

Portfolio Study of UNEP's Recent GEF-Funded Energy Efficient Lighting Projects



Evaluation Office of the United Nations Environment Programme

September 2025



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Front cover: Energy efficient street lighting, Municipality of La Guardia

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September 2025
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List of acronyms and abbreviations

CFL	Compact Fluorescent Lamp
CRSO	Collective Recycling System Organization
DGEE	Directorate General for Energy Efficiency (Peru)
EE	Energy Efficiency
EPR	Extended Producer Responsibility
ESL	Energy-Saving Lamp
FCH	Fundación Chile
GEF	Global Environment Facility
GHG	Greenhouse Gas
ISPONRE	Institute of Strategy and Policy on Natural Resources and Environment
LED	Light Emitting Diode
MEPS	Minimum Energy Performance Standards
MINEM	Ministry of Energy and Mines (Peru)
MOF	Ministry of Finance (Vietnam)
MOIT	Ministry of Industry and Trade (Vietnam)
MRV	Monitoring, Reporting and Verification
MPEER	Ministry of Petroleum, Energy and Renewable Energy (Côte d'Ivoire)
MTS	Medium-Term Strategy (UNEP)
M&E	Monitoring and Evaluation
NEECA	National Energy Efficiency and Conservation Authority (Pakistan)
PAEE	Energy Efficiency Action Plan (Chile)
PoW	Programme of Work (UNEP)
PSQCA	Pakistan Standards and Quality Control Authority
QA	Quality Assurance
QC	Quality Control
RLF	Revolving Loan Fund
SDGs	Sustainable Development Goals
TE	Terminal Evaluation
U4E	United for Efficiency
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

EXECUTIVE SUMMARY

1. This Portfolio assessment review analyses the work of the United Nations Environment Programme (UNEP) in energy-efficient lighting projects funded by the Global Environment Facility (GEF). The evaluation covers eight initiatives implemented in Vietnam, Peru, Morocco, Côte d'Ivoire, Chile, Pakistan, Bolivia, and at the global level to accelerate the transition to efficient lighting technologies, reduce energy consumption, and mitigate greenhouse gas (GHG) emissions.

2. The projects under review advanced the phase-out of incandescent bulbs, the establishment of energy efficiency standards, and the promotion of LED technologies. However, they faced challenges such as limited private sector engagement, difficulties in implementing financial mechanisms, and weaknesses in waste management strategies.

Findings

3. Strong strategic relevance: Overall, the projects aligned with national and international priorities in energy efficiency and climate change, contributing to GHG reduction and global environmental commitments.

4. Positive impact on market transformation: Progress was made in regulatory frameworks and energy labelling, although implementation varied by country context. Adoption of efficient technologies was more effective where regulatory systems were strong, and key institutions provided support during the project life cycle.

5. Sustainability challenges: Continued results depend on additional funding and institutional strengthening. In several cases, the absence of updated standards and financial incentives limited the durability of achieved outcomes. A recurrent observation was the lack of an exit strategy linking funding sources and leading institutions to sustain impacts over time.

6. Performance across the portfolio was mixed. While some projects were rated satisfactory others—such as those in Vietnam, Peru, and Pakistan—faced implementation challenges, including delayed regulatory processes, limited stakeholder coordination, and weak enforcement. Many of these limitations were not only operational but often stemmed from design shortcomings, institutional weaknesses, and insufficient safeguards. Recurrent constraints identified across the reviewed projects included:

- i. *Design: Overly ambitious project objectives fragmented vertical logic, and the parallel implementation of regulatory, financial, and outreach components reduced effectiveness and hindered causal attribution.*
- ii. *Stakeholder participation: Limited engagement of private sector, civil society, consumer groups, and local governments weakened ownership, trust, and institutional sustainability.*
- iii. *Monitoring and evaluation: Weak monitoring, reporting, and verification systems—with incomplete baselines, non-SMART indicators, limited counterfactuals, and insufficient disaggregation of data—constrained learning, adaptive management, and impact attribution.*
- iv. *Inclusion and safeguards: Gender, equity, and human rights were rarely mainstreamed; stakeholder analyses overlooked women, minorities, and indigenous populations; and social safeguards and grievance mechanisms were not systematically applied.*
- v. *Insufficient budget: Dedicated budget lines for gender and safeguards were absent, reducing accountability and limiting the ability to address differentiated risks or outcomes.*
- vi. *Communication: Strategies remained generic and not context-specific, failing to address risks such as mercury exposure, health impacts, or consumer rights, thereby weakening trust and uptake.*
- vii. *Sequencing: Inadequate sequencing of interventions attempted to implement regulatory, financial, and outreach components simultaneously, without alignment to realistic institutional capacity or policy timelines.*

- viii. *Institutional coordination: Weak institutional coordination, fragmented responsibilities, and high staff turnover reduced continuity and delayed implementation, particularly in multi-agency contexts.*
- ix. *Reporting: Reporting was fragmented, inconsistent, delayed, and inaccessible (e.g., not translated), reducing transparency, national ownership, and opportunities for accountability.*
- x. *Environmental Safeguards: Waste management and circular economy approaches, especially for mercury-containing products, were applied inconsistently. Gaps in infrastructure, weak municipal coordination, and limited enforcement reduced their effectiveness.*

Lessons Learned

7. The following is a summary of the lessons learned:

Lesson 1: *The existence of clear and enforceable regulatory frameworks is decisive for sustaining market transformation. Projects in Peru and Chile showed that the adoption of MEPS and phase-out schedules for inefficient lamps provide the foundation for long-term results.*

Lesson 2: *Another recurring lesson is the importance of institutional strengthening and technical capacity-building. Experiences in Bolivia, Morocco, and Côte d'Ivoire indicate that without equipped laboratories, trained personnel, and robust institutional frameworks, even well-designed regulations remain ineffective.*

Lesson 3: *The evaluations also show that coordination among national institutions and local governments is a critical factor for effectiveness. Where ministries, municipalities, standardization institutes, and utilities worked together, results were more visible and replicable.*

Lesson 4: *A fourth lesson is that integrating environmental and health considerations, such as mercury-containing lamp disposal, must be addressed from the outset for a safer and more sustainable transition.*

Lesson 5: *Finally, the evaluations underline that financial sustainability requires a clear exit strategy that includes co-financing mechanisms. Projects that relied solely on external resources faced challenges in maintaining results once the intervention ended, while those combining government and private contributions achieved greater resilience.*

Recommendations

8. The portfolio assessment provides the following recommendations to enhance the replicability of future initiatives, ensuring that best practices are adapted to specific contexts.

- i. *Adopt and enforce regulatory frameworks that clearly prohibit obsolete technologies while ensuring institutional capacity for compliance.*
- ii. *Design financing mechanisms that align public and private incentives to accelerate technology uptake.*
- iii. *Strengthen national testing and certification infrastructure to guarantee product quality and build market confidence.*
- iv. *Invest in technical training to build human capital across the value chain.*
- v. *Integrate end-of-life management of lighting products into project design and regulation.*
- vi. *Promote PPPs from the planning phase to enhance market responsiveness and sustainability. Clarify causal pathways and results logic through stronger ToC frameworks.*
- vii. *Ensure timely and actionable evaluations that support adaptive management.*
- viii. *Address social equity and inclusion as core design elements, not afterthoughts.*
- ix. *Strengthen institutional mandates and coordination to ensure sustainability.*

9. Energy-efficient lighting remains a key pillar in the reviewed countries for reducing electricity consumption and mitigating climate change. Its effective implementation requires an integrated and coordinated approach.

1 INTRODUCTION

10. The Energy Efficient Lighting (EEL) initiative reduces electricity demand and contributes to GHG mitigation. UNEP, with support from GEF funding, has led multiple projects to transform lighting markets in least developed countries and emerging economies by promoting the adoption of more efficient and sustainable technologies.

11. This analysis aims to support the development of policies and programmes that promote energy-efficient lighting and contribute to the transition to more sustainable energy systems. This EEL portfolio assessment reviews the performance of eight projects implemented in various regions. Through a review of Terminal Evaluations (TEs), common patterns, challenges, and best practices are identified to guide UNEP's interventions in the energy sector. The TE reports used in this portfolio are listed in the table below.

Table 1: List of Reviewed Terminal Evaluation / Review Reports

Project ID and Title	Project Dates	Report
GEF 3457: Global Market Transformation for Efficient Lighting	2010-2015	Link
GEF 3755: Phasing out incandescent lamps through lighting market transformation in Vietnam	2010-2016	Link
GEF 3876: Promotion of Energy Efficiency in Public Lighting in Côte d'Ivoire	2013-2020	Link
GEF 4139: Market Transformation for Energy Efficient Lighting in Morocco	2011-2019	Link
GEF 4173: Lighting Market Transformation in Peru	2012-2019	Link
GEF 5150: Delivering the Transition to Energy Efficient Lighting in Chile	2015-2019	Link
GEF 5299: Delivering the Transition to Energy Efficient Lighting in Bolivia	2016-2024	
GEF 5799: Delivering the Transition to Energy Efficient Lighting in Residential Commercial, Industrial and Outdoor Sectors in Pakistan	2016-2022	Link

12. The analysed projects supported the transition to efficient lighting through strategies such as the phase-out of incandescent bulbs, the development of energy efficiency regulations, the promotion of LED technologies, and the implementation of financial mechanisms to improve access to efficient products. However, the effectiveness of these interventions varied depending on the institutional, economic, and social context of each country.

13. This document is structured into five sections:

- i. **Introduction:** This section briefly outlines the Portfolio's context, purpose, methodology, scope and limitations.
- ii. **Overview of the Projects:** Presents an overview of each of the projects under review.
- iii. **Synthesis of the Key Evaluation Findings:** This section presents an analysis of the evaluation reports by delving into specific project level finding while identifying common patterns across the projects.
- iv. **Lessons Learned and Recommendations:** Highlights areas for improving the effectiveness and sustainability of future interventions, including strategies to overcome identified barriers.
- v. **Conclusions:** Summarizes the main findings, providing a foundation for the design of future energy efficiency initiatives.

1.1 Purpose of the Portfolio Brief

14. This portfolio brief is prepared to serve two main purposes: (a) to assess what worked and what did not work in the various interventions implemented and (b) to identify best practices for the implementation of future Energy Efficient Lighting projects.

1.2 Methodology, Scope and Limitations

15. The assessment was based on a systematic desk review of the TEs of each project. Key findings, lessons learned, and recommendations were extracted and organized along analytical dimensions: strategic relevance, project design and vertical logic, implementation performance, achieved results, sustainability, and replicability factors. This approach enabled the identification of cross-cutting patterns and recurring weaknesses, as well as the formulation of recommendations applicable to future projects.

16. The scope of the assessment covers Energy Efficient lighting projects implemented between 2010 and 2025 in Vietnam, Peru, Morocco, Côte d'Ivoire, Chile, Pakistan, Bolivia, and at the global level.

17. Key methodological limitations include heterogeneity in the quality and depth of the TEs, absence of systematic information in some cases, and the diversity of national contexts that limit direct comparability of results. In addition, the analysis is restricted to the evidence documented in the TEs, which constrains the ability to validate findings with primary or more recent data.

2 OVERVIEW OF THE PROJECTS

17. The EEL projects were designed and implemented in alignment with the [United for Efficiency \(U4E\) initiative](#) (formerly known as en.lighten), which aims to accelerate market shifts toward more efficient lighting technologies in least developed countries and emerging economies by promoting a phase-out of incandescent bulbs in favour of lower energy consumption products providing the same service quality. The initiative seeks to eliminate market barriers to efficient lighting technologies, considering the rapid technological evolution in the sector.

2.1 Global Market Transformation for Efficient Lighting

18. The project was approved in 2009 and began implementation in 2010. Its objective was to create local and regional institutional, legal, financial and technical environment that favours energy-efficient lighting through the promotion of high-performance and environmentally sustainable technologies such as mercury-free compact fluorescent lamps (CFLs), and the phase-out of inefficient incandescent lamps. The project aimed to reduce GHG emissions through energy-efficient lighting technologies, increase electricity access for low-income communities, improve efficiency, support technology transfer and create awareness, and potentially reduce mercury emissions from coal combustion. At the local level, it also aimed to reduce consumer energy costs.

19. The projects received a GEF grant of USD 5,000,000, complemented by an estimated in-kind co-financing of USD 15,000,000. The main contributors were lighting companies such as Osram and Philips, with additional funds from other private sector partners. The project framework included four direct outcomes: i. Establish a global platform; ii. Implementation of a center of excellence; iii. Support to country and programs; and iv. Country level capacity increased. In addition, 11 outputs were defined with corresponding indicators.

20. The project's overall performance was rated as Satisfactory by UNEP's Evaluation Office. The approach—promoting energy efficiency through a global network/platform supported by a joint expert initiative (the Centre of Excellence), and complementing other environmental efforts at global, regional, and national levels—was found highly relevant and appropriate. Project direct outcomes included the agreement on a global road map, the establishment of a Centre of Excellence (CoE), the transformation of markets towards EEL, and the strengthening of capacity at the country level.

2.2 Phasing out incandescent lamps through lighting market transformation in Vietnam

21. The project was expected to start in 2010 but began implementation in 2012. Its objective was to reduce GHG emissions by accelerating the phase-out of incandescent lamps and removing market barriers to low-consumption lighting technologies in Vietnam. It was implemented by UNEP and executed by the Vietnamese Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE).

22. The total project cost was USD 25,152,000, including a GEF grant of USD 2,924,000 and co-financing of USD 22,212,000 from national partners such as Rang Dong and Dien Quang (private sector) and Quatest 3 (government), among others. The project included four components: i. Enhance local lighting industry capacity; ii. Improve quality assurance (QA) / quality control (QC) framework; iii. Develop ESL market and consumer education and awareness; and iv. Support national policy and institutional program towards phasing out of ILs and promotion of ESLs. It established four outcomes and 17 outputs.

23. The overall performance was rated as Moderately Unsatisfactory. While the project had strong strategic relevance, its outputs and outcomes did not meet the intended objectives. Additionally, performance in cost-effectiveness and timeliness was unsatisfactory.

2.3 Promotion of Energy Efficiency in Public Lighting in Côte d'Ivoire

24. The project was implemented from January 2016 to June 2020. Its objective was to accelerate the transformation of the lighting technology market in the emerging economy of Côte d'Ivoire by removing key barriers to energy-efficient lighting and promoting mercury-free technologies, thus contributing to global GHG and mercury emission reductions. It also aimed to foster a local environment encompassing institutional, legal, technical, and financial aspects to support the phase-out of inefficient incandescent lamps and the adoption of environmentally sound efficient technologies.

25. The project budget was USD 3,785,000, including a GEF grant of USD 884,091 and co-financing of USD 2,900,090 provided by the Ministry of Petroleum, Energy and Renewable Energy (MPEER). It comprised six components: i. Energy Efficiency Policy Enhancement; ii. Technical and Managerial Capacity Building for Energy Efficient Lighting Market Development; iii. Lighting Product Quality Improvement; iv. Energy-Efficient Lighting Product Dissemination for Public Lighting; v. Consumer Education and Awareness; and vi. Project Management and M&E Support. The project was structured around 12 outcomes and 21 outputs.

26. Its overall performance was rated as Satisfactory. The project addressed key barriers, gaps, and challenges hindering market transformation. It contributed to the development of legal, policy, and regulatory instruments for importing energy-efficient lamps in Côte d'Ivoire.

2.4 Market Transformation for Energy Efficient Lighting in Morocco

27. The project aimed to develop a strategy for the phase-out of incandescent lamps and the introduction of efficient lighting technologies (specifically CFLs) to reduce GHG emissions and eliminate mercury release.

28. The initial project budget was USD 6,280,295, including a GEF grant of USD 889,091. Additional co-financing from the private sector and the Government of Morocco brought the total to USD 16,026,037. The project included four components: i. Energy Efficiency Policy Enhancement; ii. Technology and standards - CFLs quality improvement; iii. Generation of demand for CFLs through applicable consumer financing and, as applicable, financial support schemes; and iv. Information, Consumers' Education, and Awareness Raising. It established seven outcomes and 13 outputs.

29. Its performance was rated as Satisfactory. The project had a positive impact by addressing key drivers for market transformation in Morocco's lighting sector. It introduced regulatory and legal instruments that laid the foundation for future initiatives.

2.5 Lighting Market Transformation in Peru

30. The project was initially scheduled to begin in November 2012, but its implementation was delayed by six months and ultimately ran from 2016 to 2019. It was executed by the Ministry of Energy and Mines (MINEM) of the Government of Peru through the Directorate General for Energy Efficiency (DGEE). The project aimed to accelerate the transformation of the lighting market in Peru by promoting the use of energy-saving lamps and phasing out incandescent bulbs.

31. The project was funded by a GEF grant of USD 1,636,000 and co-financing that totalled USD 12,926,530, provided by the Government of Peru and private sources. As of June 2018, approximately 86% of the GEF grant had been disbursed. The project was designed with five components: i. Energy-Saving Lighting Policy and Institutional Support Programme; ii. Verification, Enforcement and Customs Enhancement Programme; iii. Improved ESL Recycling Practices and Facilities; iv. ESL Market Actors Development; and v. Consumer Awareness and Improved ESL Sales. The project foresaw the delivery of 17 outputs related to five direct outcomes.

32. Overall project performance was rated as Moderately Satisfactory. The project was relevant and achieved key regulatory and awareness outcomes. However, progress on critical components was limited due to delays and implementation challenges. Most planned outputs were delivered, supporting Peru's transition to energy-efficient lighting.

2.6 Delivering the Transition to Energy Efficient Lighting in Chile

33. The project was executed by Fundación Chile. It began operations in January 2016 and concluded in May 2019, following a five-month extension. Its objective was to accelerate the adoption of high-efficiency lighting products in the Chilean market to reduce energy consumption and related GHG emissions.

34. The project received a GEF grant of USD 2,485,713, in addition to co-financing from the Government of Chile and private sector companies totalling USD 9,429,843, for a total of USD 11,905,556. The project was composed of three components: i. Strengthening Monitoring, Verification and Enforcement (MVE) Capacities to Ensure an Effective Transition to Efficient Lighting Markets; ii. Ensuring an Environmentally Sound Management and Sustainable Transition to Efficient Lighting; and iii. Lighting Innovation: Accelerating the Use of Solid-State Lighting (including LEDs and Controls).

35. The overall project performance was rated as Satisfactory. The initiative was effective in promoting the adoption of high-efficiency LED lighting by strengthening the regulatory environment, demonstrating the use of LEDs in public buildings and residential areas, and enhancing local monitoring, verification and enforcement capacities. As a result, the project met and exceeded its target for direct GHG emission reductions over its lifetime.

2.7 Delivering the Transition to Energy Efficient Lighting in Residential Commercial, Industrial and Outdoor Sectors in Pakistan

36. The main objective of the project was to ensure global climate change mitigation and environmental benefits through the implementation of energy-efficient lighting policies and the establishment of a framework for innovative financial mechanisms to promote high-efficiency products. The project was executed by the National Energy Efficiency and Conservation Authority (NEECA) and U4E, beginning in July 2018 and ending in September 2022.

37. The project had a budget of USD 3,075,916, of which USD 1,025,916 was provided through a GEF grant and USD 2,050,000 through co-financing. It consisted of four components: i. National Energy Efficiency (EE) Lighting Strategy; ii. Compliance with EE Policies and Standards; iii. Revolving Loan Fund; and iv. Consumer and Stakeholder Awareness. The project planned the delivery of 14 outputs across four outcomes.

38. The overall project performance was rated as Moderately Satisfactory. The project promoted energy-efficient lighting through the development of MEPS, regulatory strategies,

and pilot projects in public buildings. Technical capacities were strengthened, and campaigns were conducted to encourage LED adoption. However, the project encountered obstacles such as the lack of government approval, difficulties in financing, and import restrictions. Implementation of the MRV system was delayed, and private sector engagement was limited. Despite these challenges, the project established the foundations for a transition to energy-efficient lighting in Pakistan.

2.8 Delivering the Transition to Energy Efficient Lighting (Bolivia)

39. The project was approved in 2016 and entered into force in April 2019 under UNEP's Climate Action Subprogramme. Implementation began in March 2021 and was completed in January 2025. The Ministry of Hydrocarbons and Energy (MHE) and the Ministry of Environment and Water (MMAyA) of Government of Bolivia executed the project. UNEP served as implementing agency, supported by U4E initiative.

40. The project's objective was to accelerate Bolivia's transition to energy-efficient lighting by phasing out inefficient technologies and promoting LED systems. The project had an initial GEF financing of USD 3,059,361, of which USD 1,889,542 were executed; while the initial co-financing was estimated at USD 12,467,575, the project achieved a total co-financing of USD 16,995,547. The design comprised four components: i. Development of a National Efficient Lighting Strategy, including regulatory measures and adoption of MEPS and MVE systems; ii. Institutional capacity-building across government agencies, laboratories, and municipalities; iii. Establishment of a national system for environmentally sound management of mercury-containing lamps; and iv. Demonstration projects introducing LED technologies and smart controls in six municipalities. The project anticipated 19 outputs structured under four outcomes.

41. The project was rated Moderately Unsatisfactory at TE, reflecting persistent gaps in effectiveness, efficiency, and sustainability despite strong strategic alignment and sound financial management. While the project delivered several technical outputs and mobilized significant co-financing, weaknesses in enforcement mechanisms, institutional coordination, and safeguard application limited its ability to achieve intended outcomes.

Table 2: Summary of Projects Details

GEF ID	Title	Type ¹	Executing Agency	Expected Start/ End Dates	Actual Start/ End Dates	Actual Duration	Planned Budget (USD)	Actual Expenditures (USD)	Geographical scope	Project Performance Rating
3457	Global Market Transformation for Efficient Lighting	FS	UNEP Economy Division	Jan 2010- Dec 2013	Feb 2010- Nov 2015	5 years, 11 months	20,000,000	20,548,038	Global	S
3755	Phasing out incandescent lamps through lighting market transformation in Vietnam	FS	ISPONRE	Oct 2010- Dec 2015	Mar 2012- Dec 2016	6 years, 3 months	25,152,000	22,112,007	Vietnam	MU
3876	Promotion of Energy Efficiency in Public Lighting in Côte d'Ivoire	MS	Direction Générale de l'Energie, Ministry of Petroleum, Energy and Renewable Energy (MPEER)	Sep 2013- Aug 2016	Jan 2016- Jul 2020	6 years, 11 months	3,785,000	2,710,666	Côte d'Ivoire	S
4139	Market Transformation for Energy Efficient Lighting in Morocco	MS	Economy Division, Energy & Climate Branch, Finance Unit	Sep 2011- Aug 2013	Mar 2012- Sep 2019	8 years, 1 month	6,820,295	16,026,037	Morocco	MS
4173	Lighting Market Transformation in Peru	FS	MINEM	Nov 2012- Nov 2016	May 2013 - Apr 2019	6 years, 6 months	14,562,530	14,349,398	Peru	MS
5150	Delivering the Transition to Energy Efficient Lighting in Chile	FS	Fundación Chile	Nov 2015- Nov 2018	Jan 2016- May 2019	3 years, 7 months	11,905,556	14,758,367	Chile	S
5299	Delivering the Transition to Energy Efficient Lighting (Bolivia)	FS	Ministry of Hydrocarbons and Energy and Ministry of Environment and Water United for Efficiency (U4E)	Apr 2019- Dec 2021	Mar 2021- Jan 2025	8 years, 8 months	3,059,361	1,889,542	Bolivia	MU
5799	Delivering the Transition to Energy Efficient Lighting in Residential Commercial, Industrial and Outdoor Sectors in Pakistan	MS	NEECA and U4E	Aug 2016- Feb 2020	Apr 2017- Sep 2022	6 years, 2 months	7,362,200	3,075,916	Pakistan	MS

¹ MS – Midsized project, FS – Full Sized project.

3 SYNTHESIS OF THE KEY EVALUATION FINDINGS

42. This section summarizes the ratings assigned to each EEL project according to the evaluation criteria defined by UNEP's Evaluation Office. The table below includes the relevant findings for each evaluated criterion.

Table 3: Summary of Ratings²

Criterion	GEF ID							
	3457	3755	3876	4139	4173	5150	5299	5799
Strategic Relevance	S	S	HS	HS	S	HS	HS	HS
1. Alignment to UNEP MTS, POW and strategic priorities	-	-	HS	HS	S	HS	HS	HS
2. Alignment to UNEP/GEF/Donor strategic priorities	-	-	HS	HS	S	HS	HS	HS
3. Relevance to global, regional, sub-regional and national environmental priorities	-	-	HS	HS	S	HS	HS	HS
4. Complementarity with existing interventions / Coherence	-	-	HS	HS	HS	HS	HS	S
Quality of Project Design	-	-	S	S	MS	S	MS	MS
Nature of External Context	-	-	F	MF	MU	HF	U	MU
Effectiveness	S	MU	S	S	S	S	MU	MS
1. Availability of outputs	S	MU	S	S	MS	S	U	MS
2. Achievement of project outcomes	S	MU	S	MS	MS	S	MU	MS
3. Likelihood of impact	L	ML	L	L	HL	L	U	MU
Financial Management	-	-	S	MS	S	S	HS	MS
1. Adherence to UNEP's financial policies and procedures	-	-	S	-	-	-	HS	-
2. Completeness of project financial information	-	-	S	MU	S	S	HS	S
3. Communication between finance and project management staff	-	-	S	S	S	S	HS	MU
Efficiency	S	U	MS	HU	MS	S	MU	MS
Monitoring and Reporting	-	-	S	MS	MU	S	S	S
1. Monitoring design and budgeting	-	-	S	S	S	MS	S	MS
2. Monitoring of project implementation	-	-	S	MS	MU	S	MS	MS
3. Project reporting	-	-	S	MS	U	S	S	S
Sustainability	ML	ML	L	ML	U	L	MU	U
1. Socio-political sustainability	HL	L	L	ML	HL	L	ML	ML
2. Financial sustainability	L	ML	L	HL	L	L	MU	U
3. Institutional sustainability	HL	L	L	L	U	L	L	MU
Factors Affecting Performance			S	MS	MS	HS	S	MS
1. Preparation and readiness	MS	MU	MS	MS	MU	S	MS	MS
2. Quality of project management and supervision	-	-	S	S	MU	HS	S	MS
3. Stakeholders' participation and cooperation	S	MU	HS	MS	MS	HS	HS	MS
4. Responsiveness to human rights and gender equality	-	-	MS	HU	S	MS	MS	-
5. Environmental and social economic safeguards	-	-	-	-	-	-	MU	-

² Most evaluation criteria are rated on a six-point scale as follows: Highly Satisfactory (HS); Satisfactory (S); Moderately Satisfactory (MS); Moderately Unsatisfactory (MU); Unsatisfactory (U); Highly Unsatisfactory (HU). Sustainability and Likelihood of Impact are rated from Highly Likely (HL) down to Highly Unlikely (HU) and Nature of External Context is rated from Highly Favourable (HF) to Highly Unfavourable (HU).

Criterion	GEF ID							
	3457	3755	3876	4139	4173	5150	5299	5799
6. Country ownership and driven-ness	S	MU	S	MS	MS	HS	S	MS
7. Communication and public awareness	MS	MS	HS	S	MS	HS	MS	MS
Overall Project Performance Rating	S	MU	S	MS	MS	S	MU	MS

*Note: There is an inconsistency in the Peru report between the sustainability rating stated on page 62 and the summary presented in Figure 14 on page 65.

3.1 Project Specific Findings

3.1.1 GEF 3457 - “Global Market Transformation for Efficient Lighting”

43. The project was rated as Highly Satisfactory in relevance. It aligned with GEF mandates and global priorities for energy efficiency, addressing the need to transform lighting markets to reduce GHG emissions.

44. Effectiveness was rated as Satisfactory. The project achieved most of its strategic objectives, including the development of technical guidelines, policy frameworks, and technical assistance to countries. However, actual implementation of regulatory and market changes varied across participating countries, partially limiting overall effectiveness.

45. Efficiency was rated as Highly Satisfactory. The project achieved wide-reaching results through strategic partnerships with private sector actors and other UN agencies, making efficient use of available resources. The intervention model maximized impact at minimal additional cost.

46. Sustainability was rated as Moderately Likely. While the project helped establish regulatory frameworks that support long-term progress on energy efficiency, the sustainability of results was constrained by the institutional capacities of participating countries. In several cases, mechanisms and resources necessary to sustain initiated actions were not secured.

47. Positive performance factors included the technical leadership of the project team and the development of strategic international partnerships. Constraints included uneven institutional capacities across countries, the absence of mandatory policy adoption, and variation in national political priorities.

3.1.2 GEF 3755 - “Phasing out incandescent lamps through lighting market transformation in Vietnam”

48. Relevance was rated as Satisfactory. The initiative aligned with global and national priorities on energy efficiency and climate change mitigation, as well as GEF and UNEP mandates. The project aimed to reduce GHG emissions. However, the selection of the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) as the executing agency limited impact, as it lacked sectoral expertise and the authority to influence related policies. While the project document recognized the urgency of phasing out inefficient lighting in Vietnam, ISPONRE was not positioned to drive the market transformation required since its mandate was more aligned with research and policy analysis than with energy efficiency implementation.

49. Effectiveness was rated as Moderately Unsatisfactory. Even though the project made progress in training local manufacturers and developing quality standards for energy-saving lamps, it failed to engage key stakeholders such as the Ministry of Industry and Trade (MOIT)

and the Ministry of Finance (MOF), weakening policy development and market incentives. Awareness campaigns lacked a coherent social marketing strategy, and pilot projects in rural areas had no measurable or replicable results.

50. Efficiency was rated as Unsatisfactory. Although the project carried out numerous activities, 10.08% of the GEF budget was not spent, and implementation delays undermined cost-effectiveness. International experts were rarely mobilized, and UNEP's oversight of financial management and deliverable quality was limited. Key workshops and meetings were not properly documented, affecting transparency and institutional learning.

51. Sustainability was rated as Moderately Likely. The project strengthened technical capacities in manufacturers and laboratories but did not secure financial or institutional mechanisms to ensure long-term results. The absence of an exit strategy and limited commitment from government partners raised doubts about continuity. A new UNEP-GEF LED lighting project could build on some of the capacities gained by manufacturers and laboratories, although no formal agreement or financial mechanism was established in coordination with the government.

52. Performance was affected by both enabling and limiting factors. On the positive side, Vietnam's policy environment supported energy efficiency, and the existence of previous measures (such as the ban on >60W incandescent lamps) helped set the framework. However, weaknesses included low involvement from key institutions (MOIT, MOF, EVN), ISPONRE's lack of experience in lighting, limited international technical input, weak awareness of the en.lighten initiative, and shortcomings in monitoring and documentation. The project did not integrate gender considerations or assess differentiated impacts on women or vulnerable groups, representing a missed opportunity to promote equity in access to efficient technologies.

3.1.3 GEF 3876 - "Promotion of Energy Efficiency in Public Lighting in Côte d'Ivoire"

53. The project was rated as Highly Satisfactory in terms of relevance. It addressed a key need in participating countries: establishing or strengthening MEPS and energy labelling programmes for electrical products. It was aligned with national energy efficiency strategies and supported international commitments to reduce GHG emissions.

54. Effectiveness was rated as Satisfactory. Significant progress was made in designing and implementing energy efficiency standards for products such as refrigerators, air conditioners, and lighting across several countries. However, in some cases, results were delayed due to extended regulatory processes or shifting governmental priorities. The establishment of Project Steering Committees was slowed by bureaucratic hurdles, while limited market data from distributors further delayed analysis. Despite these setbacks, adaptive management and targeted technical assistance ensured that key outputs—such as national strategies, standards adoption, and pilot demonstrations—were eventually delivered and validated by stakeholders.

55. Efficiency was rated as Moderately Satisfactory. Although outcomes were achieved with available resources, prolonged adoption processes and administrative delays reduced the cost-efficiency initially projected. The project suffered nearly four years of cumulative delays, with multiple workplan revisions driven by political instability, procurement bottlenecks, and slow approval processes. While adaptive management and the mix of local and international experts helped maintain cost-effectiveness, the prolonged timeline diluted efficiency and constrained synergies with parallel initiatives.

56. Sustainability was rated as Likely. The project laid the groundwork for long-term benefits through the adoption of mandatory standards in Côte d'Ivoire, drawing on regulatory frameworks already applied in other countries. However, the lack of mechanisms for periodic MEPS updates and limited technical capacity in some contexts posed risks to long-term sustainability. Moreover, the project's collaboration with the U4E initiative ensured that policy recommendations, lessons learned, and technical resources were shared with regional and international platforms, facilitating peer-to-peer exchanges and knowledge dissemination. This created opportunities for replication in neighbouring countries, even though implementation remained nationally focused. In parallel, the creation of the FONAME revolving fund reinforced sustainability prospects by embedding financial and institutional mechanisms that could serve as a model for other contexts.

57. Enabling factors included strong technical support provided to countries and mobilization of international expert knowledge. Limiting factors included institutional changes in national governments, turnover of key personnel, and challenges in the public consultation process for regulation adoption.

3.1.4 GEF 4139 - "Market Transformation for Energy Efficient Lighting in Morocco"

58. The project was rated as Highly Satisfactory in terms of relevance. It aligned with Morocco's national energy efficiency strategy and the goals of the GEF and the National Energy Efficiency Programme. It addressed a clearly identified need to transform the residential and institutional lighting market in line with the country's climate commitments.

59. Effectiveness was rated as Satisfactory. The project facilitated the phase-out of incandescent lamps, supported the development of efficiency regulations, implemented pilot programmes for efficient lighting distribution, and strengthened institutional capacities. However, awareness-raising activities had limited reach, and private sector integration was only partial. While fiscal incentives lowered CFL prices and 10 million lamps were distributed nationwide, regulatory adoption of MEPS remained incomplete, recycling mechanisms were stalled, and cooperation with industry actors proved weak.

60. Efficiency was rated as Highly Unsatisfactory. The project's implementation was extended from two to over seven years, caused by weak institutional coordination, shifting responsibilities, and financing shortfalls. The project underwent four extensions, linked to stalled negotiations, changes in UNEP-ONEE contractual arrangements, and the prolonged non-responsiveness of MEMWE, which deprioritized activities during government reshuffles and COP22. Costs also escalated: personnel expenses rose by 30% and CFL distribution costs tripled, requiring reliance on KfW loans. Despite adaptive measures—centralizing distribution under ONEE and reducing some travel and training expenses—most regulatory outputs remained unenforced, awareness campaigns were delayed, and the drawn-out timeline undermined efficiency.

61. Sustainability was rated as Moderately Likely. The project left behind institutional capacities and regulatory frameworks that support the continued adoption of efficient technologies. Efficient lighting was incorporated into national sectoral policies. Socio-political ownership was maintained despite ministerial shifts, though private sector buy-in and consumer engagement remained partial. Institutionally, frameworks such as Morocco's National Energy Strategy 2030 and the tax reduction for CFLs provided hope for continuity, but adoption of MEPS and recycling guidelines still awaited formal approval.

62. Performance was strengthened by national political support, the technical experience of the executing team, and the leadership of the national energy efficiency agency. Constraints included administrative hurdles, procurement delays, and low private sector participation.

3.1.5 GEF 4173 - “Lighting Market Transformation in Peru”

63. The project was rated as Satisfactory in terms of relevance. It aligned with the Government of Peru’s priorities on energy efficiency and with GEF objectives related to climate change mitigation. However, lighting was not a high-priority component within national energy strategies, which partially limited its institutional integration compared to other sectors.

64. Effectiveness was rated as Satisfactory. Progress was made in designing technical standards for lighting efficiency and in drafting a national strategy for phasing out incandescent lamps. Nevertheless, implementation of the regulations was delayed, and the pilot activities to promote technology transition were not scaled up during the project period.

65. Efficiency was rated as Moderately Satisfactory. The project implemented several technical and regulatory components but encountered administrative delays, procurement management issues, and rescheduling that affected the execution timeline. These factors reduced the cost-efficiency of the project interventions.

66. Sustainability was rated as Likely³. Peru’s market was already shifting rapidly toward LED technologies, supported by rising imports, falling costs, and high consumer acceptance documented through surveys. Financial sustainability was reinforced by private sector investments and public programmes such as the US\$ 25 million FISE–OSINERGMIN initiative to replace CFLs in low-income households. Policy sustainability was moderately likely, with mandatory labelling and public procurement specifications in place, though MEPS adoption and quality control systems remained pending. Institutional continuity was fragile due to frequent staff changes, but environmental sustainability was expected to strengthen as LEDs displace mercury-containing CFLs.

67. The project benefited from technical assistance and the support of implementing partners. However, several limiting factors were identified, including weak coordination among national institutions, turnover of technical staff, complex procurement processes, and low engagement from the private sector. The project did not incorporate a gender-responsive approach or mechanisms to promote differentiated participation by women or vulnerable groups, which was noted as a missed opportunity.

3.1.6 GEF 5150 - “Delivering the Transition to Energy Efficient Lighting in Chile”

68. The project was rated as Highly Satisfactory in terms of relevance. It was aligned with the Chilean Government’s priorities, particularly the National Efficient Lighting Strategy (ENIE) and the Energy Efficiency Action Plan 2012–2020 (PAEE 2020), as well as with GEF goals related to climate change mitigation and sustainable chemical management. The project also contributed to Chile’s commitments under the Minamata Convention on Mercury.

69. Effectiveness was rated as Satisfactory. Progress was made in strengthening market surveillance capacities, developing MEPS and labelling for LED technologies, and promoting Extended Producer Responsibility (EPR) policies. Although the EPR law was enacted, its full implementation was not achieved during the project period due to time constraints. Demonstration activities, such as the “Cambia el Foco” campaign, exceeded expectations, increasing the LED market share from 2% to 40%.

³ There is an inconsistency in the Peru report between the sustainability rating stated on page 62 and the summary presented in Figure 14 on page 65.

70. Efficiency was rated as Satisfactory. The project completed its activities in 41 months (including a five-month extension) and leveraged economies of scale through partnerships with municipalities, private companies, and public services. However, initial coordination was affected by UNEP's transition to a new financial management system, temporarily impacting expenditure monitoring by component.

71. Sustainability was rated as Likely. The project established strong foundations for market transformation, including a certified testing laboratory (CESMEC) and a pilot model for a Collective Recycling System Organization (CRSO) supported by 16 companies. Nonetheless, continuation of results will depend on future funding for the CRSO and effective implementation of the EPR law.

72. The project benefited from strong government commitment, effective management by Fundación Chile (FCH), and technical support from international experts. Challenges included limited time to consolidate EPR implementation and the absence of gender-disaggregated data in market surveys. Although the project did not integrate a gender strategy in its design, balanced participation in workshops and training sessions was recorded. Opportunities to analyse gender gaps in access to efficient technologies or recycling roles were missed.

3.1.7 GEF 5799 - "Delivering the Transition to Energy Efficient Lighting in Residential Commercial, Industrial and Outdoor Sectors in Pakistan"

73. The project was rated as Highly Satisfactory in relevance, as it aligned with UNEP's Medium-Term Strategies (MTS) and Programme of Work (PoW), as well as with GEF goals on climate change mitigation and energy efficiency. It also supported global initiatives such as the Paris Agreement and the Sustainable Development Goals (SDGs). Nationally, it aligned with policies such as the National Energy Conservation Policy (2006) and the National Climate Change Policy (2012).

74. Effectiveness was rated as Moderately Satisfactory. Progress was made in policy development, including MEPS, and in implementing pilot projects to promote LED adoption. However, challenges persisted in fully implementing the MRV process and establishing the Revolving Loan Fund (RLF). While the MEPS were adopted by the Pakistan Standards and Quality Control Authority (PSQCA), enforcement mechanisms remained weak, and the RLF was not established due to financial limitations and lack of government support. Despite these constraints, awareness campaigns and pilot projects demonstrated the benefits of energy-efficient lighting.

75. Efficiency was rated as Moderately Satisfactory. Despite delays caused by bureaucratic procedures, staffing issues, and external factors such as the COVID-19 pandemic, the project showed adaptability by leveraging public-private partnerships and obtaining two no-cost extensions. However, operational challenges—including slow government engagement and limited experience managing donor-funded projects—affected timely implementation. The centralized management structure within NEECA also contributed to delays in decision-making.

76. Sustainability was rated as Unlikely. Although the project established a solid policy basis through MEPS and increased awareness via pilot activities, financial and institutional challenges threaten its long-term viability. The absence of binding legislation to enforce MEPS, insufficient funding to scale up initiatives, and price sensitivity among consumers present significant risks. In addition, Pakistan's testing infrastructure is insufficient to verify MEPS compliance further complicating market transformation. Without sustained government support and additional funding, the project's outcomes are unlikely to be maintained.

77. The project benefited from stakeholder participation, particularly from the private sector, and received technical support from partners such as U4E. However, it faced significant external challenges including economic instability, import restrictions, and political transitions, which delayed implementation. Bureaucratic obstacles within NEECA and limited coordination with other ministries also impeded progress. Although gender mainstreaming efforts were included, broader socio-economic barriers—such as the dominance of low-cost, inefficient lighting products—were not addressed. While the project featured gender-sensitive messaging and ensured 30% female participation in workshops, it lacked a comprehensive strategy to address gender disparities in energy access.

3.1.8 GEF 5299 – “Delivering the Transition to Energy Efficient Lighting” - Bolivia

78. Strategic relevance was rated Highly Satisfactory. In this dimension the project reflected strong alignment with UNEP’s Medium-Term Strategy, GEF focal areas, Bolivia’s development priorities, SDGs, and international commitments. However, design quality had weaknesses due to incomplete baseline assessments, unclear institutional mandates between MHE and MDPyEP, overambitious enforcement expectations, and insufficient planning for pilot projects.

79. Effectiveness was rated Moderately Unsatisfactory. While a national strategy, MEPS for LED lamps, municipal demonstrations, and IBMETRO training were achieved, enforcement mechanisms, waste management systems, and a functional MVE framework remained incomplete. Equipment gaps prevented IBMETRO from certifying products, undermining market transformation and delaying enforcement of standards across municipalities and national markets.

80. Efficiency was also assessed as Moderately Unsatisfactory. Despite exceeding co-financing commitments and maintaining budget discipline, implementation was extended from 32 to 62 months due to political instability, COVID-19 pandemic disruptions, procurement delays, and institutional turnover. The cancellation of procurement of laboratory equipment further weakened the enforcement of MEPS and delayed MVE operationalisation. Corrective measures kept progress on track, but cost-effectiveness was reduced.

81. Sustainability was rated Moderately Unlikely, reflecting fragile institutional, financial, and political arrangements. Weak policy endorsement, frequent turnover, and lack of exit strategies limited prospects for long-term enforcement and waste management. However, the forthcoming USD 35 million IDB-financed street lighting program offers a key opportunity to consolidate regulatory outputs, strengthen IBMETRO’s certification role, and support municipal waste management.

82. Overall, the project contributed to strengthening Bolivia’s institutional and technical capacity to transition towards energy-efficient lighting. It supported the development of draft regulations, improved laboratory testing infrastructure, and introduced LED technologies in municipal lighting systems. These outcomes provide long-term benefits by laying the foundation for more efficient energy use, reduced mercury risks, and lower GHG emissions, even though several targets were only partially achieved due to delays and external challenges.

3.2 Overarching Findings

3.2.1 Satisfactory Performance and executing teams' actions

83. The projects received high ratings, particularly Highly Satisfactory (HS) or Highly Favourable (HF), across multiple criteria. These areas represent good practices and enabling factors that contribute to good performance in key aspects of project design and implementation. They include:

a. Strategic Relevance

84. Across multiple projects, strong performance was observed in strategic alignment and relevance. Initiatives in Chile, Côte d'Ivoire, Morocco, Pakistan, Peru, Bolivia and the Global project demonstrated close alignment with national EE strategies, GEF climate goals, and global commitments such as the Minamata Convention and the Paris Agreement. These projects effectively addressed pressing needs for lighting market transformation and policy development. Strong government ownership, as seen in Chile and Morocco, and the establishment of MEPS and labelling systems in Côte d'Ivoire, Pakistan, and Peru, contributed to enabling environments that support long-term improvements in lighting efficiency.

85. Outstanding-performing cases, such as the en.lighten Global project and Chile, stood out for their alignment at multiple levels. The en.lighten initiative addressed environmental needs from global to national scales, in full consistency with UNEP's Medium-Term Strategy and PoW. It also scored highly across sub-dimensions including institutional alignment, donor coordination, and complementarity with existing interventions. In Chile, relevance was reinforced by integration into the National Efficient Lighting Strategy and EE Action Plan, benefiting from a supportive regulatory environment and continuity with prior public policy efforts. These examples illustrate how embeddedness in national and international frameworks enhances project relevance and long-term traction.

b. Complementarity with Existing Interventions

86. Energy-efficient lighting projects demonstrated strong complementarity with multilateral development efforts and pre-existing institutional frameworks. The en.lighten initiative built upon the legacy of the World Bank/IFC ELI, and IDB initiatives, reinforcing global coordination. Projects in Côte d'Ivoire, Chile, and Peru adopted methodologies from en.lighten, such as MEPS and labelling frameworks, and attracted co-financing from institutions like IDB, KfW, and COFIDE. In Pakistan, the initiative aligned with national policies and leveraged the Energy Conservation Fund. These synergies enabled accelerated implementation, reduced duplication of effort, and fostered consistency with parallel EE and climate mitigation programmes led by development banks and donors.

87. National institutions and the private sector played a critical role in anchoring projects within existing policy and market structures. In Côte d'Ivoire, collaboration with the Ministry of Petroleum, CODINORM, and lighting distributors enhanced regulatory uptake. Chile's success hinged on strong coordination with the Ministry of Energy, and Fundación Chile, which mobilized public-private partnerships to expand LED distribution. Pakistan engaged PSQCA and local manufacturers to develop MEPS, while Morocco advanced fiscal incentives and CFL standards through IMANOR and ONEE. In Peru, enforcement responsibilities were assumed by INDECOPI, and the national lab José Feliu Bosch, with support from producers like Philips, advanced quality testing capacity.

c. Nature of External Context

88. EE initiatives frequently operate within dynamic and unpredictable national contexts. While a favourable external environment enhances implementation, unforeseen political, economic, or institutional developments can constrain performance—even in well-designed projects. External risks such as high staff turnover, regulatory bottlenecks, or global disruptions like the COVID-19 pandemic emerged without warning. The reviewed project designs did not anticipate such shifts, underscoring the need for adaptive implementation strategies and flexible risk management frameworks that account for evolving national circumstances.

89. The “Promotion of Energy Efficiency in Public Lighting” project in Côte d’Ivoire operated under a favourable external context rating. Its alignment with national priorities on energy security and emissions reduction contributed to its positive assessment. However, delays linked to political instability before 2015, and subsequent bureaucratic slowdowns in recruitment and approvals, impacted early implementation. These were not flagged during project design, reflecting the broader challenge of identifying institutional weaknesses and governance volatility in advance. Despite these hurdles, the project achieved satisfactory results, supported by strong technical assistance and international expert input.

90. In contrast, the “Delivering the Transition to Energy Efficient Lighting” project in Chile benefited from a Highly Favourable and stable context. Strong institutional continuity and minimal external disruptions allowed for smooth implementation, enabling the project to exceed its LED market share targets. Coordination with national stakeholders and alignment with the Minamata Convention further reinforced outcomes. Nonetheless, the outbreak of civil unrest in October 2019—shortly after project closure—served as a reminder that even in seemingly stable settings, socio-political conditions can shift rapidly.

91. The “Market Transformation for Energy Efficient Lighting” project in Morocco, while rated Moderately Favourable, illustrates how changing national priorities can hinder implementation. Government transitions in 2016 reduced ministerial engagement, affecting policy traction. These risks were not foreseen at the design stage. The onset of the COVID-19 pandemic further delayed procurement and restricted in-person consultations, complicating both implementation and final evaluation. Despite these challenges, the project achieved satisfactory outcomes, highlighting the critical role of institutional resilience and adaptive management in the face of external shocks.

d. Achievement of Outputs

92. Timely output delivery is a central driver of impact in EE projects, yet many operate in environments where delay risks are difficult to fully capture during design. In Côte d’Ivoire, despite major political and administrative disruptions, the project achieved its planned outputs, including key standards and technology pilots, through responsive project management and international technical support. Morocco delivered most of its outputs successfully despite political transition and pandemic-related delays. The proactive role of ONEE in surpassing CFL distribution targets demonstrates that committed institutions can mitigate implementation delays and maintain project momentum, even under shifting national conditions. In the third component of the Chile project, focused on technological innovation and the use of LED technologies, the achievement of outputs received a HS rating. The evaluation highlighted a local demonstrative programme for lighting replacement that generated replicable evidence and supported LED adoption on a broader scale.

93. While outputs were ultimately delivered in most projects, delayed execution often reduced efficiency and narrowed the window for achieving deeper systemic outcomes. In

Pakistan, disruptions caused by the COVID-19 pandemic, economic constraints, and institutional bottlenecks delayed procurement and prevented operationalization of financial instruments, weakening the project's transformation potential. In Morocco, extended regulatory processes and late-stage adjustments led to activity rescheduling, slowing output deployment. These experiences underscore the importance of integrating flexible planning and realistic risk forecasting in project design. Adaptive implementation can help recover progress, but early delays inevitably reduce implementation timeframes and constrain opportunities for scaling or replication.

e. South-South Cooperation

94. Several projects illustrate how SSC has translated into high-quality outputs. In Côte d'Ivoire, the public lighting project adapted Tunisia's 2007 phase-out policy and incorporated Ghana's lighting standards, supporting regional harmonization within ECOWAS. In Peru, project teams conducted a study tour to China's GELC testing facilities, while also engaging with Chilean counterparts and formalizing a technical cooperation agreement with Mexico's energy institute.

95. The en.lighten project received a Highly Satisfactory rating for its systematic approach to facilitating knowledge, technology, and resource exchange among developing countries. Recognized actions included collaboration with a Chinese testing laboratory, promotion of regional approaches, and the organization of workshops for peer learning among participating countries.

3.2.2 Recurring Technical and Programmatic Weaknesses

96. The evaluations identified the following recurring technical weaknesses that affected project and programme's performance and sustainability:

a. Gender, Human Rights, Environment and Social Safeguards

97. Six of the eight evaluated projects lacked an adequate approach to gender and social integration. TEs noted that project designs did not include objectives or activities addressing inequality in access to efficient technologies, nor did they establish specific mechanisms to ensure participation of women or vulnerable groups.

98. Social dimensions are rarely embedded from the outset, and dedicated budget lines for gender-related activities are commonly absent. Stakeholder analyses tend to be narrow, overlooking women, minorities, and indigenous populations, and failing to consider differentiated needs or perceptions. This limits the relevance of technical interventions and ignores political and cultural dynamics that influence uptake and impact.

99. These design gaps lead to operational limitations during implementation. Mechanisms for disaggregated data collection on gender and/or vulnerable groups are often missing, reducing the ability to monitor impacts on different groups. Communication strategies remain generic and do not address context-specific risks, such as health and environmental concerns linked to technologies like CFLs. Projects also lack systematic engagement with civil society or consumer rights groups, reducing their ability to adapt to emerging social risks. In several cases, mercury exposure from discarded CFLs disproportionately affected women and children involved in informal waste handling—an issue rarely considered in safeguards. For example, in Bolivia, Vietnam, Peru, and Morocco, data were not disaggregated and differentiated impacts were not considered. Only Côte d'Ivoire showed some institutional awareness, but without concrete integration. In some cases, these omissions were linked to a technocratic framing of energy problems, pressure to execute rapidly, and limited participation of social actors in early design phases.

100. It is worth noting that TEs stressed that gender and safeguard integration should be planned from the outset with specific resources, measurable indicators, and monitoring and accountability mechanisms. The participation of ministries of women's affairs and civil society organizations, together with the adoption of rights-based approaches, increases the relevance of technical interventions and reduces social and environmental risks (e.g., mercury exposure). Furthermore, incorporating grievance redress mechanisms and targeted engagement with vulnerable groups strengthens public trust and facilitates the adoption of efficient technologies.

b. Quality of Project Design and Logical Framework

101. Several projects showed design flaws, including unrealistic objectives, unverifiable indicators, and poorly structured logical frameworks. The en.lighten project included vague goals such as "accelerate market change" without establishing measurement mechanisms. In Peru, outputs were reformulated during implementation but continued to lack clear indicators. Vietnam experienced a contextual shift after implementation began, rendering initial assumptions inadequate. In Pakistan, baseline indicators lacked source and methodology information.

102. Overall, a common deficiency in the logical frameworks and theories of change is the conceptual flaws, resulting in poorly defined causal linkages between activities, outputs, outcomes, and long-term impacts. In several cases, the vertical logic was either implicit or fragmented, limiting the project's ability to guide implementation or evaluate performance. This weakness is compounded by vague terminology, inconsistent use of key results concepts, and unrealistic assumptions about the pace of policy change or market adoption. For example, several projects attempted simultaneous implementation of policy, awareness, and distribution activities without sufficient sequencing, weakening synergies and causal attribution. Targets were often overambitious relative to timelines and institutional capacity, reducing both credibility and feasibility.

103. These design gaps undermined impact attribution and the integration of cross-cutting issues such as gender and human rights. Projects frequently lacked robust baseline data, realistic counterfactuals, or defined assumptions, making it difficult to assess whether observed outcomes—such as increased adoption of LED technology or reduced emissions—resulted from the project or external trends. Social dimensions were often excluded from the ToC altogether. For instance, in multiple projects, stakeholder analyses did not identify women, minorities, or informal workers as distinct groups, leading to missed opportunities for engagement. As mentioned above, no provisions were made for disaggregated data collection, nor were budget lines allocated to gender-related activities. As a result, impacts on women or vulnerable populations—especially those handling hazardous waste—went unmonitored and unaddressed.

104. Additionally, lessons across the portfolio showed that vertical logic needs to be aligned with realistic national capacities and with a feasible sequence of interventions. Clear assumptions, complete baselines, and measurable targets are required to strengthen project design and allow adaptive management. The alignment of outputs, budgets, and timelines—including provisions for co-financing—is essential to avoid over-ambition and implementation bottlenecks.

c. Stakeholder Participation and Consultation

105. Key stakeholder participation (private sector, civil society organizations, and consumer groups) was limited in several projects. Communication strategies were often generic, and rarely tailored to specific groups. Specifically, projects lacked mechanisms to gather disaggregated feedback, and civil society and consumer organizations were seldom

engaged, weakening the ability to detect emerging risks or course correct. Inadequate consultation also delayed validation of studies and reduced trust among national partners. In Morocco, civil society organizations were not engaged. In Peru, retailers were not informed about applicable regulations. The en.lighten project faced concerns for failing to consult national representatives and for difficulties in adapting interventions to local contexts. These weaknesses affected ownership and reduced institutional sustainability of proposed measures particularly because when engagement is weak institutional arrangements are unlikely to persist post-project.

106. Evaluations also found that weak coordination among institutions constrained implementation. High staff turnover and fragmented responsibilities, as observed in Bolivia, further reduced continuity. In contrast, projects implementation teams that facilitated structured collaboration between ministries, municipalities, and technical institutes achieved smoother implementation and broader acceptance.

d. Monitoring, Evaluation and Reporting

107. Although several projects included M&E components, TEs identified significant deficiencies in their implementation. Indicators were frequently not SMART, and baseline data—when available—were incomplete or not systematically collected. These weaknesses limited the ability of M&E systems to track progress, detect delays, or flag implementation risks early enough to inform corrective actions—such as improving the effectiveness of establishing an operational chain responsible for the timely and safe disposal of mercury-containing lamps in Bolivia.

108. Operational monitoring was often focused on activity completion rather than on the achievement of outputs or outcomes. Disaggregated data were rarely collected, making it difficult to assess differentiated impacts across population groups. For example, in Morocco, reports did not differentiate impacts by social group, while in Pakistan, the monitoring system lacked data collection methodologies. As result, reporting was fragmented, with inconsistencies within monitoring tools. Also, high staff turnover, bureaucratic delays, and inaccessible reports further weakened monitoring and accountability.

109. For dimensions such as gender and social the project's impact attribution was compromised. Weak M&E frameworks made it difficult to determine whether observed changes were due to project interventions or external factors. Moreover, lessons from past projects were not integrated into the project designs, leading to repeated shortcomings.

110. Furthermore, TEs emphasized that M&E should not only track activities but also measure progress toward transformational outcomes, with clear causal linkages to national policy and market shifts. The absence of feedback loops limited adaptive management, while weak data-collection systems reduced opportunities for learning and replication.

e. Waste Management and Circular Economy

111. The evaluation of en.lighten, Bolivia and Vietnam projects indicated weaknesses in the implementation of environmental activities related to the safe disposal of used lamps. Despite references to mercury content and pollution risks, efforts to establish effective collection and recycling systems were insufficient. These initiatives underestimated the complexity of establishing infrastructure for the safe collection and recycling of end-of-life lighting products, particularly those containing mercury. In Vietnam, technical guides were not translated into practical mechanisms for separation and treatment. Evaluations concluded that this omission reflected both underestimation of the issue and a lack of integration of international best practices during project design.

112. Projects routinely failed to set up timely and functioning systems for the collection, transport, and disposal of hazardous lighting waste. Key barriers included limited technical capacity, inadequate institutional coordination, and insufficient engagement with local governments or informal waste sectors.

113. Waste policies and communication activities also lacked sufficient depth. While several projects produced guidelines on waste management, few established robust regulatory frameworks or enforcement mechanisms on time needed to ensure compliance. Public awareness efforts focused largely on energy savings, paying limited attention to issues such as mercury toxicity, social impacts, proper disposal practices, or the value of material recovery.

114. Moreover, lessons across the portfolio showed that projects where waste management was explicitly integrated from the design phase—such as Chile and Bolivia—were able to set the groundwork for extended producer responsibility schemes and municipal coordination. However, these efforts remained limited in scope and not replicated across other contexts, highlighting the need for systematic integration of circular economy principles and clear institutional mandates.

4 LESSONS LEARNED AND RECOMMENDATIONS

4.1 Lessons Learned

115. The TEs highlight a set of common lessons that go beyond national contexts and provide useful guidance for future energy-efficient lighting programs. Findings are organized into four areas:

Lesson 1: A first lesson is that the existence of *clear and enforceable regulatory frameworks is decisive for sustaining market transformation*. Projects in Peru and Chile showed that the adoption of MEPS and phase-out schedules for inefficient lamps provide the foundation for long-term results. In contrast, experiences in Morocco and Côte d'Ivoire demonstrated that weak or absent regulations significantly limit progress.

Lesson 2: Another recurring lesson is the importance of *institutional strengthening and technical capacity-building*. Experiences in Bolivia, Morocco, and Côte d'Ivoire indicate that without equipped laboratories, trained personnel, and robust institutional frameworks, even well-designed regulations remain ineffective. By contrast, the global and regional projects achieved multiplier effects by offering technical assistance and cooperative platforms that enhanced local capacities.

Lesson 3: The evaluations also show that *coordination among national institutions and local governments is a critical factor for effectiveness*. Where ministries, municipalities, standardization institutes, and utilities worked together, results were more visible and replicable. Institutional fragmentation and high staff turnover, as observed in Bolivia, negatively affected continuity.

Lesson 4: A fourth lesson is that *integrating environmental and health considerations, such as mercury-containing lamp disposal, must be addressed from the outset*. Where these aspects were incorporated into project strategies, as in Chile and Bolivia, conditions for a safer and more sustainable transition were created. By contrast, when they were postponed, as in Morocco, environmental risks undermined credibility and feasibility.

Lesson 5: Finally, the evaluations underline that *financial sustainability requires a clear exit strategy that includes co-financing mechanisms*. Projects that relied solely on external resources faced challenges in maintaining results once the intervention ended, while those combining government and private contributions achieved greater resilience.

4.2 Recommendations

116. The evaluated projects have helped identify strategies to replicate EEL initiatives in different contexts. The following recommendations highlight factors enabling replicability and areas for strengthening similar initiatives.

4.2.1 Enablers of Replicability

- i. **Adopt and enforce regulatory frameworks that clearly prohibit obsolete technologies** while ensuring institutional capacity for compliance. Projects in countries with effective bans on incandescent lamps (e.g., Côte d'Ivoire) succeeded when supported by updated MEPS and enforcement mechanisms. In contrast, lack of government endorsement (e.g., Pakistan) delayed implementation and reduced impact. Replication requires not just standard setting but also clarity in institutional mandates, political commitment, and routine compliance audits.
- ii. **Design financing mechanisms that align public and private incentives to accelerate technology uptake.** Consumer-facing schemes (e.g., retailer agreements in Chile) proved effective in reducing upfront costs and increasing adoption. Projects with rigid or poorly structured funds (e.g., Pakistan) failed to attract investors. Replication should combine tiered subsidies, tax incentives, and reinvestment mechanisms tailored to local financial ecosystems.
- iii. **Strengthen national testing and certification infrastructure** to guarantee product quality and build market confidence. Bottlenecks in certification (e.g., Morocco) delayed adaptation to new standards; while countries with better technical infrastructure (e.g., Côte d'Ivoire) advanced faster. Replication requires national lab capacity complemented by access to internationally accredited facilities and cost-effective conformity assessments.
- iv. **Invest in technical training to build human capital across the value chain.** Chile's targeted training for building administrators and designers supported uptake in the tertiary sector. Conversely, lack of institutional training (e.g., Pakistan) limited enforcement credibility. Replication demands continuous capacity-building for regulators, testing institutions, manufacturers, and market intermediaries.
- v. **Integrate end-of-life management of lighting products into project design and regulation.** Most projects overlooked mercury-related risks from CFL disposal (e.g., Peru, Vietnam, Bolivia), while Chile showed promising results through partnerships with private recyclers. Replication depends on embedding recycling and safe disposal measures from the outset, with adequate funding and operational enforcement.
- vi. **Promote PPPs from the planning phase to enhance market responsiveness and sustainability.** Early engagement of energy distributors and industry actors (e.g., Chile) improved uptake and ownership. Where such engagement was absent (e.g., Morocco), implementation lagged. Replication requires removing import and sales barriers, aligning incentives, and ensuring private sector representation in project governance.

4.2.2 Priority Areas for Strengthening

- i. **Clarify causal pathways and results logic through stronger ToC frameworks.** Projects often lacked explicit articulation of how activities would lead to outcomes and impact. Unverified assumptions, poor sequencing, and vague indicators limited learning and implementation focus. Future designs must define clear causal logic, including drivers, assumptions, and interdependencies.
- ii. **Ensure timely and actionable evaluations that support adaptive management.** Mid-term evaluations were often delayed or underutilized. M&E systems focused on activities rather than outcomes, and data was not used to inform decisions. Projects should establish feedback loops that translate monitoring data into real-time course corrections.
- iii. **Address social equity and inclusion as core design elements, not afterthoughts.** Gender, human rights, and vulnerable groups dimensions were weak or absent across most projects. Projects lacked gender audits, disaggregated indicators, and tailored strategies for marginalized groups. Future efforts must embed social analysis and budget lines for inclusive action from the outset.
- iv. **Strengthen institutional mandates and coordination to ensure sustainability.** Weak or temporary institutional arrangements compromised long-term results. Projects lacked clear ownership beyond the implementation phase. Replication requires formalizing intersectoral roles, establishing enduring mandates, and providing resources for institutional continuity.
- v. **Ground project design in robust diagnostics and market data.** Baselines and counterfactual assessments were missing or inadequate, limiting attribution of results. Future interventions must be based on solid ex-ante analysis, including technical, financial, and social feasibility assessments to support better targeting and measurement.
- vi. **Align project duration and sequencing with realistic policy and market dynamics.** Simultaneous rollout of interdependent components reduced effectiveness. Compressed timelines, especially for regulatory reforms, undermined results. A phased approach, aligned with institutional readiness and reform cycles, is essential for deep and sustained transformation.

5 CONCLUSIONS

117. The portfolio of UNEP–GEF efficient lighting projects demonstrates both the potential and the challenges of advancing market transformation in least developed countries. The initiatives succeeded in laying the groundwork for regulatory frameworks, standards, and regional cooperation mechanisms that continue to shape EE policies. They also catalysed knowledge sharing, capacity-building, and institutional learning, which remain valuable assets for replication.

118. At the same time, recurring weaknesses in project design, M&E, stakeholder participation, and integration of social and environmental safeguards limited the depth and sustainability of impacts. The absence of systematic gender and equity considerations, together with insufficient attention to mercury management and circular economy approaches, underscores the need for more holistic and inclusive strategies.

119. Looking forward, the lessons derived from this portfolio point to a clear pathway: future projects must combine robust regulatory and financial mechanisms with strengthened institutional capacities, realistic designs, and stronger engagement of civil society and private sector actors. Embedding gender, equity, and safeguards from the outset, alongside circular economy and waste management frameworks, will be relevant to ensure credibility, sustainability, and long-term benefits. By applying these lessons, UNEP and its partners can contribute more effectively to global climate and sustainable development goals.