting products</li> <li>4. Environmentally sound management of efficient lighting products</li> </ol>	<p>PIF approved. PPG phase starting.</p> <p><u>Duration:</u> 36 months. Project implementation will not start before end of 2017 - early 2018</p>	2,399,541 (GEF)
16	Chile U4E Child project (UNEP)	Refrigerators	<ol style="list-style-type: none"> <li>1. Revising regulatory mechanisms, including minimum energy performance standards (MEPS)</li> <li>2. Enhancing monitoring, verification, and enforcement (MVE)</li> <li>3. Developing supporting policies</li> <li>4. Enhancing environmentally sound management</li> </ol>	<p>PIF approved. PPG phase starting.</p> <p>Project</p>	1,473,762 (GEF)

				implementation will not start before end of 2017 - early 2018.	
17	Pacific Islands	Appliances and equipment	<ol style="list-style-type: none"> <li>1. Legislation and Policy Development</li> <li>2. Supporting Policies and Mechanisms</li> <li>3. Monitoring verification and Enforcement</li> <li>4. Environmentally Sound Management</li> </ol>	GCF concept submitted	50,000,000 (GCF)
18	ASEAN (UNEP)	Lighting	<ol style="list-style-type: none"> <li>1. Regional market assessment</li> <li>2. Regional policy roadmap</li> <li>3. National policy roadmaps</li> <li>4. Capacity building for compliance officials</li> <li>5. Capacity building for laboratories</li> <li>6. Awareness raising</li> </ol>	<p>Building on ASEAN-SHINE Air conditioners (ICA).</p> <p>Just started (February 2016). Only limited funding (Market assessment and initiation of policy work, until October 2016). Need fundraising (to explore GCF).</p>	300,000 (SWITCH Asia Policy Support Programme)
19	Nigeria (UNEP-UNDP)	Off-grid lighting	<ol style="list-style-type: none"> <li>1. Assessments of estimated savings (black carbon, financial, and energy) to inform decision making on developing policies, strategies, and projects.</li> <li>2. Development of tools for decision-makers, including guidance for policy-makers on kerosene subsidies reform, which will allow scale up beyond Nigeria.</li> <li>3. Policy support and market development, including Minimum Energy Performance Standards</li> </ol>	CCAC proposal approved in March 2016. Activities started.	521,250 (CCAC)

			4. National advocacy campaign			
20	Dominican Republic (UNEP-C2E2)	Lighting	1. Development of NAMA for deployment of LEDs	Ongoing.	250,000 (CTCN)	USD
21	Jordan (UNEP)	Lighting	1. Capacity development of Jordan's newly established lighting test lab	Starting.	50,000 (CTCN)	USD
22	Tunisia (UNEP)	Lighting	1. Capacity development of Tunisia's established lighting test lab 2. Architects and engineers capacity development on energy-efficient lighting design for sustainable buildings	Starting.	50,000 (CTCN)	USD

## ANNEX 3: CONCEPTS, CONTEXT AND TECHNOLOGY

The purpose of this annex is to extend the evaluation assessment concerning the concept of Centre of Excellence and issues related to mercury in lighting technology giving a brief background on the topics and supporting argumentation and discussion in the main evaluation report.

### A 3.1 The Centre of Excellence

A major output of en.lighten project is the centre of excellence, which was never clearly defined in the ProDoc and is seen to have several meanings.

The term, Centres of Excellence (COE) in general, is used more often in the corporate world as an entity or platform, that facilitates collection of standards and practices through the organization; sometimes, to promote the adoption of - "best" or good or common and accepted practice; or/and - serve as a "community of practice" for a given topic, encouraging sharing and knowledge flow, overcoming "silos". Often it would have dedicated full time staff to serve the purpose. Some refer alternately to a "Competency" or "Capability Centre".

A COE can also refer to *the network of institutions collaborating* with each other for excellence in a particular area; a coordinating function which ensures that change initiatives are delivered consistently and well, through standard processes and competent staff; delivery of business concepts such as business intelligence. In academic institutions, it often refers to a team with a clear focus on a particular area of teaching/research, which may involve cooperation across disciplines, problem areas and organizational units; in healthcare as a centre that provides high level services in some areas, and so on. The literature discusses COE "fatigue" - a failure to create a clear mission and vision, which leads people to question whether the group is actually adding value.

In general, a Centre of Excellence (COE) should, at a most basic level consist of: A team of people that promote collaboration; use best practices around a specific focus area to drive business or customer-valued results.

The evaluation finds that it is useful when many people are involved, from multiple organizations and cultures to make sure there are clear definitions and a vision of concepts being used as the terms often have multiple meanings.

## A 3.2 Evaluator's Review on Mercury in Lighting

### Background

Mercury is a naturally occurring element (Hg) with a low and unavoidable natural level of exposure, but rising anthropogenic mercury emissions have been of increased concern over the past forty years. Mercury exists in three forms that have different properties, usage, and toxicity (UNEP reports<sup>135</sup>). The three forms are called elemental (or metallic) mercury, inorganic mercury compounds, and organic mercury compounds<sup>136</sup>. The Director-General of WHO says "Mercury is one of the top ten chemicals of major public health concern and is a substance which disperses into and remains in ecosystems for generations, causing severe ill health and intellectual impairment to exposed populations." It is known to be a greater risk to foetuses, young children and so also to child bearing women. It can lead to mental retardation, seizures, vision and hearing loss, delayed development, language disorders and memory loss. Mercury vapour is rapidly absorbed into the blood stream when inhaled, damaging the central nervous system, thyroid, kidneys, lungs, immune system, eyes, gums and skin. Neurological disorders may include memory loss, cognitive and motor dysfunction. Once ingested, 95 per cent of the chemical (organic form of mercury) is absorbed in the body<sup>137</sup>.

Anthropogenic emissions of mercury are currently dominated by the burning of coal for energy production and artisanal and small-scale gold mining, accounting for around half of the global anthropogenic emissions of mercury to the air. In 2010 total mercury emissions were estimated at 1,960 tonnes. UNEP estimated that emissions in Southern and Eastern Asia, accounted for "about half of global emissions"; "Emissions in Sub-Saharan Africa and in South America are slowly rising", with each accounting for about 15 per cent of global emissions; while emissions are declining in North America and Europe, with contributions of about eight per cent of global emissions<sup>138</sup>. The Executive Director of UNEP stated – "The challenge towards addressing mercury emissions is the wide variety of sources of emissions, from industrial processes to products in day-to-day use. Indeed often unknown to many, mercury is found in electrical switches and thermostats, lamps, measuring devices and dental amalgam fillings"<sup>139</sup>.

### Fluorescent lamps and mercury

Mercury is an essential element in fluorescent lighting. The electricity is passed through mercury vapor in the lamp, which produces ultraviolet light, which then causes the

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<sup>135</sup> UNEP, 2013. Mercury: A Time to Act, provides a relatively short and complete over view of the sources and dangers from Mercury in the environment and provides much of the background information used here, especially when other sources are not cited.

<sup>136</sup> [https://www.cdc.gov/biomonitoring/pdf/Mercury\\_FactSheet.pdf](https://www.cdc.gov/biomonitoring/pdf/Mercury_FactSheet.pdf)

<sup>137</sup> UNEP, 2013. Mercury: A Time to Act, pages 20-25.

<sup>138</sup> Ibid, page 26

<sup>139</sup> Ibid, page 5

phosphor in the tube to fluoresce, making visible light. This potentially negative characteristic of fluorescent lamps (FL) was always known but with low domestic use of linear fluorescent lamps and special collection of office and industrial wastes, regulators were less concerned until the 1990s. Historically, the main barrier hampering the deployment of CFL was their high initial cost (in the eighties and early nineties, CFLs were 20 to 30 times more expensive than incandescent lamps, and in many cases of poorer quality. In the 1990s on-going technical change in the manufacture of compact fluorescent lamps (CFLs) led to lower cost and relatively efficient CFLs becoming available in the market. The sales of CFL soared when the costs dropped to between four and ten times that of an incandescent lamp (IL). In 2000 the global sales of CFL were estimated at one billion pieces and in ten years that had grown three times to around three billion pieces<sup>140</sup>. The European Commission noted in 2008 “Compact fluorescent light bulbs (CFLs) use up to two-thirds less energy than standard incandescent bulbs. But CFLs contain mercury, a neurotoxin that can cause serious health problems. A global study calls for a strategic policy to address the risks associated with mercury emissions from CFLs”<sup>141</sup>.

Thus the increased use of CFLs was recognised to have mixed repercussions. On one hand it provided gains in reduced GHG emissions per unit of light consumed in all countries where a share of electricity was produced with fossil fuels<sup>142</sup>. Further, if coal was one component of the fossil fuel use for electricity, it could reduce coal consumption for electricity, thereby also reducing mercury emissions. It bears repetition, only in those countries using coal for electricity, reduction in coal use would lead to reductions of mercury emissions offsetting the added emissions from the light bulb. The reduction of mercury emissions due to increased energy efficiency depends on the original and subsequent mix of energy sources for electricity production in the country and varies according to their circumstances. In addition, it also provided benefits to consumers when the purchase price was sufficiently low and quality high, by saving on lighting costs. The technology was also very useful to many electricity producers (utilities) by reducing the peak demand in the evening hours.

The new, smaller and cheaper CFL also provided new opportunities for providing electric light to those without access to grid connected electricity, an important goal of the sustainable development goals (SDGs)<sup>143</sup> and the earlier Millennium Development Goals

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<sup>140</sup> UNEP, 2013 Mercury: A Time to Act, page 34. As this is a graphic taken from en.lighten data of 2012, the numbers above are broad estimates.

<sup>141</sup> European Commission DG ENV, News Alert Issue 129, November 2008

<sup>142</sup> Even this metric of reductions of GHG emissions per unit of light, does not necessarily lead directly to reductions in total emissions, because of what is called the “take back effect”. In many cases of efficiency gains, the gains make the outputs cheaper and lead to larger consumption, which then negates the anticipated benefit of absolute reductions in GHG required for positive climate change benefits.

<sup>143</sup> See “Sustainable energy for all: Strategic framework for results 2016-21, June 2016” available at <http://www.un.org/sustainabledevelopment/>. It estimates 1.1 billion people lack access to electricity today. SE4All an Initiative of the UN Secretary-General in 2011, aims to double the rate of increase of energy efficiency and the share of renewables. The 2030 Agenda for Sustainable Development established SDG7,

(MDGs). Families and businesses without access to electricity are only able to use candles and/or kerosene lamps for lighting. Electric lamps (even the inefficient IL) are many times more efficient in their conversion of energy to light – electric lights (ILs) are almost 30 times more efficient than kerosene lamps (a single 60 watt incandescent bulb replaces 30 kerosene lamps<sup>144</sup>). Electricity in rural areas is first and foremost important for lighting – domestic, institutional, communal, public places and in health and education facilities. At home and institutions better lighting extends the potential for useful hours for reading, for security and extends income-earning work opportunities<sup>145</sup>. For the almost 30% of the world's population without access to the electrical grid, solar panels and other off grid solutions have become important, and the increased efficiency of CFL made the new lamps attractive for off grid lighting, used by relatively more poor and rural populations. Thus the new technology contributed to further economic and social gains by the poor and was seen to be important for women. It also contributed to new economic activity in the production and sales of the new lamps.

Nevertheless, given the growth in demand for CFLs, there has also been increased concern over their mercury content. The Executive Director of UNEP cautioned, “the high global demand for CFLs might present a challenge to achieving the goal of effective reduction of mercury use”.<sup>146</sup> In 2003 the EU Directive 2002/95/EC was introduced restricting mercury content in CFLs to not exceed 5 mg per lamp. The EU-wide ban on incandescent light bulbs in 2010 was seen to increase the use of CFLs and added urgency to the need to encourage appropriate recycling of the bulbs.

Mercury poisoning can result from exposure to water-soluble forms of mercury (such as mercuric chloride or methyl mercury), by inhalation of mercury vapor, or by ingesting methyl mercury. Agency guidelines, such as those from the EU, EPA (US) and UNEP, caution that most mercury compounds are extremely toxic and must be handled with great care, e.g. vapour emissions from mercury products such as fluorescent lamps. During transport containers of mercury must be securely sealed to avoid spills and evaporation. Heating of mercury, or of compounds of mercury that may decompose when heated, should be carried out with adequate ventilation in order to minimize exposure to mercury vapour.

Concern is associated with the way in which CFLs are disposed of or recycled after initial use. A study of over 130 countries revealed that the rate of recycling of CFLs is low in most countries and regions. Taiwan has the highest rates of CFL recycling, with

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which aims to ensure universal access to affordable, reliable, sustainable and modern energy by 2030 and most (125 of 169 targets) depend on achieving progress on energy.

<sup>144</sup> See Rath, Amitav, 2005. Energy, women and rural poverty: A review focusing on Latin America, Policy Research International, 31 May 2005; and also Shonali Pachauri and Abeeku Brew-Hammond, Energy Access for Development Energy Access for Development, Ch. 19, in Global Energy Assessment, International Institute for Applied Systems Analysis, Austria; at <http://www.globalenergyassessment.org/>

<sup>145</sup> See ODI, 2016. Accelerating access to electricity in Africa with off-grid solar; for more details and evidence of benefits to poor people and the differential benefits to women and children.

<sup>146</sup> UNEP, 2013. Mercury: A Time to Act,

87 per cent recycled thanks to a compulsory programme. In China, India, Mexico, South Africa, Canada and Japan, less than 10 per cent are recycled. The Lighting Council Australia estimated (for 2014) that 95% of fluorescent lamps in Australia arrive at the landfill mixed with other waste<sup>147</sup>. Canada, Japan, and Mexico are estimated to collect and recycle less than 10% of waste lamps<sup>148</sup> (EU Commission, 2008). Despite the relatively high rates of recycling in the Nordic countries, the amounts of collected CFLs represented as low as 29% of the product sold in Norway, to as high as 68% in Sweden<sup>149</sup> in 2012. This suggests that globally CFLs are typically disposed of along with general household waste potentially releasing the mercury contained – some due to bulb breakage during handling and transport, and leaching and evaporation from landfills.

### **The Role of GEF, UNEP and UNDP in Mercury Reduction**

Actions to control mercury in the environment began in 1970s and have grown over the years. The evidence that mercury levels remained high, and with new evidence on critical health effects even at low-doses, new efforts were begun to set new agreements and goals. This section discusses the role of GEF, UNEP and UNDP in mercury reduction. These parties have been part of the enlighten network.

Among the core enlighten partners, the Global Environment Facility (GEF) has been engaged in supporting efforts to manage and eliminate the use of mercury from inception. The GEF is designated as one of the two funding mechanisms of the new Minamata Convention on Mercury and is committed to the reduction and eventual elimination of mercury contamination by “funding a range of interconnected environmental programs addressing chemical pollution, land degradation, climate change, and threats to biological diversity and water resources”<sup>150</sup>.

UNEP has led much of the international efforts on reduction and control of mercury emissions<sup>151</sup> and produced its first Global Mercury Assessment in 2002 and followed up with a second report in 2008<sup>152</sup> based on national emissions data for the year 2005. In

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<sup>147</sup> Richter, J. L., & Koppejan, R. 2016. Extended producer responsibility for lamps in Nordic countries: best practices and challenges in closing material loops. *Journal of Cleaner Production*, v. 123, June 1, 2016.

<sup>148</sup> EU Commission. 2008. Managing mercury risks from energy-saving light bulbs. [http://ec.europa.eu/environment/integration/research/newsalert/pdf/129na1\\_en.pdf](http://ec.europa.eu/environment/integration/research/newsalert/pdf/129na1_en.pdf)

<sup>149</sup> F. Magalini, and others, Study on collection rates of waste electrical and electronic equipment (WEEE), EU Commission, 2014.

<sup>150</sup> GEF, Mercury and the GEF, May 2013.

<sup>151</sup> The UNEP work on mercury is directed by the Chemicals and Waste Branch, based in Geneva and with units in Osaka and Paris, and is the UN system’s catalysing body and focal point on chemicals and waste. It focuses on “the chemicals life cycle” and “seeks sound chemicals management, waste minimization and proper waste disposal”, while examining safer alternatives, with the goal “to protect people and the environment from the adverse effects of improper chemicals management and hazardous chemicals and waste”. <http://web.unep.org/chemicalsandwaste/>

The UNEP staff member responsible for the UNEP Global Mercury Partnership’s - on reduction of intentional uses of mercury, is listed as a Global Taskforce Member.

<sup>152</sup> UNEP, 2008. The Global Atmospheric Mercury Assessment: Sources, Emissions and Transport.

2009, the Governing Council of UNEP requested an update, leading to the most current “Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport”, based on national emissions data for the year 2010. The next update is underway to be completed in 2018<sup>153</sup>. In 2009, the Governing Council of UNEP agreed to negotiate a global, legally-binding treaty, to drive concerted actions on reducing mercury emissions<sup>154</sup>. The Minamata Mercury Convention was signed by 128 countries in 2013<sup>155</sup>. This was welcomed by the Executive Director of UNEP - “Mercury has some severe effects, both on human health and on the environment. UNEP has been proud to facilitate and support the treaty negotiation over the past four years because almost everyone in the world - be they small-scale gold miners, expectant mothers or waste-handlers in developing countries - will benefit from its provisions.” UNEP’s current and planned GEF funded mercury portfolio is US\$46 million<sup>156</sup>.

UNDP – an en.lighten Steering Committee member – has also been active in mercury reduction efforts since the 1970s. UNDP’s earlier work focused on artisanal and small-scale gold mining. They’ve also worked on Mercury waste in the health sector together with WHO, to phase-out mercury-containing medical devices<sup>157</sup>. Following the adoption of the Minamata Convention, UNDP is managing US\$22 million in GEF grants in the GEF cycle 6 on mercury-related projects in 42 countries<sup>158</sup>. UNDP has also taken “a lifecycle approach” which aims to phase-out mercury-containing products, with cost-effective alternatives. Where that is not possible, it supports countries in improving the management of used mercury-containing products, from production, transport and storage, and the management and treatment, of the waste stream, especially for products such as “fluorescent light tubes, energy-efficient light bulbs, .....”<sup>159</sup>

### A 3.3 Evaluator’s Review of the En.lighten Toolkit and a sample of other publications

Despite the Energy and Climate Branch, which houses the en.lighten project, and the Chemicals and Health Branch both belonging to the Economy Division, the evaluation

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<sup>153</sup> See more at: <http://web.unep.org/chemicalsandwaste/what-we-do/technology-and-metals/mercury/global-mercury-assessment#sthash.IBX4zhHM.dpuf>

<sup>154</sup> United Nations Environment Programme, 2016, Intergovernmental negotiating committee to prepare a global legally binding instrument on mercury, UNEP(DTIE)/Hg/INC.7/4, 8 December 2015

<sup>155</sup> The convention has set a high limit to ban Compact fluorescent bulbs that exceed 5 milligrams of mercury by 2020. The tests undertaken by GELC show that the majority of the bulbs meet the above standard today and some suggest that the mercury content could be reduced to 2.5 mg without waiting for new technologies.

<sup>156</sup> UN Environment internal sources : UN Environment current mercury portfolio is \$29,826,119 and the submitted projects (not yet approved by the GEF) is \$16,325,000 (as of 30 November 2017)

<sup>157</sup> UNDP, 2016. Mercury management for Sustainable Development, January 2016.

<sup>158</sup> Ibid, page 4. Many of the 42 countries – for example, Colombia, Costa Rica, Egypt, Panama, Uruguay and Vietnam, overlap with en.lighten focus countries.

concludes that the project did not integrate effectively with other mandates of UNEP related to chemicals, waste and 'green' economy.

The en.lighten project has always emphasized that it had an "integrated approach" in terms of mercury handling. This had four dimensions – the development of Minimum Energy Performance Standards (MEPS); the design and implementation of supporting policies nationally; measurement, verification and enforcement scheme (MVES) and establishing environmentally sound management for lighting products. It is important that materials produced by the project reflect this integrated approach and, with regard to environmentally sound management of lighting products, materials should present an accurate and balanced approach to 'environmentally sound management' that is consistent with UNEP's mandate and technical expertise.

The evaluation finds that the en.lighten project tended to under emphasize potential negative impacts. The project had a strong emphasis on communications and the communications effort had strong support also from its private sector partners. The evaluation observes that many documents read as a mix of public relations, publicity for sponsors and sales promotion for the product – Energy Efficient Lighting (EEL). The project outputs and the guidance provided to partners was to emphasize the potential benefits of their switch to the products offered. All communication products offer the new technology as a highly positive story, while under-emphasising the negative effects and costs. In many communications products the negatives were not included, but always emphasized the energy savings and resultant GHG savings. Both were calculated in a simple way, without taking into account wider systemic effects that would result from price and technological changes.

The evaluation findings include that the en.lighten communications did not deal with the possibility that mercury emissions could in fact increase in countries where coal is not used for electricity production coal; or that the actual GHG savings would be lower than the estimates made in national and regional analysis and presentations, because of the "take back" or "rebound" effects, where consumers would use some of their savings to use more light hours (especially poor people). GHG savings from energy efficient lighting could be also lower than estimated in countries that are moving towards utilization of renewable energy for electricity production.

The evaluation view is that the produced publications/toolkits/guidelines have often been perfunctory and legalistic, with much space devoted to the statement of principles in the area of health effects. The reasons for this can only be guessed and are assumed to be due to a strong focus in promoting aspects of energy efficiency; the view that the project was to sell the value of EEL, which diverted attention from the associated risks. The capacity building efforts by the project in the environmental area was low.

The project deliverables on waste management during manufacture, use and end of life for lamps was evaluated inadequate. Consumers in general and groups such as women and the poor, both as consumers and also as part of the life cycle management, were not represented among the stakeholders. For their benefit and for UNEP to close the

loop, in the continued work in the new phase, a more careful and rigorous study of mercury emissions and exposure risks - from breakage, in the waste stream, the potential for negative impacts, and appropriate measures to minimize such negative impacts on sub groups of people and the environment – must be undertaken. This can promote the sustainability of project achievements for the future and would be more truly representative of the mandates of UNEP and GEF.

Specific references to content in project publications follow:

*En.lighten Tool Kit:*

The en.lighten tool kit – the flagship product of the project – was meant to “promote an integrated policy approach” and ensure that areas sometimes overlooked in national phase-out programmes would be considered and implemented, including “environmentally sound management”<sup>160</sup>. En.lighten offered its support to countries in “establishing focused waste management efforts including: waste collection, disposal and/or recycling”<sup>161</sup>.

The toolkit is organized in six sections, laid out in over 150 pages, where one section (22 pages) is “Safeguarding the Environment and Health”. This discusses the life cycle stages and covers the lamp manufacturing process. The toolkit notes that there has already been “significant reduction in the amount of mercury used in many types of fluorescent lamps over the last two decades”; that there are new environmental regulations such as the European Union’s Restriction of Hazardous Substances (RoHS) to increasingly limit the allowable mercury content in CFLs from 5mg to as low as 2.5 mg; that new technology allows a small amount of mercury to be ‘dosed’ or placed inside a CFL and presents very low risk of exposure to workers, compared with older techniques, such as manual pipette dosing in open air. There is a figure which shows the reduction of mercury content in fluorescent lamps from 1980 to 2008. This impressive graphic shows that the milligrams of mercury per lamp declined by 80% by 1996 compared to 1980. The evaluation considers that when the sales of such lamps is superimposed (as in UNEP, 2013, page 34) it would have been beneficial to also show negligible sales during the same period when the lamps were bulky, expensive and unattractive to consumers. Given the scales/measures used it is not possible to judge the rates of improvements in the more recent period, and whether the trend is expected to continue. The toolkit adds, “Responsible (sic) lamp manufacturers” without clarifying who they might be, “ have introduced several high-precision methods whereby the threat of mercury exposure to workers is minimized”, although no data on the occupational exposures of workers is provided.

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<sup>160</sup> UNEP, 2012. Achieving the Global Transition to Energy Efficient Lighting Toolkit, page 8.

<sup>161</sup> En.lighten, 2011. Draft Regional Report on Efficient Lighting in the Middle East and North Africa, Sep. 2011.

The toolkit highlights the EU's Restriction of Hazardous Substances Directive (RoHS), as the one best approach towards setting benchmarks for international best practice standards for regulations<sup>162</sup>. It also reviews a few other countries, including China where there is a special certification system that encourages low-mercury containing CFLs (1.5 mg for <30 W and 2.5 mg for >30 W) and even micro-mercury CFLs (1.0 mg for <30 W and 1.5 mg for >30 W), much lower than earlier EU and North American limits and new lamps made by leading manufacturers in other countries have also reduced the mercury content of their best-in class lamps to 1 mg as against the maximum of 2.5mg allowed by the EU RoHS.

In its coverage of health concerns the toolkit advises that "Some end users may voice concerns about the environmental impact of CFLs. CFLs do not release mercury during the usage phase, unless the lamp is broken during installation, storage or transportation. Considering the amount of mercury released during electricity generation (especially when coal is the primary power source) and since CFLs use considerably less electricity than incandescent lamps for the same light output, using CFLs will reduce the overall amount of mercury released into the environment". It is again reassuring in its statement – "with adequate ventilation and proper clean-up, a broken CFL is very unlikely to lead to mercury exposure that creates any significant threats for adults, pregnant women, fetuses and children". The toolkit advises that "The most effective strategy to allay concerns associated with the use of CFLs is to provide accurate factual information describing the potential risks and *put them into perspective* (emphasis added), and also to provide clear, useful advice about how to prevent and address breakages".

The toolkit recommends that communication is provided to the effect that – "All fluorescent lamps contain small amounts of mercury that are essential for them to operate efficiently. *The mercury in an intact CFL poses no risk to consumers. A hazard may arise when the bulb is broken and mercury is released.* Critical variables that influence the risk from a broken CFL include: the amount of mercury the bulb contains; the chemical and physical form(s) of that mercury; the fraction of mercury that escapes on breakage; the absorbency of the surface onto which mercury is released; how long mercury remains in or around the breakage site; environmental factors such as temperature, room volume, rate and timing of ventilation; and, most importantly, clean-up actions taken by the consumer. A broken CFL can release mercury vapour, which is of most concern within enclosed spaces without ventilation"<sup>163</sup>.

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<sup>162</sup> The EU directive sets limits for toxic materials for all lamps, and was in effect from July 2006 and then updated as RoHS 2 directive (2011/65/EU that took effect in 2013., with more stringent mercury content limits and without impeding their energy efficiency or life expectancy".

<sup>163</sup> Toolkit section on breakage of lamps. It further reassures that "Most of the epidemiological evidence on health effects of exposure to mercury vapour comes from studies on workers exposed *occupationally*. There have been evaluation studies for pregnant women and children based on many exposure studies of elemental mercury spills in the homes from CFLs . These studies conclude that for sensitive populations (e.g. adults, pregnant women, fetuses and children), the health risk is very unlikely where there is proper

In a fourth sub-section the toolkit covers end of lamp life in pages 12-18. According to the tool kit, “programmes for the environmentally sound management of mercury-added lamps have been implemented in many countries”. And “is a relatively recent area of focus for regulators”. It correctly highlights “Collection and Recycling Programmes” since the “Improper handling, collection, storage, transportation or disposal of CFL waste can lead to releases of mercury”. The toolkit reviews programmes in 8 countries and regions (pages 17-18). It discusses European Union laws on e-waste management. The EU WEEE (Waste Electrical & Electronic Equipment) Directive makes equipment manufacturers financially or physically responsible for their products at the end-of-life under extended producer responsibility. Users of electrical and electronic equipment from private households should have the possibility of returning WEEE at least free of charge and manufacturers must dispose of it in an environmentally friendly manner, by disposal, reuse, or refurbishment. The WEEE Directive was made into national law by all member countries of the European Union, thus creating national compliance schemes”. It says, since August 2005, EU electronics manufacturers have been financially responsible for compliance with the WEEE Directive. The EU Environment Ministers are in the process of revising the WEEE Directive aiming at establishing collection targets of 45% by 2016.

The actual current number of lamps being recycled is not provided but is estimated by other sources to be below 25% almost 10 years after the directive aimed at full life cycle management in the region reputed to be an environmental leader. The toolkit discusses Japan, and says there only 5% of waste lamps were being collected. The report then discusses Taiwan, a most unusual case, without comment, while providing the information that it has a “zero landfill - total recycling” approach; “residents purchase city-approved bags for waste pick-up by municipal solid waste trucks”, and Taiwanese lamp retailers “must accept lamps back for recycling or face fines”. Taiwan reported “an 80% recycling rate for mercury-added lamps”.

The cases then add an example of India also without comment. It states that a study commissioned by the Ministry of Environment and Forests found that over “90% of households either threw lamps in the trash or expected waste handlers to address the problem”. Only “about half of all those surveyed knew special handling was needed”.

The Toolkit returns briefly to the Mercury topic in Section 6: Communications and Engagement (27 pages) where it places “Communicating about the mercury content of CFLs” as a complex issue. It suggests – “Only a very small quantity of mercury is required to operate a CFL. On average, a CFL for indoor residential use contains the smallest quantity of mercury of all mercury-containing personal and household products. From a communications perspective, useful comparisons that can be made include the fact that a CFL contains about the amount of mercury to cover the tip of a

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ventilation and clean up.” It strongly encourages “instructions on how to carefully handle CFLs to prevent breakage”.

ballpoint pen; there is up to five times the amount of mercury in a watch battery; between 60 to 200 times the amount of mercury in a single “silver” dental filling, depending on the size of the amalgam; 100 to 200 times the amount in old-style thermometers; and about 500 times the amount in old thermostats used to adjust heat in homes”.

The toolkit lists NGO members (from the “Mercury Policy Project/Zero Mercury Working Group” among key authors), and the project allocated resources<sup>164</sup> through a Small-Scale Funding Agreement (SSFA) for assistance for the section dealing with “Options for the Sustainable Production and Management of Energy Efficient Mercury-containing Lamps”. In individual survey responses and follow up interviews there was criticism of the handling of the issues related to health and environmental impacts of mercury from fluorescent light bulbs, including CFLs, in the toolkit and also in the work done by the Task Force on health, environment and consumer issues. A sample of task force members were divided in their views, some of them indicating that the industry partner representatives were resistant to a fuller discussion and explanation of the latest science related to the issues of toxicity, recycling and producer responsibility.

*Other En.lighten Publications:*

The UNEP and the enlighten project also had a news release - Mercury in Lighting a Focus at the Minamata Convention: Countries encouraged to adopt standards now to reduce mercury in lighting products - at Conference of Plenipotentiaries on the Minamata Convention (Kumamoto, Japan on 7th October September 2013). The project manager “presented at the UNEP Global Mercury Partnership side event. As successful public-private partnership, supported by private sector manufacturers Philips and OSRAM and financed by the Global Environment Facility”. The key points made repeated the core communications of the project - the phase-out of inefficient incandescent lamps reduces CO<sub>2</sub> emissions and mercury pollution from fossil fuel burning. However, the news release also emphasizes that due to mercury content of the CFLs, a more integrated policy approach is required that addresses the principles of pollution prevention and environmentally sound management. This approach includes maximizing energy efficiency and lamp life and minimizing toxicity at the design and manufacturing stages, while taking into account the sustainable management of spent lamps.<sup>165</sup>

“Potential concerns about mercury-added lamps have resulted in viable methodologies and good practices for environmentally sound management of spent lamps. Collection and recycling systems coupled with technologies that capture and securely contain mercury can be effective. Further processing to recover mercury and recycle other lamp components is manageable and affordable if an appropriate system is designed and properly implemented”.

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<sup>164</sup> SSFA 120 11/GFL-5070-4E F1-2720-230200 for the sum of US\$20,000. There was also one UNEP staff member from the Mercury Partnership and Basel Convention Secretariat, who attended the TF meetings.

<sup>165</sup> <http://www.enlighten-initiative.org/Portals/0/documents/news/minimata.pdf>

Then the press release continues reassuring – “It is important to note that CFLs do not release mercury, unless the lamp is broken during installation, storage or transportation. Mercury releases from broken CFLs can be minimized by providing the public with information on how to prevent breakage and properly clean up and dispose of broken CFLs. The amount of mercury entering the environment from CFLs can be further minimized when the mercury is recovered from spent lamps.” The statement added - The new Ambilamp International Academy for the Recycling of Light has been established for en.lighten Partner countries to receive hands-on training<sup>166</sup> on establishing legislation and take-back schemes”.

The toolkit appeared to be technically accurate, in both what it covered and the sources it cited. But it did not cite or review other substantial research and experiences in the life cycle management of fluorescent lamps or on long term systemic issues. It did cover, that there was a lack of awareness that manufacturing facilities, waste collectors and that consumers often did not adhere to pristine clinical standards that are recommended in the toolkit. The evaluation sees it as a limitation that the toolkit did not address the question as to why the collection rates of spent lamps were so low, not only in poor countries, but also in countries such as Japan, Canada, USA and even in Spain, the home of Ambilamp. It is also noted that the the project was not curious to determine the key characteristics of the efforts in the most successful programmes for a decade such as in Taiwan and Sweden.

Evaluation also observes that in some country reports the level of attention to mercury drops further. In the Middle East report by en.lighten, mercury has been listed under “Risk perception”. Here the report states – “Concerns about the risk caused by the mercury content of CFLs with regard to health and the environment, are widespread. However, a CFL has average mercury content of 4 - 5 milligrams, much less than the content produced by the carbon combustion needed to light a single incandescent lamp”. This would likely not be factual for the Middle Eastern countries listed, which largely used oil and natural gas for electricity production<sup>167</sup>. The project did make more careful country assessments where mercury savings were dependent on the amount of coal production.

En.lighten highlighted “wider environmental, health and 'Green Economy' benefits to communities and countries of switching away from, for example, fuels such as kerosene”. It erred by linking the benefits of efficient lamps to reducing 1.8 million deaths a year from in-door air pollution. Indoor air pollution and attendant ill health is dependant much more on cooking than lighting<sup>168</sup>. En.lighten coordinated with the Global Off-Grid Lighting Association (GOGLA), the German Federal Ministry for Economic Cooperation and Development (BMZ) on a regional policy to enable the penetration of

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<sup>166</sup> Based on the evaluation findings En.lighten was able to provide one time training for 5 nationals from partner countries at Ambilamp, an industry sponsored not for profit organization.

<sup>167</sup> The evaluation acknowledges that oil refinery process is also a source of mercury emissions.

<sup>168</sup> See discussion in ODI, 2016.

sustainable off-grid lighting solutions in the Economic Community of West African States (ECOWAS) region, working with the Regional Centre for Renewable Energy and Energy Efficiency (ECREEE)<sup>169</sup>. The report does have a small section advising policymakers to “consider how to develop a legal framework for environmentally sound, end-of-life management, making this a national priority and ensuring coordinated law enforcement” but it again has no details. En.lighten produced another useful report “Guidebook for the Development of a Nationally Appropriate Mitigation Action on Efficient Lighting”, which would fit with its goal by scaling up investments in EEL. It only mentions a positive environmental impact “Less mercury and other hazardous materials in waste streams and environment”, also again with no qualifications as discussed earlier.

It is the evaluator’s view that solar photovoltaic based off-grid solutions which use efficient lamps are a very good thing and they support the Sustainable Development Goal 7 ‘Affordable and Clean Energy’. But, the evaluation also considers, that it would be highly important, that the consumers were made aware of the new toxic materials in the waste stream (which here also includes battery wastes) and that the end-of-life issues were integrated with the promotion of new technologies. Slowly the looming challenges associated with the energy transition in rural areas, and in Africa, are getting more recognition, for instance with the United Nations Environment Assembly, focusing on health and environmental hazards caused by the recovery of lead from waste batteries (meeting held in May 2016 in Nairobi, Kenya). As also mentioned in several en.lighten publications extended producer responsibility can be a key concept to address the health and environment issues and needs to be widely promoted not only for lamps.

The Centre of Excellence was unable to effectively support one of the components of the project<sup>170</sup> concerning the CFL disposal strategy and action plan adopted, with the target – “all participating countries have adopted the strategy and implemented the action plan”. This weakness has to be seen within the design to which the COE was responding. Nine priority activities had been laid out for the COE, but the issue of safe handling and waste disposal at the end of life was not one of the specified priorities.

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<sup>169</sup> UNEP, 2015. Developing Effective Off-Grid Lighting Policy: Guidance note for governments in Africa.

<sup>170</sup> See also the evaluation report, Table 2, row 3.4, Output 3.4.

## ANNEX 4: BUDGET TABLES FOR EN.LIGHTEN

**Table A5: GEF BUDGET AS APPROVED**

	<b>GEF Budget</b>	<b>Total</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
1	Personnel Component	\$3,080,000	\$710,000	\$780,000	\$800,000	\$790,000
2	Sub-contract component	\$300,000	\$110,000	\$80,000	\$60,000	\$50,000
3	Training component	\$800,000	\$150,000	\$275,000	\$225,000	\$150,000
4	Equipment & premises	\$50,000	\$12,500	\$12,500	\$12,500	\$12,500
5	Misc. component	\$770,000	\$70,000	\$260,000	\$210,000	\$230,000
	<b>Total GEF</b>	<b>\$5,000,000</b>	<b>\$1,052,500</b>	<b>\$1,407,500</b>	<b>\$1,307,500</b>	<b>\$1,232,500</b>

**Table A6: COFINANCING BUDGET AS APPROVED**

	<b>Co-financing</b>	<b>Total</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
1	ADEME (France)	\$132,000	N.A.	N.A.	N.A.	N.A.
2	UNEP	\$68,000	N.A.	N.A.	N.A.	N.A.
3	OSRAM	\$6,000,000	N.A.	N.A.	N.A.	N.A.
4	Phillips	\$6,000,000	N.A.	N.A.	N.A.	N.A.
5	Others	\$2,800,000	N.A.	N.A.	N.A.	N.A.
	<i>Subtotal</i>	\$15,000,000	N.A.	N.A.	N.A.	N.A.
	<b>Total cost of project</b>	<b>\$20,000,000</b>				

Source: Both from PRODOC. as approved

**Table A7: EXPENDITURES BY YEAR**

	PRODOC Budget	2010	2011	2012	2013	2014	2015	Actual Total
<b>GEF Budget</b>	\$5,000,000	\$1,052,500	\$1,407,500	\$1,307,500	\$1,232,500			\$5,000,000
GEF Budget revised			\$2,108,270	\$2,298,519	\$1,232,500	\$1,127,217	\$347,944	
Unspent funds		\$700,770	\$991,019	\$736,265	\$390,952	\$347,944	Nil	Nil
% underspent		67%	47%	32%	32%	31%	0%	0%
<b>GEF Expenditures</b>		\$351,730	\$1,117,251	\$1,562,254	\$841,548	\$779,273	\$347,944	\$5,000,000
<b>Co-financing</b>								
OSRAM	\$6,000,000	IN KIND	IN KIND	IN KIND				
Phillips	\$6,000,000	IN KIND	IN KIND	IN KIND				
ADEME (France)	\$132,000			-\$132,000				\$0
UNEP	\$68,000							N.A.
<b>Others</b>	\$2,800,000							
<b>TOTAL</b>	\$20,000,000							
NLTC I					\$265,521			\$265,521
NLTC II							\$276,625	\$276,625
AusAid					\$2,547,160			\$2,547,160
BMZ					\$258,732			\$258,732
<b>SUB TOTAL</b>								\$3,348,038
<b>Total costs available</b>	\$20,000,000							\$20,548,038\$
Notes: All figures in US\$								

1. There were 5 budget revisions - one for each year
2. Each year unspent money is reallocated to the next year
3. In 2012, the unspent money was reallocated to 2014.
4. Information regarding cofinancing by BMZ, Ausaid and NLTC is illustrated in table A6 and A7
5. No information is available regarding co-financing provided by UNEP, Osram and Philips for 12.068 million

Source: Budget revisions (2011-2015)

**Table A8: ADDITIONAL LEVERAGED FINANCING: BMZ**

<b>BMZ Funds (in US\$)</b>				
<b>UNEP Codes</b>	<b>Activity</b>	<b>Budget</b>	<b>Expenditure 2013</b>	<b>Expenditure 2014</b>
1201	Field-based Technical expert on Efficient Lighting	\$97,025	\$72,000	
1202	Expert off-grid strategy development	\$25,873	\$51,085	
1601	Travel on official business			\$4,960
2101	Research and report development by UN entity	\$25,873		
2202	ECREE		\$90,000	
3301	Workshops - Regional Consultations	\$90,556		
5201	Reports design, translating and publishing	\$19,405		\$16,635
	<b>Grand Total</b>	<b>\$258,732</b>	<b>\$213,086</b>	<b>\$21,595</b>

Notes: Unspent balance end of 2014 was \$24,051. In 2015 expenditures were \$19,526.14. Balance of \$4,525.26 was to be spent in 2016

Source: EN.LIGHTEN BMZ Annual Report for 2013-2014 and 2014-2015

**Table A9: ADDITIONAL LEVERAGED : AusAid**

<b>Ausaid funds</b>					
	<b>Activity</b>	<b>Budget</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
1	Personnel Component	\$1,017,964	\$69,192	\$570,942	\$377,830
2	Sub-contract component	\$1,128,646		\$657,515	\$471,131
3	Training component	\$58,755			\$58,755
4	Equipment and premises total				
5	Misc. component	\$10,664		\$6,791	\$3,872
	<b>Total</b>	<b>\$2,216,029</b>	<b>\$69,192</b>	<b>\$1,235,248</b>	<b>\$911,859</b>

Source: 5th Budget revision (March 2015)

**Table A10: ADDITIONAL LEVERAGED FINANCING: NLTC**

<b>NLTC Funds</b>							
		<b>Budget</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
1	NLTC phase I	\$265,521	\$23,380	\$211,595	\$0	-\$54,416	\$84,963
2	NLTC phase II	\$276,625				\$130,335	\$146,290

Source: 5th Budget revision (March 2015)

**Table A11: GEF Project Costs by component**

Component/sub-component/output	Estimated cost at design	Actual Cost	Expenditure ratio (actual/planned)
Personnel Component	\$3,080,000	\$ 3,510,150	114%
Sub-contract component	\$300,000	\$ 981,789	327%
Training component	\$800,000	\$298,018	37%
Equipment& premises	\$50,000	-	0%
Misc. component	\$770,000	\$178,708	23%
<b>Total GEF</b>	<b>\$5,000,000</b>	<b>\$4,968,665<sup>171</sup></b>	<b>99.37%</b>

Source: UNEP figures, Expenditure figure as per April 5, 2017

**Table A12: Co-financing and leveraged financing**

Co financing (Type/Source)	UNEP own Financing (US\$1,000)		Government (US\$1,000)		Other (US\$1,000)		Total (US\$1,000)		Total Disbursed (US\$1,000)
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	
Grants	\$68	\$68	N. A.	N.A.			\$68	\$68	\$68
In-kind support: OSRAM and Philip					\$12,000	\$12,000 <sup>172</sup>	\$12,000	\$12,000	\$12,000
Other co-financing – private sector					\$2,800				

<sup>171</sup> Excluding the Terminal Evaluation budget of 50 000 USD

<sup>172</sup> Estimate

Other leveraged financing – Donor Government and Laboratory partner						\$3,348			\$3,348
<b>Totals</b>	<b>\$68</b>	<b>\$68</b>			<b>14,280</b>	<b>13,348</b>			<b>\$15,416</b>

**Table A13. GEF rating table for financial management (compiled by the Evaluation Office)**

Financial management components	Rating	Evidence/ Comments
Attention paid to compliance with procurement rules and regulations	S	Source: questionnaire June 2017 (over all perception concerning compliance was good)
Contact/communication between the PM & FMO	HS	Frequent. Source: questionnaire June 2017
PM & FMO knowledge of the project financials	MS	Generally good but changes in staff and UMOJA transition appeared to have influenced these aspects to certain extent. Source: questionnaire June 2017. Despite the operational closure of the project, it took a long time for the project to provide details regarding the project finances and secure the evaluation budget.
FMO responsiveness to financial requests	U	Major delays in providing the financial details for the evaluation purposes. Delays also in the evaluation budget related issues.
PM & FMO responsiveness to addressing and resolving financial issues	S	Source: questionnaire June 2017
Were the following documents provided to the evaluator:		
A.	An up to date co-financing table	Y/N
B.	A summary report on the projects financial management and expenditures during the life of the project - to date	Y
C.	A summary of financial revisions made to the project and their purpose	Y
D.	Copies of any completed audits	N/A
		Provided late and was not in the component specific format. Private sector co-financing details were not available.
		Provided late
		Provided in time
		Not required for internally executed projects (stakeholder comment).

Availability of project financial reports and audits	MS	Very much delayed
Timeliness of project financial reports and audits	S	Questionnaire (June 2017) did not indicate any major issues
Quality of project financial reports and audits	MS	Lowered due to lack of GEF required outcome level financial reports
FMO knowledge of partner financial requirements and procedures	S	No issues indicated
<b>Overall rating</b>	<b>MS</b>	<b>[Evaluation office rating]</b>

## ANNEX 5: DOCUMENTS CONSULTED

### List of Documents Consulted

#### En.Lighten Documents

- 1 Inception report
- Expenditure reports
- 2 Budget En.lighten;  
Budget Revisions
- 3 March 2011,
- 4 August 2012,
- 5 November 2013,
- 6 July 2014,
- 7 Mar-2015
- Progress reports:
- 8 April 2011 to March 2012;
- 9 April 2012 to March 2013;
- 10 April 2013 to March 2014;
- 11 February 2010 to January 2011;
- 12 January 2011 to December 2011;
- 13 July to December 2015

14 Co-financing report: Budgets in two above state cofinancing amounts. Details only available for BMZ and AUSAID. Not available for Philips and OSRAM.

**Project Implementations Reports:**

15 PIR 2011,

16 PIR 2012,

17 PIR 2013,

18 PIR 2014,

19 PIR 2015

**Annual Submissions to the Project Steering Committee**

20 Powerpoint on plans, First PSC Meeting, Light and Building Fair, Frankfurt, 15 April 2010

21 Minutes of First PSC Meeting

22 Project Steering Committee Members List 2010

23 Invitations to join PSC

24 Progress report, April 2011 – March 2012, for 2<sup>nd</sup> PSC, Washington D.C., 15 April 2011

24 Minutes PSC Meeting 15 April 2011;

25 Project Steering Committee Members List 2011

26 Progress report, April 2012 – March 2013 for Third PSC

27 Minutes PSC Meeting 20-April 2012

28 Progress report, April 2013 – March 2014, PSC of 2014

29 Minutes PSC Meeting April 2014

30 Progress report, April 2014 – March 2015

31 U4E March 2016 – ongoing and hard pipeline

32 Mission reports and "aide memoire":

33 Grants made and contracts

34 Information on OSRAM and Philips

35 Mission report\_Quito Washington 11-16 April 2011

36 Mid-term review or Mid-term evaluation:

37 Mid-term evaluation Inception Report (2 June, 2013);

38 Mid-term evaluation Final Report (12 September 2013)

**Other Documents Reviewed**

- 39 BMZ related documents:  
 40 BMZ Annual Reports (for work done with their financing 2013-2014; 2014-2015);  
 41 ECOWAS Meeting- Development Workshop Reports (July 2013 and October 2013);

**Design documents**

- 42 PIF Phase- Project Identification Form 05 October 2007;  
 43 PPG Phase- Global lighting PPG; PIF;  
 44 Letter-CEO endorsement of the project;  
 45 Letter- request for council approval; ProDoc;  
 46 Request for CEO endorsement-Approval

**Other material**

- 47 Better Partnership report- CISL & Ecofys;  
 48 Better Partnership press release August 2015  
 49 Lites Asia Evaluation

**Project outputs/deliverable**

- 50 CLA assessments and country data from Michael Scholand  
 51 UNEP, Green Paper: Policy Options to Accelerate the Global Transition to Advanced  
 Lighting. November 2014  
 52 CLA for countries over 100  
 53 The ECOWAS Process and Strategy on the Development of the Sustainable Energy for All  
 (SE4ALL) Action Agendas, National Renewable Energy Action Plans (NREAPs) and National  
 Energy Efficiency Action Plans (NEEAPs)  
 54 Complete En.lighten toolkit 2012  
 55 UNEP, Developing Minimum Energy Performance Standards for Lighting Products:  
 Guidance note for Policymakers, June 2015  
 56 En.lighten, Minimum Energy Performance Standards (MEPS) to promote the transition to  
 efficient lighting, 4th November 2011, Singapore  
 57 The Efficient Lighting Toolkit – December 2012, en.lighten webinar  
 58 Philips, Best Practice Guide Collection & Recycling Lamps, 13 December 2012, en.lighten  
 webinar  
 59 AMBILAMP: Recycling System Organization (CRSO) for light in Spain 2005- 2012, December  
 2012, en.lighten webinar

- 60 Final expenditure Statement
- 61 Mission Report en.lighten Indonesia August 2014
- 62 Mission report\_Fiji\_29-29 May 2014
- 63 Mission report\_Jordan\_6-9 Jul 2013
- 64 Mission Report\_Kuala Lumpur\_21-25 Apr 2014
- 65 Mission report\_Last\_Mile & Ethiopia\_Dec 2013
- 66 Mission report\_Ouagadougou\_20-24 Apr 2013
- 67 Mission report\_Tunis\_18-21 Jun 2013
- 68 Mission report\_Tunisia\_25-28 Nov 2013
- 69 2010\_Cancun COP OSRAM Philips
- 70 GELC\_SSFA
- 71 SSFA\_Fundacion Chile
- 72 Regional Expert Workshop on “ Technology Transfer in Energy and Efficient Lighting to Combat Climate Change .” (2011, September)
- 73 Assessment of Opportunities for Global Harmonization of Minimum Energy Performance Standards Collaborative Labeling and Appliance Standards Program - CLASP in Partnership with en.lighten, 2011, June
  
- 74 Closing the loop: Implementing a sustainable collection and recycling solution for Lighting products, Rob Koppejan, November 2014

**Other: references cited and documents reviewed:**

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- 2 Ana María Ruz, Fundación Chile– Chile: National Efficient Lighting Strategy (ENIE), 2013 – 2017, at <http://www.enlighten-initiative.org/GlobalForum/Program/Presentations.aspx>
- 3 Basel Convention Coordinating Centre, (BCCC-SCRC-Uruguay), WORK PLAN (2016 - 2019), Date: 30 September 2015.
- 4 Bensch, G., Peters, J., & Sievert, M. (2015). The Lighting Transition in Africa – From Kerosene to LED and the Emerging Dry-Cell Battery Problem.
- 5 Bergesen, J. D., and others, 2016. Potential Long-Term Global Environmental Implications of Efficient Light-Source Technologies. *Journal of Industrial Ecology*, 20(2), 263–275.

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- 11 Carolina Mena, MIEM, 2012. Proyecto de Eficiencia Energética Uruguay, Uruguay, 9 May, 2012.
- 12 Carolina Mena, MIEM, 2016. National strategy for Efficient and sustainable lighting, Carolina Mena, Secretary of Energy – MIEM, December 4, 2013 - August 29, 2016.
- 13 Castro-de-la-mata, G., Leader, T., Bechraoui, N., & Consultant, S. (2013). MID-TERM EVALUATION.
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## ANNEX 6: STAKEHOLDERS INTERVIEWED

No	Name	Organization and Role
1	Jonathan Duwyn	UNEP, Project manager U4E-en.lighten Initiative
2	Patrick Blake	UNEP, Policy Expert U4E-en.lighten Initiative
3	Olola Vierya Mifsud	UNEP, en.lighten Africa Coordinator
4	Julien Lheureux	UNEP/GEF Climate Change Mitigation Unit
5	Zitouni Ould-Dada	UNEP, Head Technology Unit
6	Mark Radka	UNEP, Chief Energy Climate and Technology Branch
7	Zura Nukusheva	Former en.lighten consultant (2010-2013)
8	Ruth Coutto	UNEP/GEF Climate Change Mitigation Unit Task Manager
9	Tania Daccarett Pinzás	UNEP/GEF Climate Change Mitigation Unit
10	Eric Yang	UNEP, Country cases en.lighten and U4E
11	Bozhil Kondev	Energy Advisor, HERA, GIZ
12	Martin Bachler	Global Communication & Brand Strategy, OSRAM
13	Stéphane Himber	Governmental Affairs OSRAM GmbH
14	Frank Hohn	OSRAM GmbH
15	Andreas Adam	OSRAM GmbH
16	Harry Verhaar	Philips Lighting
17	Rolf Smeets	Philips Lighting
18	Michael Scholand	UNEP Consultant, Data and country analysis, en.lighten
19	Gustavo Manez Gomis	UNEP, Project manager (2010-2014), en.lighten
20	Ali Mir	BMZ
21	David Boughey	Assistant Manager, Lighting and Communications Efficiency Branch, Energy Division, Department of Industry, Innovation and Science, Australia
22	Michael Bender	Director, Mercury Policy Project (SmallScale Funding Agreement with en.lighten) and Coordinator, Zero Mercury Working Group
<b>China</b>		
23	Jing Wang	Project Manager, Global Efficient Lighting Centre
24	Shuming Hua	Director, Global Efficient Lighting Centre
25	Nanqing Jiang	PMO; UNEP China
26	Rong Rong	Project Assoc.; UNEP China
27	Carsten Germer	UNDP

28	Yue Teng	UNDP
29	Wang Zuguang	Foreign Economic Coopn Office, Min of Env Protection
30	Han Xu	Mercury Convention Implementation Divn, Min of Env Protection
31	Li Pengcheng	Energy Conserv. Group, Resources & Env. Branch, China National Inst of Standardization (CNIS); and, Admin Quality Supervision Inspection Quarantine (AQSIQ)

### **Chile**

	Enrique Garcia	Divn. Planification
33	Elena Chifflet	Divn. Planification
34	Ricardo Cramer	Coordinador de Control Ambiental. Gerencia de Medio Ambiente (GMA)
35	Marcelo Padilla	Division de Eficiencia Energetica, Ministerio de Energia
36	Ana Maria Ruz	Fundación Chile
37	Karien Volker	Fundación Chile
38	Astrid Hanrot	Fundación Chile
39	Francisco Leiva	Fundación Chile

### **Uruguay**

40	Carolina Mena	Área de Demanda, Acceso y Eficiencia Energética, MIEM
41	Beatriz Olivet	Asesora Dirección Nacional de Energía, MIEM
42	Griselda Castagnino	Coordinadora Proyecto Mercurio, DINAMA
43	Anahir Cenoz	Asistente Proyecto Mercurio, DINAMA
44	Judith Torres	Jefe de Departamento Control de Cadenas Productivas, flujo de Residuos y Sustancias. DINAMA
45	Magdalena Preve	Unidad de Políticas y Programa, PNUD
46	José Dallo	Director Oficina Subregional para el Cono Sur, UNEP
47	Claudia Cabal	Gerente de la Unidad de Gestión Ambiental, UTE
48	Ricardo Kramer	Subgerente de la Unidad de Gestión Ambiental, UTE
49	Juan Carlos Patrone	Gerente de Mercado, UTE
50	Marcelo Gonzalez	Gerente de Sector Eficiencia Energética, UTE
51	Gabriela Medina	Directora, BCCC-SCRC, LATU
52	Virginia Santana	Asistente, , BCCC-SCRC, LATU

## ANNEX 7: TERMS OF REFERENCE OF THE EVALUATION

### 1. Objective and Scope of the Evaluation

1) In line with the UNEP Evaluation Policy<sup>173</sup> and the UNEP Programme Manual<sup>174</sup>, the Terminal Evaluation is undertaken at completion of the project to assess project performance (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from the project, including their sustainability. The evaluation has two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote operational improvement, learning and knowledge sharing through results and lessons learned among UNEP and the partners.

2) A proposal for the second phase of the initiative has been developed and approved under the fifth GEF cycle. Based on the lessons learned from the on-going initiative the next phase is designed to have a global component together with country specific components (co-implemented in partnership with UNDP). The next phase will also expand the sectors of work beyond lighting to address energy efficiency in other appliances and equipment, such as air conditioners, refrigerators, electric motors, or distribution transformers. This evaluation will identify lessons of operational relevance and consider how these should be taken into account in the implementation of the next phase.

3) It will focus on the following sets of **key questions**, based on the project's intended outcomes, which may be expanded by the consultant as deemed appropriate:

- (b) To what extent there is evidence on the progress in commercialization and market development of energy-efficient lighting technologies? To what extent the progress in this area can be attributed to project interventions?
- (c) To what extent the participating countries and regions have agreed on the road-map to transform lighting markets? How does this progress contribute to the overall project goal?
- (d) Is the Centre of Excellence operational and does it effectively support the overall project objectives? To what extent the produced publications/toolkits/guidelines have been utilized in the country and regional level? What are the reasons for successful/unsuccessful uptake of findings/recommendations/analysis?
- (e) How effective were the capacity building efforts by the project among the programme countries and regions? To what extent the global components of the project contributed in the capacity building in the national and regional level?
- (f) To what extent the project intervention has been relevant to the UNEP mandate, comparative advantages and priorities? To what extent the project is aligned with GEF priorities and built on the lessons from earlier GEF funded projects in this area?

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<sup>173</sup> <http://www.unep.org/eou/StandardsPolicyandPractices/UNEPEvaluationPolicy/tabid/3050/language/en-US/Default.aspx>

<sup>174</sup> [http://www.unep.org/QAS/Documents/UNEP\\_Programme\\_Manual\\_May\\_2013.pdf](http://www.unep.org/QAS/Documents/UNEP_Programme_Manual_May_2013.pdf)

- (g) How well has the project been linked to and coordinates with other global, regional and national initiatives with regard to the promotion and market transformation towards efficient lighting?
- (h) To what extent the project deliverables (outputs, publications, country assessments and studies, regulatory tools, partnerships, networks etc.) can be utilized further during the next phases of the project? How can the sustainability of project achievements be ensured?

## 2. Overall Approach and Methods

4) The Terminal Evaluation of the Project will be conducted by an independent consultant under the overall responsibility and management of the UNEP Evaluation Office in consultation with the UNEP Task Manager and the Sub-programme Coordinators of the UNEP Division of Technology, Industry and Economics (DTIE).

5) It will be an in-depth evaluation using a participatory approach whereby key stakeholders are kept informed and consulted throughout the evaluation process. Both quantitative and qualitative evaluation methods will be used to determine project achievements against the expected outputs, outcomes and impacts. It is highly recommended that the consultant(s) maintains close communication with the project team and promotes information exchange throughout the evaluation implementation phase in order to increase their (and other stakeholder) ownership of the evaluation findings.

6) The findings of the evaluation will be based on the following:

(a) A **desk review** of:

- Relevant background documentation, such as the UNEP Medium-term Strategy 2010-2013 and 2014-2017 and Programmes of Work
- Project design documents (including minutes of the project design review meeting at approval); Annual Work Plans and Budgets or equivalent, revisions to the project (Project Document Supplement), the logical framework and its budget;
- Project reports such as Project Implementation Reports (PIRs), six-monthly progress and financial reports, progress reports from collaborating partners, meeting minutes, relevant correspondence etc.;
- Project outputs/publications, such as strategies and policies developed by partner countries and regional integration bodies, technical publications, guides and toolkits, reports, webinars, videos, country lighting assessments, policy and regulatory maps, workshop reports, etc.
- Mid-term evaluation report of the global market transformation for efficient lighting (en.lighten) (September 2013)
- Other evaluations/reviews of similar projects
- Project proposal for the follow-up initiatives under GEF 5 and GEF 6.
- National GEF proposals supported by the project team under GEF 5 and GEF 6.
- Funding proposals submitted to other donors (Australia, Germany).
- Reports produced by technical institutions and academia which have analyzed the project or some of its components (e.g. Cambridge University & Ecofys report on cooperative initiatives).

(b) **Interviews (individual or in group) with:**

- UNEP Task Manager
- Project management team
- UNEP Fund Management Officer

- Project partners, including but not limited to: GEF Secretariat, Philips, Osram, Global Efficient Lighting Center, ECOWAS-ECREEE, Proyecto Mesoamerica, Secretariat of the Pacific Community, Southern African Power Pool, Eskom, Government of Australia, IPEEC, IEA, and UNDP.
  - Other relevant resource persons;
- (c) **Survey** (will be specified during the inception phase)
- (d) **Evaluation missions** to meet the project team in Paris, partners at Osram and Philips (assumed travel locations are Munich and Amsterdam), ECOWAS-ECREEE in Praia (Cabo Verde), Proyecto Mesoamerica in San Salvador (El Salvador), and partners in Tunis and Chile. *[to ensure sufficient geographical coverage a visit to one of the partner countries in Asia will be an option, this will be discussed and agreed during the inception phase if deemed necessary]*
- (e) **Other data collection tools**

### 3. Key Evaluation principles

7) Evaluation findings and judgements should be based on **sound evidence and analysis**, clearly documented in the evaluation report. Information will be triangulated (i.e. verified from different sources) to the extent possible, and when verification was not possible, the single source will be mentioned. Analysis leading to evaluative judgements should always be clearly spelled out.

8) The evaluation will assess the project with respect to a **minimum set of evaluation criteria** grouped in five categories: (1) Strategic Relevance; (2) Attainment of objectives and planned result, which comprises the assessment of outputs achieved, effectiveness and likelihood of impact; (3) Sustainability and replication; (4) Efficiency; and (5) Factors and processes affecting project performance, including preparation and readiness, implementation and management, stakeholder participation and public awareness, country ownership and driven-ness, financial planning and management, UNEP supervision and backstopping, and project monitoring and evaluation. The evaluation consultant can propose other evaluation criteria as deemed appropriate.

9) **Ratings.** All evaluation criteria will be rated on a six-point scale. Annex 3 provides guidance on how the different criteria should be rated and how ratings should be aggregated for the different evaluation criterion categories.

10) **Baselines and counterfactuals.** In attempting to attribute any outcomes and impacts to the project intervention, the evaluators should consider the difference between *what has happened with, and what would have happened without, the project*. This implies that there should be consideration of the baseline conditions, trends and counterfactuals in relation to the intended project outcomes and impacts. It also means that there should be plausible evidence to attribute such outcomes and impacts to the actions of the project. Sometimes, adequate information on baseline conditions, trends or counterfactuals is lacking. In such cases this should be clearly highlighted by the evaluators, along with any simplifying assumptions that were taken to enable the evaluator to make informed judgements about project performance.

11) **The “Why?” Question.** As this is a terminal evaluation and a follow-up project has been developed and granted with funding (GEF 5), and a second one has been submitted for GEF consideration (GEF 6), particular attention should be given to learning from the experience. Therefore, the “Why?” question should be at the front of the consultant’s minds all through the evaluation exercise. This means that the consultant needs to go beyond the assessment of “what” the project performance was, and make a

serious effort to provide a deeper understanding of “why” the performance was as it was, i.e. of processes affecting attainment of project results (criteria under category F – see below) or sustainability. This should provide the basis for the lessons that can be drawn from the project. In fact, the usefulness of the evaluation will be determined to a large extent by the capacity of the consultant to explain “why things happened” as they happened and are likely to evolve in this or that direction, which goes well beyond the mere review of “where things stand” at the time of evaluation.

12) A key aim of the evaluation is to **encourage reflection and learning by UNEP staff and key project stakeholders**. The consultant should consider how reflection and learning can be promoted, both through the evaluation process and in the communication of evaluation findings and key lessons. Special attention should be paid communicating and reflecting the lessons learned to serve the implementation of the upcoming initiatives.

13) **Communicating evaluation results**. Once the consultant(s) has obtained evaluation findings, lessons and results, the Evaluation Office will share the findings and lessons with the key stakeholders. Evaluation results should be communicated to the key stakeholders in a brief and concise manner that encapsulates the evaluation exercise in its entirety. There may, however, be several intended audiences, each with different interests and preferences regarding the report. The Evaluation Manager will plan with the consultant(s) which audiences to target and the easiest and clearest way to communicate the key evaluation findings and lessons to them. This may include some or all of the following; a webinar, conference calls with relevant stakeholders, the preparation of an evaluation brief or interactive presentation.

## 4. Evaluation criteria

### A. Strategic relevance

14) The evaluation will assess, in retrospect, whether the project’s objectives and implementation strategies were consistent with global, regional and national environmental issues and needs.

15) The evaluation will assess whether the project was in-line with the GEF’s focal area on Climate Change and its strategic priorities and operational programme(s).

16) The evaluation will also assess the project’s relevance in relation to UNEP’s mandate and its alignment with UNEP’s policies and strategies at the time of project approval. UNEP’s Medium Term Strategy (MTS) is a document that guides UNEP’s programme planning over a four-year period. It identifies UNEP’s thematic priorities, known as Sub-programmes (SP), and sets out the desired outcomes [known as Expected Accomplishments (EAs)] of the Sub-Programmes. The evaluation will assess whether the project makes a tangible/plausible contribution to any of the EAs specified in the MTS 2010-2013 and 2014-2017. The magnitude and extent of any contributions and the causal linkages should be fully described.

- The evaluation should assess the project’s alignment / compliance with UNEP’s policies and strategies. The evaluation should provide a brief narrative of the following:

- a) *Alignment with the Bali Strategic Plan (BSP)*<sup>175</sup>. The outcomes and achievements of the project should be briefly discussed in relation to the objectives of the UNEP BSP.

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<sup>175</sup> <http://www.unep.org/GC/GC23/documents/GC23-6-add-1.pdf>

- b) *Gender balance*. Ascertain to what extent project design, implementation and monitoring have taken into consideration: (i) possible gender inequalities in access to and the control over natural resources; (ii) specific vulnerabilities of women and children to environmental degradation or disasters; and (iii) the role of women in mitigating or adapting to environmental changes and engaging in environmental protection and rehabilitation. Are the project intended results contributing to the realization of international GE (Gender Equality) norms and agreements as reflected in the UNEP Gender Policy and Strategy, as well as to regional, national and local strategies to advance HR & GE? To what extent the toolkits and guidelines produced by the project are taking into account gender aspects?
  - c) *Human rights based approach (HRBA) and inclusion of indigenous peoples issues, needs and concerns*. Ascertain to what extent the project has applied the UN Common Understanding on HRBA. Ascertain if the project is in line with the UN Declaration on the Rights of Indigenous People, and pursued the concept of free, prior and informed consent.
  - d) *South-South Cooperation (SSC)*. This is regarded as the exchange of resources, technology, and knowledge between developing countries. Briefly describe any aspects of the project that could be considered as examples of South-South Cooperation. Also consider whether in the next phase of the project the SSC aspects could be enhanced.
  - e) *Safeguards*. Whether the project has adequately considered environmental, social and economic risks and established whether they were vigilantly monitored. Was the safeguard management instrument completed and were UNEP ESES requirements complied with?
- 17) Based on an analysis of project stakeholders, the evaluation should assess the relevance of the project intervention to key stakeholder groups.

## B. Achievement of Outputs

- 18) The evaluation will assess the outputs as presented in Table 2 above, both in quantity and quality, as well as their usefulness and timeliness.
- 19) The evaluation will take into account the revisions of the project log frame and its outputs and indicators (if applicable).
- 20) Evaluation will assess and explain the reasons behind the success (or failure) of the project in producing its different outputs and meeting expected quality standards, cross-referencing as needed to more detailed explanations provided under Section F (which covers the processes affecting attainment of project results). It will also assess to what extent the key stakeholders and country partners were involved in producing the outputs.

## C. Effectiveness: Attainment of Objectives and Planned Results

- 21) The evaluation will assess the extent to which the project's objectives were effectively achieved or are expected to be achieved.
- 22) The **Theory of Change** (ToC) of a project depicts the causal pathways from project outputs (goods and services delivered by the project) through outcomes (changes resulting from the use made by key stakeholders of project outputs) towards impact (long term changes in environmental benefits and living conditions). The ToC will also depict any intermediate changes required between project outcomes and impact, called 'intermediate states'. The ToC further defines the external factors that influence change along the major pathways; i.e. factors that affect whether one result can lead to the next. These external factors are either drivers (when the project has a certain level of control) or assumptions (when the project has no control). The ToC also clearly identifies the main stakeholders involved in the change processes.

23) The evaluation will reconstruct the ToC of the project based on a review of project documentation and stakeholder interviews. The evaluator will be expected to discuss the reconstructed TOC with the stakeholders during evaluation missions and/or interviews in order to ascertain the causal pathways identified and the validity of impact drivers and assumptions described in the TOC. This exercise will also enable the consultant to address some of the key evaluation questions and make adjustments to the TOC as appropriate (the ToC of the intervention may have been modified / adapted from the original design during project implementation).

24) The assessment of effectiveness will be structured in three sub-sections:

- (a) Evaluation of the **achievement of outcomes as defined in the reconstructed ToC**. These are the first-level outcomes expected to be achieved as an immediate result of project outputs. The main question will be to what extent the project has contributed to immediate outcomes as specified in the table 2, to what extent the outputs have been relevant to achieve the outcomes.
- (b) Assessment of the **likelihood of impact** using a Review of Outcomes to Impacts (ROtI) approach<sup>176</sup>. The evaluation will assess to what extent the project has to date contributed, and is likely in the future to further contribute, to reduced global greenhouse gas emissions as well as mercury releases. It will also assess the likelihood that those changes in turn lead to positive changes in the natural resource base, benefits derived from the environment and human well-being. The evaluation will also consider the likelihood that the intervention may lead to unintended negative effects that could be related environmental, social, and economic aspect.
- (c) Evaluation of the **achievement of the formal project overall objective, overall purpose, goals and component outcomes** using the project's own results statements as presented in the Project Document<sup>177</sup>. This sub-section will refer back where applicable to the preceding sub-sections (a) and (b) to avoid repetition in the report. To measure achievement, the evaluation will use as much as appropriate the indicators for achievement proposed in the Logical Framework (Logframe) of the project, adding other relevant indicators as appropriate. Briefly explain what factors affected the project's success in achieving its objectives, cross-referencing as needed to more detailed explanations provided under Section F. Most commonly, the overall objective is a higher level result to which the project is intended to contribute. The section will describe the actual or likely **contribution** of the project to the objective.
- (d) The evaluation should, where possible, disaggregate outcomes and impacts for the key project stakeholders. It should also assess the extent to which HR and GE were integrated in the Theory of Change and results framework of the intervention and to what degree participating institutions/organizations changed their policies or practices thereby leading to the fulfilment of HR and GE principles (e.g. new services, greater responsiveness, resource re-allocation, etc.)

#### D. Sustainability and replication

25) Sustainability is understood as the probability of continued long-term project-derived results and impacts after the external project funding and assistance ends. The evaluation will identify and assess the key conditions or factors that are likely to undermine or contribute to the persistence of benefits.

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<sup>176</sup> Guidance material on Theory of Change and the ROtI approach is available from the Evaluation Office.  
<sup>177</sup> Or any subsequent **formally approved** revision of the project document or logical framework.

Some of these factors might be direct results of the project while others will include contextual circumstances or developments that are not under control of the project but that may condition the sustainability of benefits. The next phase of the project has been developed and approved by the GEF Secretariat (GEF 5). This particular evaluation should ascertain to what extent follow-up work has been initiated and how project results will be sustained and enhanced in the next phase and over time.

26) The reconstructed ToC will assist in the evaluation of sustainability, as the drivers and assumptions required to achieve higher-level results are often similar to the factors affecting sustainability of these changes.

27) Four aspects of sustainability will be addressed:

- (a) *Socio-political sustainability.* Are there any social or political factors that may influence positively or negatively the sustenance of project results and progress towards impacts? Is the level of ownership by the main stakeholders sufficient to allow for the project results to be sustained? Are there sufficient government and other key stakeholder awareness, interests, commitment and incentives to [add as relevant]? Did the project conduct 'succession planning' and implement this during the life of the project? Was capacity building conducted for key stakeholders? Did the intervention activities aim to promote (and did they promote) positive sustainable changes in attitudes, behaviours and power relations between the different stakeholders? To what extent has the integration of HR and GE led to an increase in the likelihood of sustainability of project results?
- (b) *Financial resources.* To what extent are the continuation of project results and the eventual impact of the project dependent on financial resources? What is the likelihood that adequate financial resources<sup>178</sup> will be or will become available to use capacities built by the project? Are there any financial risks that may jeopardize sustenance of project results and onward progress towards impact?
- (c) *Institutional framework.* To what extent is the sustenance of the results and onward progress towards impact dependent on issues relating to institutional frameworks and governance? How robust are the institutional achievements such as governance structures and processes, policies, sub-regional agreements, legal and accountability frameworks etc. required to sustaining project results and to lead those to impact on human behaviour and environmental resources, goods or services?
- (d) *Environmental sustainability.* Are there any environmental factors, positive or negative, that can influence the future flow of project benefits? Are there any project outputs or higher level results that are likely to affect the environment, which, in turn, might affect sustainability of project benefits? Are there any foreseeable negative environmental impacts that may occur as the project results are being up-scaled?

28) **Catalytic role and replication.** The *catalytic role* of UNEP interventions is embodied in their approach of supporting the creation of an enabling environment and of investing in pilot activities which are innovative and showing how new approaches can work. UNEP also aims to support activities that upscale new approaches to a national, regional or global level, with a view to achieve sustainable global environmental benefits. The evaluation will assess the catalytic role played by this project, namely to what extent the project has:

- (a) *catalyzed behavioural changes* in terms of use and application of capacities developed, by the relevant stakeholders especially in the country and regional level;

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<sup>178</sup> Those resources can be from multiple sources, such as the national budget, public and private sectors, development assistance etc.

- (b) provided *incentives* (social, economic, market based, competencies etc.) to contribute to catalyzing changes in stakeholder behavior in the country and regional level;
- (c) contributed to *institutional changes*, for instance institutional uptake of project-demonstrated technologies or models, practices or management approaches;
- (d) contributed to *policy changes* (on paper and in implementation of policy) in industry and country/regional level;
- (e) contributed to sustained follow-on financing (*catalytic financing*) from Governments, donors, and especially from private sector;
- (f) created opportunities for particular individuals or institutions ("*champions*") to catalyze change (without which the project would not have achieved all of its results).

29) *Replication* is defined as lessons and experiences coming out of the project that are replicated (experiences are repeated and lessons applied in different market or industry sector) or scaled up (experiences are repeated and lessons applied in the same market area but on a much larger geographical scale and funded by other sources). The evaluation will assess the approach adopted by the project to promote replication effects and determine to what extent actual replication has already occurred, or is likely to occur in the near future. What are the factors that may influence replication and scaling up of project experiences, lessons and implementation approaches?

### E. Efficiency

30) The evaluation will assess the cost-effectiveness and timeliness of project execution. It will describe any cost- or time-saving measures put in place in attempting to bring the project as far as possible in achieving its results within its budget and time. It will assess how the established partnerships with the governments, private sector, and other stakeholders have advanced the efficiency of the project.

31) The evaluation will give special attention to efforts by the project team to make use of pre-existing institutions, agreements, data sources, synergies and complementarities with other initiatives, programmes and projects etc. to increase project efficiency. This evaluation will in particular assess the cooperation with regional integration bodies, national governments, Sustainable Energy for All (SE4ALL) initiative and private sector cooperation in terms of information and resource exchange.

32) It will also analyse how delays, if any, have affected project execution, costs and effectiveness. Wherever possible, costs and time over results ratios of the project will be compared with that of other similar interventions. The evaluation will also pay attention to what extent the extensive participation by government (66 participating countries) improved/reduced project efficiency. The evaluation will also assess the extent to which HR and GE were allocated specific and adequate budget in relation to the results achieved.

### F. Factors and processes affecting project performance

33) **Preparation and readiness.** This criterion focusses on the quality of project design and preparation. Were project stakeholders<sup>179</sup> adequately identified and were they sufficiently involved in project development and ground truthing e.g. of proposed timeframe and budget? Were the project's objectives and components clear, practicable and feasible within its timeframe? Are potentially negative environmental, economic and social impacts of projects identified? Were the capacities of executing agencies properly considered when the project was designed? Was the project document clear and

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<sup>179</sup> Stakeholders are the individuals, groups, institutions, or other bodies that have an interest or 'stake' in the outcome of the project. The term also applies to those potentially adversely affected by the project.

realistic to enable effective and efficient implementation? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project implementation? Were counterpart resources (funding, staff, and facilities) and enabling legislation assured? Were adequate project management arrangements in place? Were lessons from other relevant projects properly incorporated in the project design? What factors influenced the quality-at-entry of the project design, choice of partners, allocation of financial resources etc.? Were any design weaknesses mentioned in the Project Review Committee minutes at the time of project approval adequately addressed?

34) **Project implementation and management.** This includes an analysis of implementation approaches used by the project, its management framework, the project's adaptation to changing conditions and responses to changing risks including safeguard issues (adaptive management), the performance of the implementation arrangements and partnerships, relevance of changes in project design, and overall performance of project management. The evaluation will:

- (a) Ascertain to what extent the project implementation mechanisms outlined in the project document have been followed and were effective in delivering project milestones, outputs and outcomes. Were pertinent adaptations made to the approaches originally proposed?
- (b) Evaluate the effectiveness and efficiency of project management and how well the management was able to adapt to changes during the life of the project.
- (c) Assess the role and performance of the teams and working groups established and the project execution arrangements at all levels.
- (d) Assess the extent to which project management responded to direction and guidance provided by the UNEP Task Manager and project steering bodies.
- (e) Identify operational and political / institutional problems and constraints that influenced the effective implementation of the project, and how the project tried to overcome these problems.

35) **Stakeholder participation, cooperation and partnerships.** The Evaluation will assess the effectiveness of mechanisms for information sharing and cooperation with other UNEP projects and programmes, external stakeholders and partners. The term stakeholder should be considered in the broadest sense, encompassing both project partners and target users (such as governments and regional integration bodies of project products). The TOC and stakeholder analysis should assist the evaluators in identifying the key stakeholders and their respective roles, capabilities and motivations in each step of the causal pathways from activities to achievement of outputs, outcomes and intermediate states towards impact. The assessment will look at three related and often overlapping processes: (1) information dissemination to and between stakeholders, (2) consultation with and between stakeholders, and (3) active engagement of stakeholders in project decision making and activities. The evaluation will specifically assess:

- (a) the approach(es) and mechanisms used to identify and engage stakeholders (within and outside UNEP) in project design and at critical stages of project implementation. What were the strengths and weaknesses of these approaches with respect to the project's objectives and the stakeholders' motivations and capacities?
- (b) How was the overall collaboration between different functional units of UNEP involved in the project? What coordination mechanisms were in place? Were the incentives for internal collaboration in UNEP adequate?
- (c) Was the level of involvement of the Regional, Liaison and Out-posted Offices in project design, planning, decision-making and implementation of activities appropriate?

- (d) Has the project made full use of opportunities for collaboration with other projects and programmes including opportunities not mentioned in the Project Document<sup>180</sup>? Have complementarities been sought, synergies been optimized and duplications avoided?
- (e) What was the achieved degree and effectiveness of collaboration and interactions between the various project partners and stakeholders during design and implementation of the project? This should be disaggregated for the main stakeholder groups identified in the inception report.
- (f) To what extent has the project been able to take up opportunities for joint activities, pooling of resources and mutual learning with other organizations and networks? In particular, how useful are partnership mechanisms and initiatives such as the Global Efficient Lighting Center, the Ambilamp Academy, REGATTA, or the Global Lighting Challenge of the Clean Energy Ministerial to build stronger coherence and collaboration between participating organisations?
- (g) How did the relationship between the project and the collaborating partners (institutions and individual experts) develop? Which benefits stemmed from their involvement for project performance, for UNEP and for the stakeholders and partners themselves? Do the results of the project (strategic programmes and plans, monitoring and management systems, sub-regional agreements etc.) promote participation of stakeholders, including users, in environmental decision making?

36) **Communication and public awareness.** The evaluation will assess the effectiveness of any public awareness activities that were undertaken during the course of implementation of the project to communicate the project's objective, progress, outcomes and lessons. This should be disaggregated for the main stakeholder groups identified in the inception report. Did the project identify and make use of existing communication channels and networks used by key stakeholders? Did the project provide feedback channels?

37) **Country ownership and driven-ness.** The evaluation will assess the degree and effectiveness of involvement of government / public sector agencies in the project, in particular those involved in project execution and those participating in the en.lighten initiative and its steering committee:

- (a) To what extent have Governments assumed responsibility for executing agreements to establish policies by the end of 2016 that would phase out inefficient incandescent lamps (an aspirational target established by the en.lighten Project Steering Committee)
- (b) To what extent the Governments and Regional Integration Agencies of the pilot countries, or regions, receiving technical assistance assumed responsibility for the project and set targets
- (c) To what extent the Governments and Regional Integration Agencies, provided support to project execution, including the degree of cooperation received from the various public institutions involved in the project?
- (d) How and how well did the project stimulate country or regional ownership of project outputs and outcomes? What could be done by the project to enhance the country ownership?

38) **Financial planning and management.** Evaluation of financial planning requires assessment of the quality and effectiveness of financial planning and control of financial resources throughout the project's lifetime. The assessment will look at actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co-financing. The evaluation will:

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<sup>180</sup> [If the ProDoc mentions any opportunities for collaboration with other projects and programmes, present these here in the footnote]

- (a) Verify the application of proper standards (clarity, transparency, audit etc.) and timeliness of financial planning, management and reporting to ensure that sufficient and timely financial resources were available to the project and its partners;
  - (b) Assess other administrative processes such as recruitment of staff, procurement of goods and services (including consultants), preparation and negotiation of cooperation agreements etc. to the extent that these might have influenced project performance;
  - (c) Present the extent to which co-financing has materialized as expected at project approval (see Table 1). Report country co-financing to the project overall, and to support project activities at the national level in particular. The evaluation will provide a breakdown of final actual costs and co-financing for the different project components (see tables in Annex 4).
  - (d) Describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project's ultimate objective. Leveraged resources are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO's, foundations, governments, communities or the private sector.
- 39) Analyse the effects on project performance of any irregularities in procurement, use of financial resources and human resource management, and the measures taken UNEP to prevent such irregularities in the future. Determine whether the measures taken were adequate.
- 40) **Supervision, guidance and technical backstopping.** The purpose of supervision is to verify the quality and timeliness of project execution in terms of finances, administration and achievement of outputs and outcomes, in order to identify and recommend ways to deal with problems which arise during project execution. Such problems may be related to project management but may also involve technical/institutional substantive issues in which UNEP has a major contribution to make.
- 41) The evaluators should assess the effectiveness of supervision, guidance and technical support provided by the different supervising/supporting bodies including:
- (a) The adequacy of project supervision plans, inputs and processes;
  - (b) The realism and candour of project reporting and the emphasis given to outcome monitoring (results-based project management);
  - (c) How well did the different guidance and backstopping bodies play their role and how well did the guidance and backstopping mechanisms work? What were the strengths in guidance and backstopping and what were the limiting factors?
- 42) **Monitoring and evaluation.** The evaluation will include an assessment of the quality, application and effectiveness of project monitoring and evaluation plans and tools, including an assessment of risk management based on the assumptions and risks identified in the project document. The evaluation will assess how information generated by the M&E system during project implementation was used to adapt and improve project execution, achievement of outcomes and ensuring sustainability. M&E is assessed on three levels:
- (a) *M&E Design.* The evaluators should use the following questions to help assess the M&E design aspects:
    - Arrangements for monitoring: Did the project have a sound M&E plan to monitor results and track progress towards achieving project objectives? Have the responsibilities for M&E activities been clearly defined? Were the data sources and data collection instruments appropriate? Was the time frame for various M&E activities specified? Was the frequency of various monitoring activities specified and adequate?
    - How well was the project logical framework (original and possible updates) designed as a planning and monitoring instrument?

- SMART-ness of indicators: Are there specific indicators in the logframe for each of the project objectives? Are the indicators measurable, attainable (realistic) and relevant to the objectives? Are the indicators time-bound?
  - Adequacy of baseline information: To what extent has baseline information on performance indicators been collected and presented in a clear manner? Was the methodology for the baseline data collection explicit and reliable? For instance, was there adequate baseline information on pre-existing accessible information on global and regional environmental status and trends, and on the costs and benefits of different policy options for the different target audiences? Was there sufficient information about the assessment capacity of collaborating institutions and experts etc. to determine their training and technical support needs?
  - To what extent did the project engage key stakeholders in the design and implementation of monitoring? Which stakeholders (from groups identified in the inception report) were involved? If any stakeholders were excluded, what was the reason for this? Was sufficient information collected on specific indicators to measure progress on HR and GE (including sex-disaggregated data)?
  - Did the project appropriately plan to monitor risks associated with Environmental Economic and Social Safeguards?
  - Arrangements for evaluation: Have specific targets been specified for project outputs? Has the desired level of achievement been specified for all indicators of objectives and outcomes? Were there adequate provisions in the legal instruments binding project partners to fully collaborate in evaluations?
  - Budgeting and funding for M&E activities: Determine whether support for M&E was budgeted adequately and was funded in a timely fashion during implementation.
- (b) *M&E Plan Implementation.* The evaluation will verify that:
- the M&E system was operational and facilitated timely tracking of results and progress towards projects objectives throughout the project implementation period;
  - PIR reports were prepared (the realism of the Task Manager's assessments will be reviewed)
  - Half-yearly Progress & Financial Reports were complete and accurate;
  - Risk monitoring (including safeguard issues) was regularly documented
  - the information provided by the M&E system was used during the project to improve project performance and to adapt to changing needs.

## **G. The Consultants' Team**

43) The evaluation team will consist of one independent evaluation consultant. Details about the specific role and responsibilities of the consultant are presented in Annex 1 of these TORs. The consultant should have extensive evaluation experience, including of large, regional or global programmes and using a Theory of Change approach; and a broad understanding of large-scale, consultative assessment processes and factors influencing use of assessments and/or scientific research for decision-making.

44) The consultant will be responsible for data collection and analysis, and the preparation of the evaluation report, and to ensure that all evaluation criteria and questions are adequately covered.

45) By undersigning the service contract with UNEP/UNON, the consultant certifies that s/he have not been associated with the design and implementation of the project in any way which may jeopardize their independence and impartiality towards project achievements and project partner performance. In

addition, they will not have any future interests (within six months after completion of the contract) with the project's executing or implementing units.

## H. Evaluation Deliverables and Review Procedures

46) The consultant will prepare an **inception report** (see Annex 2(a) of TORs for Inception Report outline) containing a thorough review of the project context, project design quality; a draft reconstructed Theory of Change of the project, the evaluation framework and a tentative evaluation schedule.

47) It is expected that a large portion of the desk review will be conducted during the inception phase. It will be important to acquire a good understanding of the project context, design and process at this stage. The review of design quality will cover the following aspects (see Annex 7 for the detailed project design assessment matrix):

- Strategic relevance of the project
- Preparation and readiness;
- Financial planning;
- M&E design;
- Complementarity with UNEP strategies and programmes;
- Sustainability considerations and measures planned to promote replication and up-scaling.

48) The inception report will present a draft, desk-based reconstructed Theory of Change of the project. It is vital to reconstruct the ToC *before* most of the data collection (review of progress reports, in-depth interviews, surveys etc.) is done, because the ToC will define which direct outcomes, drivers and assumptions of the project need to be assessed and measured – based on indicators – to allow adequate data collection for the evaluation of project effectiveness, likelihood of impact and sustainability.

49) The inception report will also include a stakeholder analysis identifying key stakeholders, networks and channels of communication. This information should be gathered from the Project document, discussion with the project team, and other supporting materials. See annex 2 for template.

50) The evaluation framework will present in further detail the overall evaluation approach. It will specify for each evaluation question under the various criteria what the respective indicators and data sources will be. The evaluation framework should summarize the information available from project documentation against each of the main evaluation parameters. Any gaps in information should be identified and methods for additional data collection, verification and analysis should be specified. Evaluations/reviews of other large assessments can provide ideas about the most appropriate evaluation methods to be used.

51) Effective communication strategies help stakeholders understand the results and use the information for organisational learning and improvement. While the evaluation is expected to result in a comprehensive document, content is not always best shared in a long and detailed report; this is best presented in a synthesised form using any of a variety of creative and innovative methods. The evaluator is encouraged to make use of multimedia formats in the gathering of information eg. video, photos, sound recordings. Together with the full report, the evaluator will be expected to produce a 2-page summary of key findings and lessons. A template for this has been provided in Annex?.

52) The inception report will also present a tentative schedule for the overall evaluation process, including a draft programme for the country visit and tentative list of people/institutions to be interviewed.

53) The inception report will be submitted for review and approval by the Evaluation Office before the any further data collection and analysis is undertaken.

54) When data collection and analysis has almost been completed, the evaluation team will prepare a short **note on preliminary findings and recommendations** for discussion with the project team and the Evaluation Reference Group. The purpose of the note is to allow the evaluation team to receive guidance on the relevance and validity of the main findings emerging from the evaluation.

55) **The main evaluation report** should be brief (no longer than 40 pages – excluding the executive summary and annexes), to the point and written in plain English. The report will follow the annotated Table of Contents outlined in Annex 2. It must explain the purpose of the evaluation, exactly what was evaluated and the methods used (with their limitations). The report will present evidence-based and balanced findings, consequent conclusions, lessons and recommendations, which will be cross-referenced to each other. The report should be presented in a way that makes the information accessible and comprehensible. Any dissident views in response to evaluation findings will be appended in footnote or annex as appropriate. To avoid repetitions in the report, the authors will use numbered paragraphs and make cross-references where possible.

56) **Review of the draft evaluation report.** The evaluation team will submit a zero draft report to the UNEP EO and revise the draft following the comments and suggestions made by the EO. Once a draft of adequate quality has been accepted, the EO will share this first draft report with the Task Manager, who will alert the EO in case the report would contain any blatant factual errors. The Evaluation Office will then forward the first draft report to the other project stakeholders, in particular the members of the en.lighten Project Steering Committee for their review and comments. Stakeholders may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions. It is also very important that stakeholders provide feedback on the proposed recommendations and lessons. Comments would be expected within two weeks after the draft report has been shared. Any comments or responses to the draft report will be sent to the UNEP EO for collation. The EO will provide the comments to the evaluation team for consideration in preparing the final draft report, along with its own views.

57) The evaluation team will submit the final draft report no later than 2 weeks after reception of stakeholder comments. The team will prepare a **response to comments**, listing those comments not or only partially accepted by them that could therefore not or only partially be accommodated in the final report. They will explain why those comments have not or only partially been accepted, providing evidence as required. This response to comments will be shared by the EO with the interested stakeholders to ensure full transparency.

58) **Submission of the final evaluation report.** The final report shall be submitted by Email to the Head of the Evaluation Office. The Evaluation Office will finalize the report and share it with the interested Divisions and Sub-programme Coordinators in UNEP. The final evaluation report will be published on the UNEP Evaluation Office web-site [www.unep.org/eou](http://www.unep.org/eou).

59) As per usual practice, the UNEP EO will prepare a **quality assessment** of the zero draft and final draft report, which is a tool for providing structured feedback to the evaluation consultant. The quality of the report will be assessed and rated against the criteria specified in Annex 3.

60) The UNEP Evaluation Office will assess the ratings in the final evaluation report based on a careful review of the evidence collated by the evaluation consultant and the internal consistency of the report. Where there are differences of opinion between the evaluator and UNEP Evaluation Office on project ratings, both viewpoints will be clearly presented in the final report. The UNEP Evaluation Office ratings will be considered the final ratings for the project.

61) At the end of the evaluation process, the Evaluation Office will prepare a Recommendations Implementation Plan in the format of a table to be completed and updated at regular intervals by the Task Manager. After reception of the Recommendations Implementation Plan, the Task Manager is expected to complete it and return it to the EO within one month. S/he is expected to update the plan every six months until the end of the tracking period.

62) As this is a Terminal Evaluation, the tracking period for implementation of recommendations will be 18 months, unless it is agreed to make this period shorter or longer as required for realistic implementation of all evaluation recommendations. Tracking points will be every six months after completion of the implementation plan.

### I. Logistical arrangements

63) This Terminal Evaluation will be undertaken by an independent evaluation consultant contracted by the UNEP Evaluation Office. The consultant will work under the overall responsibility of the UNEP Evaluation Office and will consult with the EO on any procedural and methodological matters related to the evaluation. It is, however, the consultant's individual responsibility to arrange for their travel, visa, obtain documentary evidence, plan meetings with stakeholders, organize online surveys, and any other logistical matters related to the assignment. The UNEP Task Manager and project team will, where possible, provide logistical support (introductions, meetings etc.) allowing the consultant to conduct the evaluation as efficiently and independently as possible.

### J. Schedule of the evaluation

64) Table below presents the tentative schedule for the evaluation.

**Table. Tentative schedule for the evaluation**

<b>Milestone</b>	<b>Deadline</b>
Contractual procedures	March 11, 2016
Inception Report	April 8, 2016
1 <sup>st</sup> evaluation mission (Europe, Africa)	April 10 – 21, 2016
2 <sup>nd</sup> evaluation mission (Americas)	May 1 – 8, 2016
Survey out	May 27, 2016
Survey findings and analysis	July 15, 2016
Note on preliminary findings	July 15, 2016
1 <sup>st</sup> Draft Report	July 31, 2016
2 <sup>nd</sup> Draft Report	August 12, 2016

Final Report submitted	August 20, 2016
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## ANNEX 8: THE EVALUATOR

### Amitav Rath

Dr. Amitav Rath is the Director of Policy Research International, a consulting practice based in Ottawa. He is also associated with research institutions in Canada, India, South Africa and Tanzania. His education incorporates interdisciplinary training, combining science and engineering with studies in economics, finance, statistics and natural resources systems. He obtained his B. Tech. (Hons) from the Indian Institute of Technology, Kharagpur, and his M.S. and Ph.D. from the University of California, Berkeley. He has a diverse experience of over 30 years working on many intersecting issues of development, policy and programs, in the public and private sectors, and in monitoring and evaluations, in over fifty countries.

His areas of work include policy design, analysis and Monitoring & Evaluation related to energy, technology, capacity building and innovation, as applied to challenges of poverty, growth, renewables and efficiency, natural resources, climate change and other facets of sustainable development. He has worked with many programs, agencies and governments. Notable assignments include: the Management Development Institute, Delhi; the International Development Research Centre (IDRC) in Ottawa and many agencies of the Government of Canada; the regional development banks; the World Bank; the African Union; many UN agencies such as the UNEP; UNESCO; UNU; UNDP; UNIDO; the UN Fund for the Montreal Protocol; the Commonwealth Secretariat; DfID; GIZ; Sida; the International Energy Agency; several NGOs and Community organizations, research institutes and national governments of developing countries. He often works in multidisciplinary and multi-stakeholder networks and teams, both as a team leader and as a team member. He has been involved in over fifty complex evaluations in 20 years, on economic development, research, innovation, energy, environment, natural resources, small enterprise development, education and capacity building in Africa, Asia and Latin America allowing for cross country learning and institutional sharing.

Earlier he worked at the International Development Research Centre in Ottawa, for over a decade, managing several global programs. His primary focus at IDRC was in the programs on Science, Technology and Innovation, and on Energy Policy. He also contributed to programming on economic policy, environment and natural resources, enterprise development, education and institutional capacity building. He has continued to be involved in teaching and research, beginning at Berkeley, then as a professor and a director of the research and consulting on Indian industry and economics, at the Management Development Institute, New Delhi. Subsequently, he has been involved in different capacities with over a dozen research and teaching institutions in several countries, most recently he was a visiting professor at the Indian Institute of Technology, Bhubaneswar. He has contributed as the author or co-author to over sixty research articles, reports and books on key development challenges.

## ANNEX 9: STAKEHOLDER COMMENTS

Stakeholder comments to the draft evaluation report and responses (covering those comments that were acknowledged in the evaluation report review process but not integrated in the report)

#	Stakeholder comment(s)	UNEP Evaluation Office (EO) suggestion / response	Consultant response /action
1	<p><b>Coverage of Mercury in the report:</b></p> <p>Comment 1:</p> <p>we believe that the the issue of mercury was well covered by en.lighten since this was not first objective (not a chemicals project), main focus/objective of the project is CC mitigation through energy efficiency. Despite this en.lighten treated the mercury issue as an important issue (contributing to Minimata to recommend the max mercury a CFL should contain, AMBILAMP training, chapter in toolkit...). The waste collection and recycling is a major issue in general in the countries we're working with... hence difficult to address and requires significant investments. As part of our support to countries to develop national efficient lighting strategies, the collection and recycling issue has never been overlooked... and targeted recommendations have been provided. Moreover, we are now and I would say for the last 3 years really promoting LEDs over CFLs.</p> <p>Comment 2:</p>	<p>EO's view is that the topic is important, highlighted in the project design and well supported by the TOC approach and safeguards principles. Thus the discussion about the topic is very welcome.</p> <p>The overall rating of the project is Satisfactory. Thus in the end it doesn't have a major influence on the rating, Energy efficiency aspects are emphasized.</p> <p>As the evaluation needs to address positive and negative impacts of the project, the mercury issue is rightly discussed in the report, and well in line with UN Environment ESES and the TOC approach etc.</p>	<p>1. The evaluation does agree that mercury was covered in multiple ways. It does not agree - the issue of mercury was well covered in quantity by en.lighten. And this has been reflected under output sections, and can be further expanded where there is specific additional information provided or is requested by the team.</p> <p>2. Agree - this was not first OR PRIMARY objective (not a chemicals project), main focus/objective of the project is CC mitigation through energy efficiency. "Despite this en.lighten treated the mercury issue as an important issue". Its coverage was mandated in the ProDoc, LFA etc</p> <p>4. The contribution to Minimata to recommend the max mercury a CFL should contain, AMBILAMP training, chapter in toolkit... – evaluator's view is that they mirror Industry views.</p> <p>5. No report mentions that - The waste collection and recycling is a major issue in general in the countries we're working with... hence difficult to address and requires significant investments.</p> <p>6. The reports do not also say – they are a major issue in almost all countries, including the best practice examples provided.</p> <p>7. It is good that - for the last 3 years really</p>

	<p>We consider the impact of mercury in this evaluation report as overrated (too heavily impacting the results in a negative sense)</p>		<p>promoting LEDs over CFLs. BUT the CFLs and FLs are not going to disappear.</p> <p>8. It is said - now and for the last 3 years really promoting LEDs over CFLs. Evaluator cannot speak with full knowledge on LEDs as they are relatively new and outside the current scope. Issues of collection and recycling and unanticipated impacts can remain important for LEDs; many on-going EEL work will include CFL; and the broader issues of “unanticipated outcomes” are also important in the larger successor project, U4E, under whose umbrella further work is being carried out. .</p> <p>9. In one document of new approvals there is allocated resources for the Chemicals branch to review waste collection issues as they arise.</p>
2	<p><b>Consumers’ views:</b></p> <p>It should be noted that consumers views were provided through NGOs at global (like Topten, NDRC...) and in the national/regional support activities where representatives from local NGOs participated in policy discussions.</p>	<p>The consultant is requested to address the comment.</p> <p>If additional evidence required concerning NGO participation, please request directly from the project.</p>	<p>No evidence of consumer views was seen in the documents listed and participants’ lists reviewed.</p> <p>Should there exist the evidence should be provided and this can be added. <i>[not provided by the project]</i></p>
3	<p><b>En.lighten impacts:</b></p> <p>we provided data for the countries regions we worked in re: growth in EE lighting on markets which could potentially provide clearer evidence of en.lighten’s impacts (knowing of course that all growth in EE lighting cannot be solely attributed to en.lighten)</p>	<p>The evaluation consultant is requested to utilize this data in the likelihood of impact section. Attribution (or at least ‘credible association’) of the project should be addressed, utilizing the TOC (drivers and assumption).</p> <p>We do not support having long data tables in annex without clear reference in the evaluation analysis.</p>	<p>Not clear. Complete tables as provided were in the Annex. They were taken out by EO. The tables can all be provided EO wishes.</p> <p>They DO show growth in EE lighting. But as explained in the ToC - that does not show either attribution or credible association as explained in the ToC.</p> <p>Also the ToC does explain how the evaluation sought to gain alternate credible evidence of impacts and such evidence has allowed the evaluation to provide many high ratings. This still would NOT show how the market transformation was accelerated due to en.lighten (for example having a larger share of CFLs/LEDs in 2020 than the baseline).</p> <p>To show that requires two additional pieces of information – assumptions on what would have happened without en.lighten; or the baseline; and removal of all other factors</p>

			besdies en.lighten contributing to the change.
4	<p><b>Recommendation 1/2:</b></p> <p>The present 3 lighting manufacturers are leading in LED, and all have a global presence. UN is the guardian to prevent any unintended brand promotion amongst industry participants. Moreover, we are conscious of new partners that potentially can take disproportionate benefits from the accumulated efforts made by earlier partners (as pointed out in par 4.1.3)</p>	<p>Co-financing details would be very vital for transparent cooperation with private sector. Evaluation Office is also promoting more rigorous approach in terms of co-finance reporting. Recommendation will remain. Nevertheless any sensitive partner information should remain undisclosed.</p>	<p>We all agree - any sensitive partner information should remain undisclosed. BUT legally mandated information should not fall under that.</p>

## ANNEX 10: QUALITY ASSESSMENT OF THE EVALUATION REPORT

Evaluation Title:

<p><b>Terminal Evaluation of the UNEP project</b></p> <p><b>“Global Market Transformation for Efficient Lighting” (en.lighten initiative)</b></p>
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All UNEP evaluations are subject to a quality assessment by the Evaluation Office. The quality assessment is used as a tool for providing structured feedback to the evaluation consultant.

The quality of both the draft<sup>181</sup> and final evaluation report<sup>182</sup> is assessed and rated against the following criteria:

	UNEP Evaluation Office Comments	Draft Report Rating	Final Report Rating
<b>Substantive report quality criteria</b>			
A. Quality of the Executive Summary: Does the executive summary present the main findings of the report for each evaluation criterion and a good summary of recommendations and lessons learned? (Executive Summary not required for zero draft)	<p><b>Draft report:</b></p> <p>n/a</p> <p><b>Final report:</b></p> <p>Too long, but contained main findings</p>	n/a	4

<sup>181</sup> Draft report version submitted to the Evaluation Office January 12, 2017

<sup>182</sup> Submitted 24<sup>th</sup> August, 2017

<p>B. Project context and project description: Does the report present an up-to-date description of the socio-economic, political, institutional and environmental context of the project, including the issues that the project is trying to address, their root causes and consequences on the environment and human well-being? Are any changes since the time of project design highlighted? Is all essential information about the project clearly presented in the report (objectives, target groups, institutional arrangements, budget, changes in design since approval etc.)?</p>	<p><b>Draft report:</b></p> <p>The draft report presented sufficient amount of information/details regarding the project context. Some repetition (such as partner and stakeholder sections) in the presentation, that needs to be revised for the final draft. Some sections also go beyond the project context providing e.g. analysis of en.lighten networks (which should be under evaluation findings).</p> <p><b>Final report:</b></p> <p>All aspects sufficiently covered</p>	4	6
<p>C. Strategic relevance: Does the report present a well-reasoned, complete and evidence-based assessment of strategic relevance of the intervention in terms of relevance of the project to global, regional and national environmental issues and needs, and UNEP strategies and programmes?</p>	<p><b>Draft report:</b></p> <p>Gender and HRBA are not addressed.</p> <p><b>Final report:</b></p> <p>All aspects sufficiently covered</p>	4	6
<p>D. Achievement of outputs: Does the report present a well-reasoned, complete and evidence-based assessment of outputs delivered by the intervention (including their quality)?</p>	<p><b>Draft report:</b></p> <p>Section discusses too much about the design flaws or bad indicators. Such issues should be addressed in the reconstruction of the TOC and this section should focus on delivery and quality of actual outputs (project deliverables).</p> <p><b>Final report:</b></p> <p>Feedback addressed. All aspects mostly covered</p>	3	5

<p>E. Presentation of Theory of Change: Is the Theory of Change of the intervention clearly presented? Are causal pathways logical and complete (including drivers, assumptions and key actors)?</p>	<p>Draft report: Text and diagram are not consistent. Needs to be a systematic presentation.</p> <p>Final report: Issues concerning alignment addressed. Drivers and assumptions are still not sufficiently covered.</p>	2	4
<p>F. Effectiveness - Attainment of project objectives and results: Does the report present a well-reasoned, complete and evidence-based assessment of the achievement of the relevant outcomes and project objectives?</p>	<p>Draft report: Not clear whether the R-TOC is utilized here. Not all the results layers that were identified in the TOC are analyzed. The presentation is confusing mixing logframe and the TOC results statements.</p> <p>Achievement of official project goal and objectives is presented ok.</p> <p>Final report: Systematic presentation provided</p>	2	4
<p>G. Sustainability and replication: Does the report present a well-reasoned and evidence-based assessment of sustainability of outcomes and replication / catalytic effects?</p>	<p>Draft report: further evidence for the analysis could be presented. Some aspects like mercury which is in the core of potential negative effects is not covered at all (environmental sustainability).</p> <p>Final report: All aspects sufficiently covered</p>	3	5

<p>H. Efficiency: Does the report present a well-reasoned, complete and evidence-based assessment of efficiency? Does the report present any comparison with similar interventions?</p>	<p>Draft report:</p> <p>Final report: All aspects sufficiently covered</p>	4	5
<p>I. Factors affecting project performance: Does the report present a well-reasoned, complete and evidence-based assessment of all factors affecting project performance? In particular, does the report include the actual project costs (total and per activity) and actual co-financing used; and an assessment of the quality of the project M&amp;E system and its use for project management?</p>	<p>Draft report:</p> <p>Most sections (management, stakeholder participation, financial planning, supervision) lack substance and evidence</p> <p>Final report:</p> <p>EO comments were addressed, sufficient evidence was provided in all sections</p>	2	5
<p>J. Quality of the conclusions: Do the conclusions highlight the main strengths and weaknesses of the project, and connect those in a compelling story line?</p>	<p>Draft report:</p> <p>Not reviewed due to gaps in the main report</p> <p>Final report:</p>	-	5
<p>K. Quality and utility of the recommendations: Are recommendations based on explicit evaluation findings? Do recommendations specify the actions necessary to correct existing conditions or improve operations ('who?' 'what?' 'where?' 'when?'). Can they be implemented?</p>	<p>Draft report:</p> <p>Not reviewed due to gaps in the main report</p> <p>Final report:</p> <p>Useful recommendations for future projects</p>	-	6
<p>L. Quality and utility of the lessons: Are lessons based on explicit evaluation findings? Do they suggest prescriptive action? Do they specify</p>	<p>Draft report:</p> <p>Not reviewed due to gaps in the main</p>	-	3

in which contexts they are applicable?	<p><b>report</b></p> <p>Final report:</p> <p>Not very substantive but aligned with recommendations that are good and useful.</p>		
<b>Report structure quality criteria</b>			
<p>M. Structure and clarity of the report: Does the report structure follow EO guidelines? Are all requested Annexes included?</p>	<p><b>Draft report:</b></p> <p>Most annexes yes. The headings mostly follow the EO requirements but the overall presentation is not clear (e.g background section and evaluation analysis mixed, reference to TOC or logframe not clear)</p> <p>Final report:</p> <p>yes</p>	2	5
<p>N. Evaluation methods and information sources: Are evaluation methods and information sources clearly described? Are data collection methods, the triangulation / verification approach, details of stakeholder consultations provided? Are the limitations of evaluation methods and information sources described?</p>	<p><b>Draft report:</b></p> <p>Major gaps.</p> <p>Final report:</p> <p>Well presented with sufficient details</p>	3	5
<p>O. Quality of writing: Was the report well written? (clear English language and grammar)</p>	<p><b>Draft report:</b></p> <p>English language is at acceptable level.</p> <p>Final report:</p> <p>Some sentences very long and complicated diminishing slightly the</p>	4	5

	clarity of analysis.		
P. Report formatting: Does the report follow EO guidelines using headings, numbered paragraphs etc.	<p>Draft report:</p> <p>No para numbering, headings are not properly fomatted.</p> <p>Final report:</p> <p>yes</p>	3	6
<b>OVERALL REPORT QUALITY RATING</b>		<b>3.6</b>	<b>4.9</b>

The quality of the evaluation process is assessed at the end of the evaluation and rated against the following criteria:

	UNEP Evaluation Office Comments		Rating
<b>Evaluation process quality criteria</b>			
Q. Preparation: Was the evaluation budget agreed and approved by the EO? Was inception report delivered and approved prior to commencing any travel?	Evaluation budget was approved by EO		5
R. Timeliness: Was a TE initiated within the period of six months before or after project completion? Was an MTE initiated within a six month period prior to the project's mid-point? Were all deadlines set in the ToR respected?	No to all.		1

<p><b>S. Project's support: Did the project make available all required documents? Was adequate support provided to the evaluator(s) in planning and conducting evaluation missions?</b></p>	<p>Financial documentation was very much delayed. Project team was supportive but country missions caused some problems in terms of availability of key persons.</p>		4
<p><b>T. Recommendations: Was an implementation plan for the evaluation recommendations prepared? Was the implementation plan adequately communicated to the project?</b></p>	<p>Will be prepared.</p>		5
<p><b>U. Quality assurance: Was the evaluation peer-reviewed? Was the quality of the draft report checked by the evaluation manager and peer reviewer prior to dissemination to stakeholders for comments? Did EO complete an assessment of the quality of the final report?</b></p>	<p>Two peer-reviews were conducted, one prior dissemination and one after.</p>		5
<p><b>V. Transparency: Were the draft ToR and evaluation report circulated to all key stakeholders for comments? Was the draft evaluation report sent directly to EO? Were all comments to the draft evaluation report sent directly to the EO and did EO share all comments with the commentators? Did the evaluator(s) prepare a response to all comments?</b></p>	<p>Yes mostly, TOR was circulated at UN Environment, the report to the key stakeholders. EO managed the circulation and responding process to the comments.</p>		5
<p><b>W. Participatory approach: Was close communication to the EO and project maintained throughout the evaluation? Were evaluation findings, lessons and recommendations adequately communicated?</b></p>	<p>Yes</p>		6
<p><b>X. Independence: Was the final selection of the evaluator(s) made by EO? Were possible conflicts of interest of the selected evaluator(s) appraised?</b></p>	<p>Yes</p>		6

<b>OVERALL PROCESS RATING</b>		4.5
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Rating system for quality of evaluation reports

A number rating 1-6 is used for each criterion: Highly Satisfactory = 6, Satisfactory = 5, Moderately Satisfactory = 4, Moderately Unsatisfactory = 3, Unsatisfactory = 2, Highly Unsatisfactory = 1

The overall quality of the evaluation report is calculated by taking the mean score of all rated quality criteria.