

A nighttime photograph of a city skyline with several tall skyscrapers illuminated. In the foreground, a street is lit by a bright streetlight, creating a lens flare effect. The sky is dark, and the overall scene is a mix of warm yellow light from the streetlights and cooler blue and white lights from the buildings.

Clean
Lighting
Coalition

Technical & Economic Assessment of Mercury-Free Lighting: Global Overview

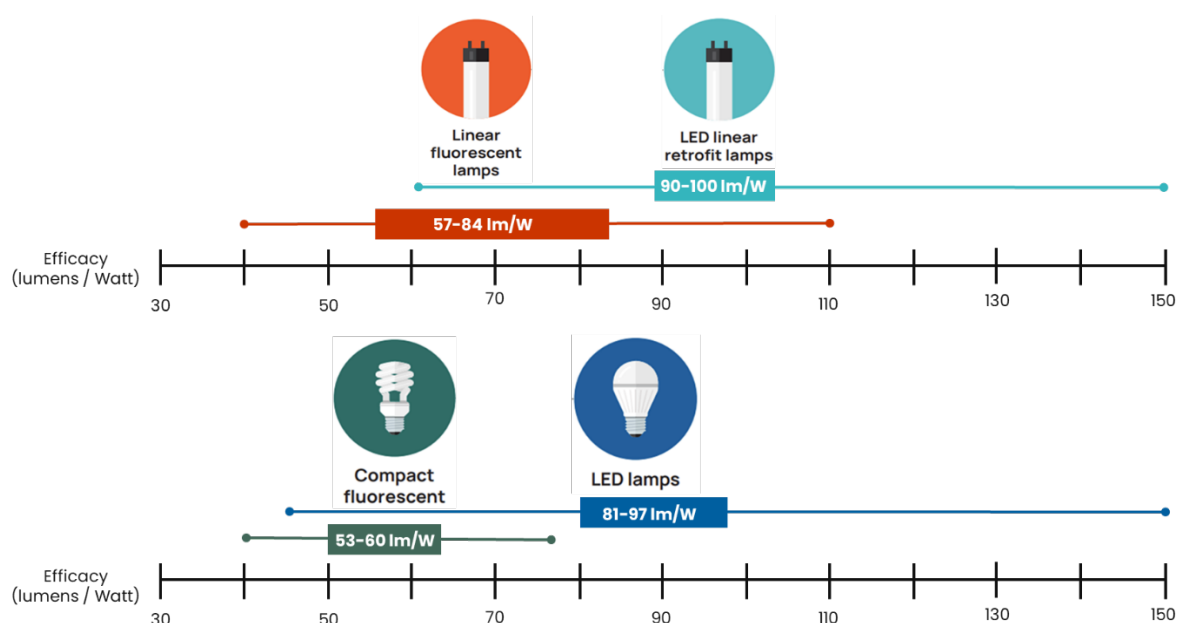
Global Overview

In April 2021, the African region proposed an amendment to Annex A of the Minamata Convention on Mercury to remove exemptions for mercury-containing fluorescent lamps, phasing out virtually all fluorescents by 2025. While fluorescent lamp exemptions may have been necessary in 2013 when the Convention was drafted, lighting technology has moved on rapidly – and today, the accessibility and affordability of mercury-free LED retrofit lamps makes the fluorescent lamp exemption unnecessary.

Over the last year, the Clean Lighting Coalition engaged partner organisations in 35 countries across Africa, Latin America and Asia-Pacific to gather price and performance information on over 1200 lightbulbs, including both mercury-containing fluorescent and LED retrofits from those markets. The evidence outlined in this report demonstrates the widespread availability of cost-effective, energy-efficient and retrofittable LED alternatives to fluorescent lamps.

Energy Efficiency Comparison

The energy efficiency of a light bulb is measured in lumens/watt. That is, the service provided which is measured in lumens of light, divided by the power consumption measured in watts. When you look at the range of values in the market, LED alternatives to mercury-containing fluorescent lamps are more energy-efficient. The lumens per watt of LED products are higher than fluorescent – generally approximately double the efficacy (or energy efficiency). The scale and range of efficiency values found across these 35 lighting markets and more than 1200 lamps is presented in the figure below.



Another way to look at the performance of the lamps found in these 35 national markets is presented in the scatter plot below. This graph below shows the efficacy (i.e., energy efficiency) of individual lamps collected across all regions. In general, LEDs are

approximately twice as efficient as fluorescent lamps, which enables them to produce the same light with less energy and to reduce electricity bills.

The clusters of lighting technologies have been indicated on the graph – with LED lamps (both general service lamps and tubular lamps) being the most efficient, followed by fluorescent lamps (including compact fluorescent and linear fluorescent) and for reference purposes only, incandescent and halogen lamps that were also part of the market research sample at the bottom of the scale.



Comparing Costs: LEDs vs CFL/LFL

The table below presents a sample of some of the economic findings from the various country markets that were analysed. In all cases, mercury-free LED lamps were found to be highly cost-effective, paying back within very short timescales and contributing net savings to the end-users over time. The full list of tables can be found in the Annexes to this report, however this provides an overview of the typical results of these economic comparisons.

Country	LED payback vs. Inc/Hal	LED savings compared to CFL	LED payback vs. LFL	LED savings compared to LFL
Bangladesh	7 months	41%	12 months	40%
Belize	6 weeks	42%	11 months	48%
Brazil	4 weeks	43%	5 months	43%
Burkina Faso	Instant	53%	8 months	46%
Cameroun	8 weeks	55%	6 months	55%

Country	LED payback vs. Inc/Hal	LED savings compared to CFL	LED payback vs. LFL	LED savings compared to LFL
Chile	Instant	38%	2 months	44%
Ethiopia	7 weeks	54%	11 months	47%
Gabon	18 weeks	54%	8 months	43%
Ghana	Instant	49%	1 month	50%
India	7 months	50%	6 months	41%
Indonesia	6 weeks	47%	7 months	47%
Kenya	3 weeks	50%	9 months	48%
Nigeria	16 weeks	41%	9 months	45%
Pakistan	4 weeks	49%	5 months	47%
Perú	2 weeks	50%	4 months	55%
Philippines	12 weeks	53%	2 months	49%
South Africa	Instant	48%	Instant	50%
Vietnam	12 weeks	48%	4 months	49%

Overall, this market research exercise has shown that around the world – in more than 35 countries and thousands of lamps analysed – the time to switch to mercury-free LED lighting is now. There are health, economic, energy and climate reasons to make the switch. Eliminating toxic fluorescent lighting will bring about positive outcomes for public and environmental health, and help to realise a more sustainable, healthier and more climate-friendly lighting market moving forward.

The body of this report is divided up into three Annexes for each of the three regions studied. Within each of those three Annexes, the data is desegregated into the seven key areas of consideration as countries determine if a fluorescent phase-out, as outlined in the African lighting amendment, is feasible at the national and regional level. Below the key sections are summarized:

1. **CO₂ and Mercury Avoided:** If the proposed African lighting amendment is adopted, this section uses lamp shipment projections from CLASP's [Mepsy](#) model to provide regional and country-level projections of avoided CO₂ emissions and mercury releases cumulatively from 2025-2050. The data demonstrates that regions – and many individual countries – will experience significant reductions in CO₂ and mercury emissions.
2. **Lighting Market Overview:** Lighting markets are already transitioning to LEDs around the world, yet the legacy mercury-laden fluorescent lamps still linger, causing widespread mercury pollution and wasting energy. Adopting the proposed African lighting amendment will help to ensure the gradual transition to an all-LED market globally by 2025, in line with the [IEA's roadmap to achieve carbon neutrality by 2050](#). Furthermore, research demonstrates that adopting the proposed African lighting amendment will create new opportunities for local LED manufacturers to supply domestic and regional demand.

3. **Comparing Costs: LEDs vs. CFL/LFL:** Transitioning to efficient LED lighting will result in significant cost savings for people, businesses and governments. By analyzing current price and performance data collected in these 35 countries, we found strong and compelling economics in all markets. On the general service lamps, LED lamps are in most cases less expensive than the compact fluorescent lamps (CFLs) they were designed to replace. For those countries, the payback is instantaneous – switching to mercury-free LED saves at the time of purchase and cuts the energy bill for lighting in half. For linear fluorescent lamps, LED retrofit tubes are also highly cost effective, with all countries reporting payback periods – meaning, the energy savings pays for the incremental higher price of the LED tube – in one year or less. Most countries had payback periods between 4 and 8 months – on LED tubes that then go on to last for years. Given that LED technology is continuing to improve and get cheaper over time, the positive economic case we are observing in 2021/22 will be even more compelling in 2024/25 – the effective years in the proposed African lighting amendment.
4. **Energy Efficiency Comparison:** Each of the regions presents a comparison of the efficacy of light produced between linear fluorescent lamps and LED linear retrofit lamps, and between compact fluorescent lamps and LED lamps. In all cases, the average efficacy and the range of efficacies is higher for LED than for fluorescent. In the market comparisons, researchers found that LED lamps typically had approximately half the wattage of fluorescent lamps, yet produced an equivalent amount of light when installed in a fixture.
5. **Lighting Policy & Legislative Landscape:** In this section, a brief summary of relevant policies and programmes that relate to lighting issues in the region are presented and discussed. Hyperlinks are provided which give access to more information.
6. **Compatibility / Retrofits for LED tubes:** LED lamps have been designed to have the same form, fit and function as the fluorescent lamps that they are replacing. In each of the markets researched, direct, drop-in replacement lamps were found that could be used in both compact fluorescent and linear fluorescent lighting applications. LED retrofits are widely available, have high rates of compatibility – particularly in developing and emerging markets which have a higher share of magnetic (choke) ballasts, on which LED lamps have re 100% compatibility. Overall, using manufacturer literature published in both Europe and North America, LED retrofits have been found to be available for more than 90% of the applications in the field.
7. **End of Life Management for Lighting:** Collecting fluorescent lamps at the end of life is a global problem that has existed since the introduction of fluorescent lamps. Mercury released during the lifecycle of fluorescent lamps contaminate the atmosphere, land and water. This contamination may occur from lamp breakage when old lamps are mixed with general household waste, and during installation, collection or transport of discarded lamps, processing or recycling of spent lamps, or when lamps are landfilled, incinerated or otherwise disposed of. Each of the regional reports discusses the very low rates of recovery at end of life – for example only 4% recovery in Southern Africa, 1.3% in Eastern Africa and close to 0% in other parts. This means that virtually all the mercury from

fluorescent lamps is going to landfills and is polluting the soil and water, and may poison vulnerable people for years to come. The best, lowest cost solution to this problem is simply to stop importing, buying, and/or selling the fluorescent lamps – turn the mercury tap off – and transition to cost-effective LED lamps.

8. **Annexes of Country Level Data:** For each of the countries where data was gathered, there is one or two pages of more detailed national-level information of interest. First, a table is provided which gives the mercury, electricity, CO₂ and financial savings associated with the proposed African Lighting Amendment. Next, a few bullet points are presented which provide relevant information on fluorescent and LED lamps in that country. Finally, there are one or two economic tables which compare fluorescent lamps with mercury-free LED retrofit lamps. In these tables, detail is given on the price in both local currency and USD, the running costs, the payback period and the total lifetime cost of light. These comparisons demonstrate that LED lighting is highly cost effective, in all of the markets analysed. And again, the cost-effectiveness is established based on 2021 / 22 LED prices and performance, in 3-4 years time when the proposed African Lighting Amendment would take effect, the LED lamps will be even cheaper and more efficient, meaning the economics will be even more attractive.

Our Partners

The Clean Lighting Coalition would like to thank and acknowledge the 35 partner organisations around the world which supported us in data collection efforts. Without their efforts, this analysis would not have been possible.

A full list of partners is provided below:

Partner	Country
AFRICA REGION	
Gouvernance Environnementale et le Développement Durable	Burkina Faso
CREPD	Cameroon
ok	Ethiopia
Centre d'Etudes et de Recherches Interafricaines en Santé-Environnement	Gabon
Ecological Restorations	Ghana
African Center for Environmental Health	Ivory Coast
CEJAD	Kenya
SRADeV	Nigeria
Groundwork	South Africa
Les Amis de la Terre-Togo	Togo
Bio Vision Africa (BIVA)	Uganda
Children's Environmental Health Foundation	Zambia
ASIA PACIFIC REGION	

Environment and Social Development Organization	Bangladesh
Nexus3 Foundation	Indonesia
350.org	Japan
Environmental Protection Society Malaysia	Malaysia
SDPI	Pakistan
Centre for Renewable Energy and Sustainable Technology	Philippines
Janathakshan GTE	Sri Lanka
Centre for Supporting Green Development (GreenHub)	Vietnam
LATIN AMERICA & CARIBBEAN GROUP	
Integrated Health Outreach	Antigua and Barbuda
Asociacion Argentina de Medicos por el Medio Ambiente	Argentina
International Energy Initiative - Brazil	Brazil
Toxisphera	Brazil
Juana Lorena Salas Salgado	Colombia
IDEAMBIENTE	Chile
Casa Cem / Vias Verdes A.C.	Mexico
Alianza Contaminacion Zero	Panama
Red Social	Peru
Amalia Laborde	Uruguay



**Clean
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**Technical & Economic Assessment
of Mercury-Free Lighting: African
Region**

African Region

In 2021 the Clean Lighting Coalition engaged partner organisations in **35 countries across Africa, Latin America and Asia** and gathered over 1200 models of both mercury-containing fluorescent and LED retrofits from those markets.

In April 2021, the African region proposed an amendment to Annex A of the Minamata Convention on Mercury to remove exemptions for mercury-containing fluorescent lamps, phasing out virtually all fluorescents by 2025. While these fluorescent exemptions may have been necessary in 2013 when the Convention was drafted, lighting technology has moved on rapidly – and today, the accessibility and affordability of mercury-free LED retrofit lamps makes the fluorescent lamp exemption unnecessary.

Adopting the proposed amendment at the fourth Conference of Parties (COP4) would lead to an accelerated global transition to LED lighting, which is non-toxic and climate friendly. Specifically, it would:

- avoid **232 metric tons** of mercury pollution from leaking into the environment between 2025-2050, both from the lamps themselves and from avoided burning of coal in power plants.
- avoid **3.5 gigatons** of CO2 emissions which is equivalent to getting ALL passenger cars (globally) off the road for a whole year.

If adopted, the African Region would avoid



4,900 kilograms

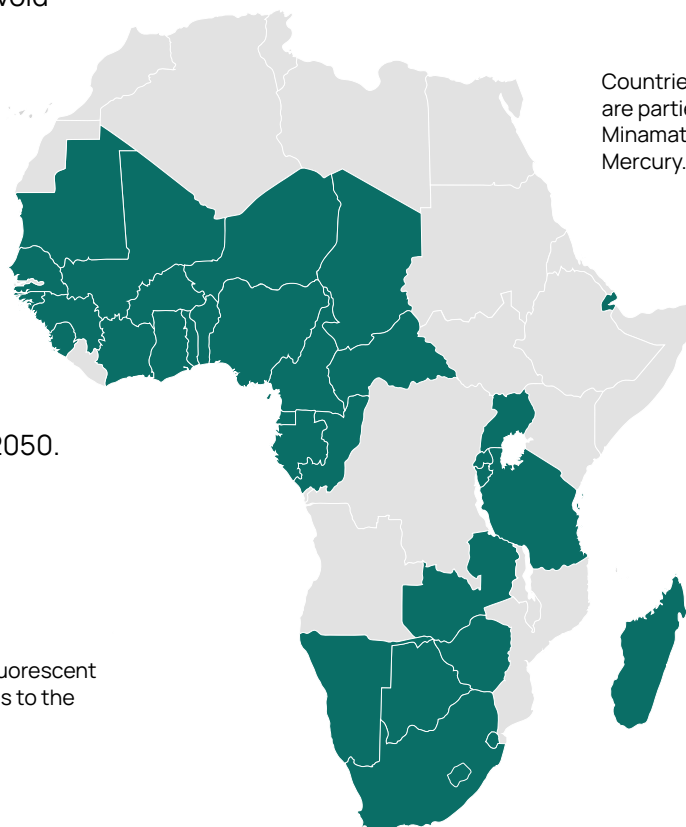
of mercury pollution and



220 mega tons

of CO2 emissions cumulatively 2025-2050.

The data above reflects the benefits of a global fluorescent phase-out to all countries in Africa, not just parties to the Minamata Convention on Mercury.



Based on projections from [CLASP's MEPSY model](#), the table below provides country-level projections of avoided CO2 emissions and mercury releases cumulatively 2025-2050.

COUNTRY	CO2 (MT)	MERCURY (KG)
ALGERIA	21.0	500.3
ANGOLA	3.3	86.1
BENIN	0.3	4.5
BOTSWANA	3.2	28.8
BURKINA FASO	0.8	13.9
BURUNDI	0.1	4.0
CAPE VERDE	0.2	3.9
CAMEROON	1.7	56.7
CENTRAL AFRICAN REPUBLIC	0.0	0.9
CHAD	0.1	1.9
COMOROS	0.0	0.7
DEMOCRATIC REPUBLIC OF THE CONGO	0.2	39.2
REPUBLIC OF THE CONGO	0.8	17.7
CÔTE D'IVOIRE	3.3	73.7
DJIBOUTI	0.0	0.4
EGYPT	66.8	1,796.6
EQUATORIAL GUINEA	0.6	13.3
ERITREA	0.1	2.0
ESWATINI	0.1	14.9
ETHIOPIA	0.3	57.5
GABON	1.2	27.5
GAMBIA	0.1	1.5
GHANA	3.4	87.4
GUINEA	0.4	9.2
GUINEA-BISSAU	0.0	0.6
KENYA	2.3	70.3
LESOTHO	0.0	3.4
MADAGASCAR	0.3	9.4
MALAWI	0.0	9.6
MALI	0.5	10.5
MAURITANIA	0.4	9.1
MAURITIUS	0.9	19.4
MOROCCO	13.0	234.1
MOZAMBIQUE	0.7	53.5
NAMIBIA	0.5	43.8
NIGER	0.7	9.1
NIGERIA	10.7	284.8
RWANDA	0.2	4.9
SENEGAL	1.3	23.4
SIERRA LEONE	0.0	0.3
SOUTH AFRICA	66.1	868.7
SUDAN	1.8	44.1
TANZANIA	1.5	31.6
TOGO	0.1	4.6
TUNISIA	5.2	128.3
UGANDA	0.2	20.2
ZAMBIA	0.6	68.0
ZIMBABWE	6.0	68.5

*Note: Table sums will not match above totals due to rounding. Additionally, for countries without values, there were not sufficient data to accurately project mercury and CO2 figures.

Lighting Market Overview

The African region is a net importer of lighting products. There is no local manufacture of fluorescent lighting on the continent. However, there are several LED **assembly** companies, providing local jobs and stimulating national economies. The companies include:

- **Botswana** - The Bulb World focuses entirely on LED production.
- **Ghana** – Solid Home Appliance Ltd
- **Kenya** – LEDMatix Ltd.
- **Mozambique** - Tempest LED Lighting and Tecnoelectrica
- **Nigeria** – Oretronics technology
- **Rwanda** - Sahasra
- **South Africa** - LEDwise Lighting and Radiant Group (Pty)
- **Uganda** - Lumens Manufacturing Industries (U) Ltd.
- **Zambia** – Savenda Electricals

As an import-based market, phasing-out fluorescents would encourage local manufacturing of LEDs, aligning with regional efforts to stimulate economic growth, generate employment opportunities, and reduce reliance on lighting product importation.

Comparing Costs: LEDs vs CFL/LFL

Based on projections from [CLASP's MEPSY model](#), transitioning to efficient LED lighting would avoid the sale of 183.7 million compact fluorescent lamps and 525.9 million linear fluorescent lamps. Taken together, this will avoid 4,900 kilogrammes of mercury in the lamps and save approximately 425 TWh of the African Region's total electricity consumption between 2025 and 2050. Over the 25 year analysis period, Africa would save \$31.4 billion USD and 221 million metric tonnes of CO₂.

The following tables provide comparative information about the cost of light across countries. The tables show the prices that were recorded in retail stores and on-line shops in each country, and then three columns illustrate the benefits associated with switching to mercury-free LED technology. The Payback Period column tells the amount of time needed for the energy savings from the LED lamp to pay for its higher cost. If the LED lamp is less expensive than the fluorescent lamp, then the payback is "instantaneous". Next, the column labelled "energy savings with LED" shows what the savings will be on the energy bills over the lifetime of the LED lamp.

The following tables detail comparative cost across countries. Please note that the value in brackets is the equivalent cost in USD.

TABLE 1

THE TRUE COST OF LIGHT - GENERAL SERVICE LAMPS











 COUNTRY	 CFL PRICE	 LED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Burkina Faso	XOF 2,500 (US\$ 4.50)	XOF 2,200 (US\$ 3.96)	Instantaneous	XOF 26,986 (US\$ 46.06)
Cameroon	XAF 1,650 (US\$ 2.92)	XAF 1,200 (US\$ 2.12)	Instantaneous	XAF 8,315 (US\$ 14.19)
Ethiopia	EBT 75 (US\$ 1.58)	EBT 75 (US\$ 1.58)	Instantaneous	EBT 571 (US\$ 11.25)
Gabon	XAF 1,000 (US\$ 1.80)	XAF 1,500 (US\$ 2.70)	5 months	XAF 23,215 (US\$ 39.61)
Ghana	GHS 17 (US\$ 2.72)	GHS 22 (US\$ 3.52)	6 months	GHS 136 (US\$ 20.39)
Kenya	KES 140 (US\$ 1.26)	KES 100 (US\$ 0.90)	Instantaneous	KES 1,808 (US\$ 15.89)
Nigeria	NGN 400 (US\$ 0.96)	NGN 340 (US\$ 0.82)	Instantaneous	NGN 6,863 (US\$ 16.49)
South Africa	ZAR 49.99 (US\$ 3.25)	ZAR 27.50 (US\$ 1.79)	Instantaneous	ZAR 208 (US\$ 13.52)
Togo	XOF 800 (US\$ 1.44)	XOF 500 (US\$ 0.90)	Instantaneous	XOF 22,489 (US\$ 38.39)
Uganda	UGX 14,000 (US\$ 3.92)	UGX 8,000 (US\$ 2.24)	Instantaneous	UGX 157,146 (US\$ 44.50)
Zambia	ZMW 35 (US\$ 2.03)	ZMW 30 (US\$ 2.84)	Instantaneous	ZMW 93 (US\$ 5.27)

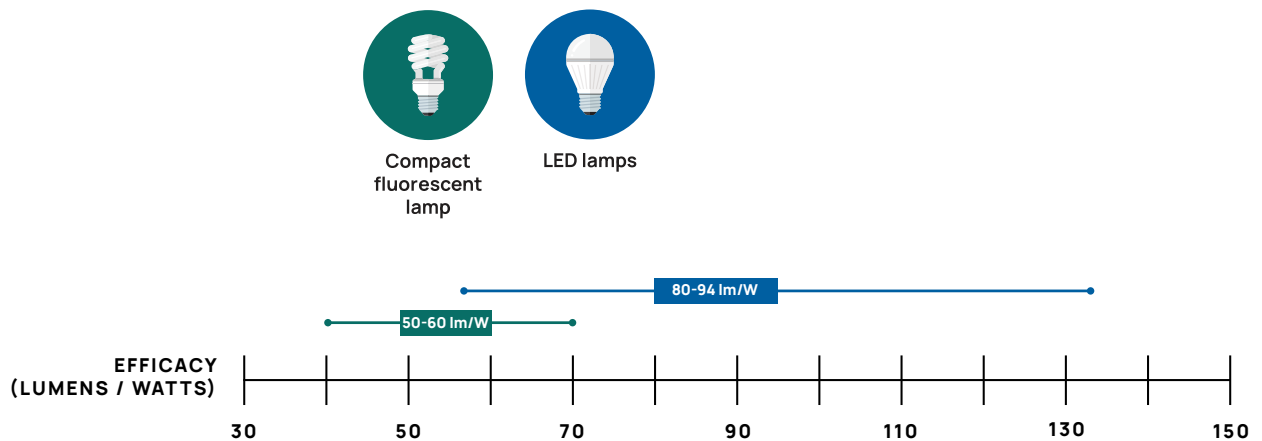
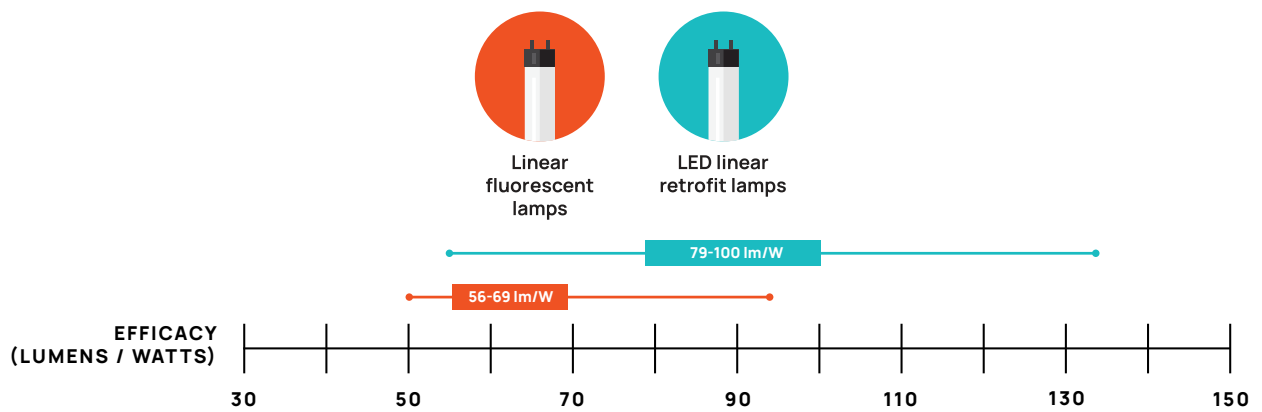
TABLE 2

THE TRUE COST OF LIGHT - LINEAR LAMPS

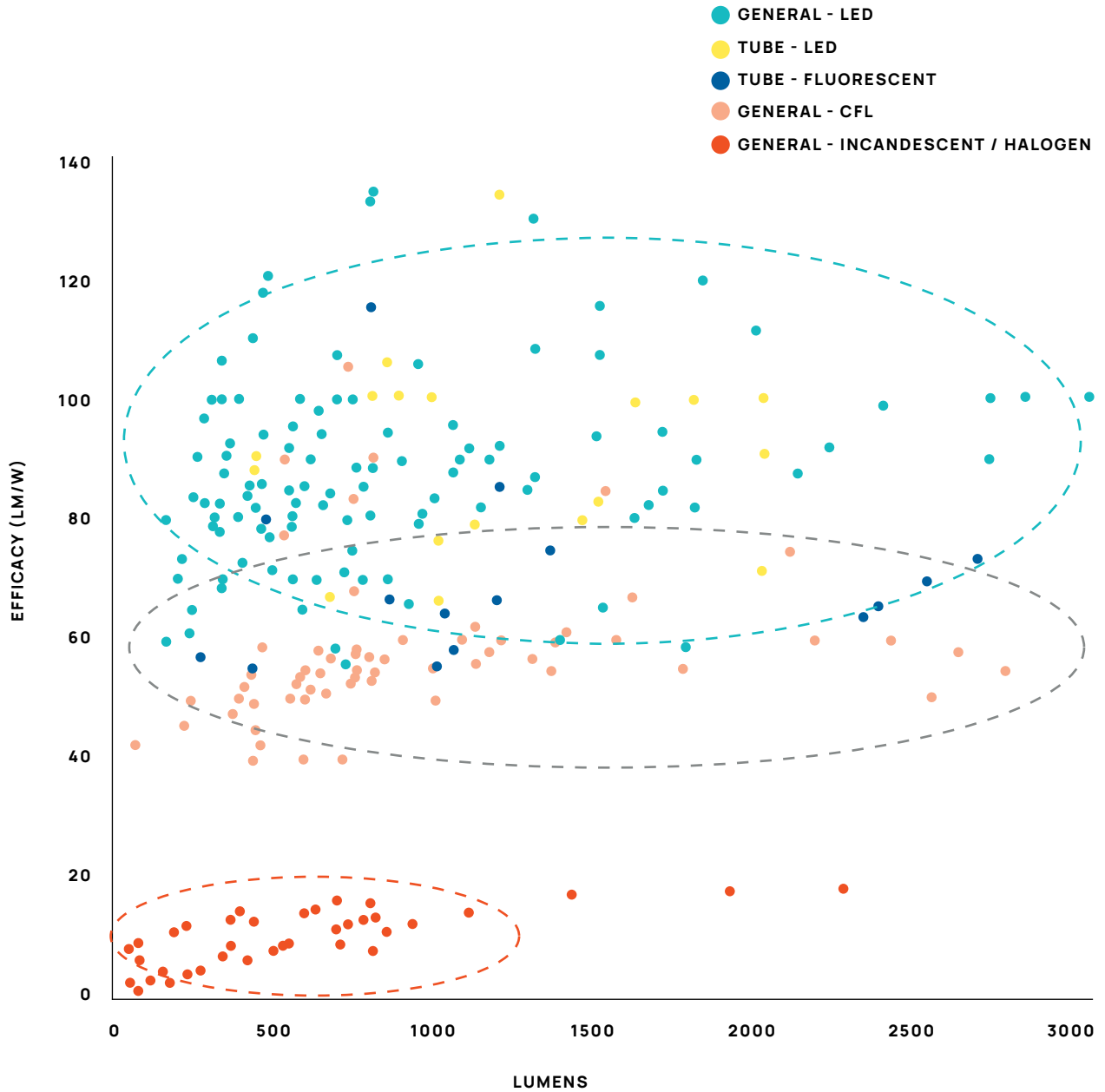
 COUNTRY	 LFL PRICE	 TLED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Burkina Faso	XOF 2,200 (US\$ 3.96)	XOF 4,000 (US\$ 7.20)	7 months	XOF 67,489 (US\$ 115.19)
Cameroon	XAF 2,500 (US\$ 4.42)	XAF 3,500 (US\$ 6.19)	5 months	XAF 53,447 (US\$ 91.19)
Ethiopia	EBT 95 (US\$ 2.00)	EBT 170 (US\$ 3.57)	11 months	EBT 2,314 (US\$ 45.56)
Gabon	XAF 650 (US\$ 1.17)	XAF 2,500 (US\$ 4.50)	7 months	XAF 42,753 (US\$ 72.95)
Ghana	GHS 7 (US\$ 1.12)	GHS 10 (US\$ 1.60)	1 month	GHS 1,468 (US\$ 220.28)
Kenya	KES 125 (US\$ 1.13)	KES 400 (US\$ 3.60)	8 months	KES 10,800 (US\$ 94.89)
Nigeria	NGN 500 (US\$ 1.20)	NGN 1,500 (US\$ 3.60)	10 months	NGN 56,301 (US\$ 135.29)
South Africa	ZAR 39.99 (US\$ 2.60)	ZAR 39 (US\$ 2.54)	Instantaneous	ZAR 1,246 (US\$ 81.12)
Uganda	UGX 14,500 (US\$ 4.06)	UGX 8,600 (US\$ 2.41)	Instantaneous	UGX 205,726 (US\$ 58.26)

Energy Efficiency Comparison

The energy efficiency of a light bulb is measured in lumens/watt. Based on data collected in Q4 2021, the graphic below depicts the ranges of energy efficiency of different types of bulbs available across African markets. It represents efficiency quartiles (0%,25%,50%,75%,100%) of the data we collected when sorted from lowest to highest efficiency. The box with numbers represents the 25th-75th quartile while the thin lines with the dots represent the lowest and highest efficiency per technology on either end.



The graph below shows the energy efficiency of individual samples collected across the region. LEDs are up to 2-3 times more efficient than the other lighting technologies, therefore use less overall electricity to provide the same or better lighting service.



Lighting Policy & Legislative Landscape

Many countries in the region are shifting towards LED only markets through energy efficiency policy and/or mercury regulation. Some of the notable regulations include:

- Southern Africa Development Community – 16 countries adopted a **harmonised** standard SADC HT 109:2021 in Q2 2021, **shifts markets to LED**.
- East African Community – 6 countries, draft harmonised standard DEAS 1064; finalization is expected in Q1 2022 which will **shift markets to LED**.
- Ivory Coast – After signing the Minamata Convention and developing the Decree of E-waste Management (adopted in 2017), the government has been supplying LEDs lamps for public lighting in all the major cities of the country since 2019. The government is further promoting LEDs lamps by reducing taxes on these lamps.
- Nigeria: In its highlighted strategies to achieve energy efficiency, the Nigeria Energy Policy of 2013 specifically mentions replacing all incandescent light bulbs in every home, industry and institutions with LEDs and other energy saving lamps by the year 2025.
- Burkina Faso's National Energy Act has an entire chapter dedicated to Energy Efficiency. In support of this objective, one of the notable government interventions includes the installation of 3,000LED streetlamps.

Compatibility/Retrofits for LED tubes

In all the studied African markets, LED retrofits were easily available for both general service lamps and tube lamps. Additionally, the economic co-operation between regions such as EAC and SADC is an indicator that can be used to extrapolate the availability of retrofits in the other African countries, given regions typically have harmonized standards for lighting products and source through the same import channels.

End of Life Management for Lighting

Collecting fluorescent lamps at the end of life is a global problem that has existed since the introduction of fluorescents. Mercury released during the lifecycle of fluorescent Lamps contaminate the atmosphere, land and water. This contamination may occur from lamp breakage when old lamps are comingled with general household waste, and during installation, collection or transport of discarded lamps, processing or recycling of spent lamps, or when lamps are landfilled, incinerated or otherwise disposed of.

In Africa, collected and properly recycled e-waste (not just lighting products) was at 4% in Southern Africa, 1.3% in Eastern Africa and close to 0% in other regions. The small size and weight of bulbs makes them easy for consumers to mistakenly dispose of in general waste, and consumers may not be aware that they require special disposal. Collection and safe recycling/disposal of fluorescent lamps is difficult – especially in regions with low levels of general e-waste collection and processing. Currently, sub-Saharan Africa has no mercury treatment or disposal facility.

However, major e-waste recyclers across the continent are already safely disposing LED lighting products, including Enviroserve in Rwanda, WEEE Centre in Kenya, Hinckley Recycling in Nigeria and more. While LED lamps are also considered e-waste, they are not toxic or considered hazardous waste. The proposed African Lighting Amendment would remove toxic e-waste from the market more quickly.



Annex of Country Level Data

Burkina Faso



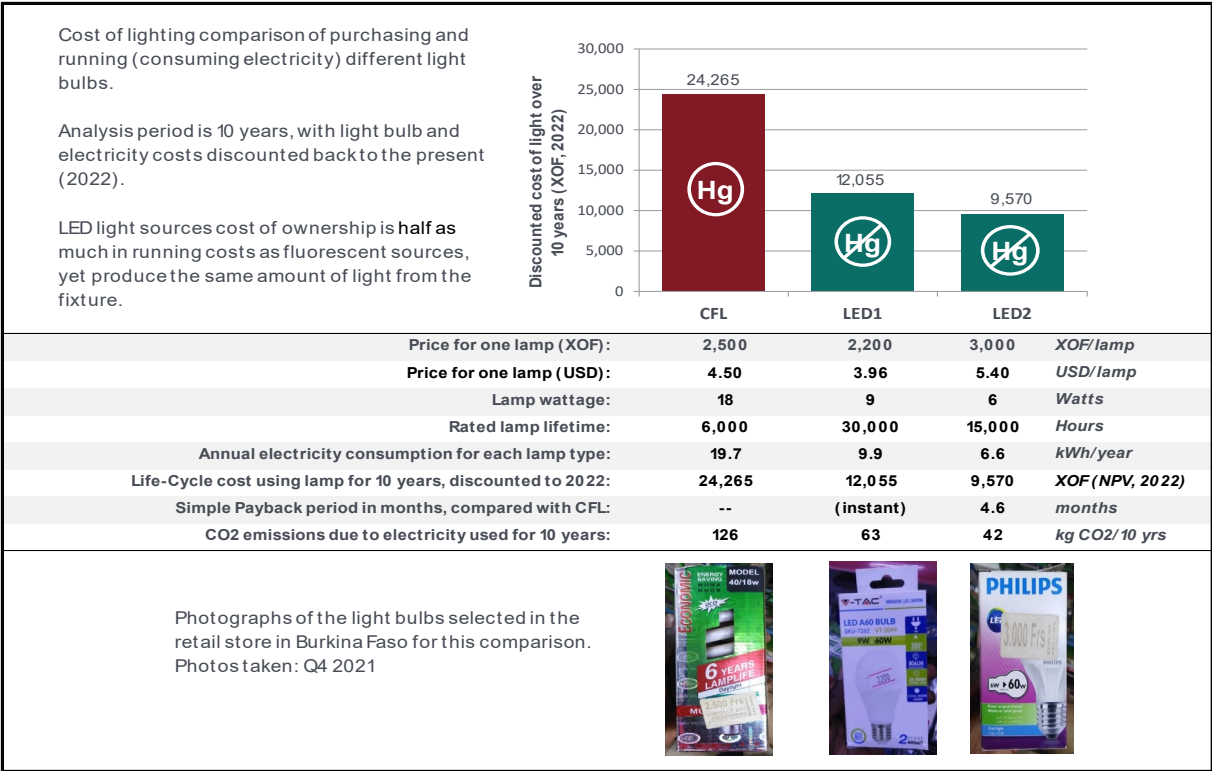
Table 1. Quantifying the Benefits of the African Lighting Amendment in Burkina Faso

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	522,929 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	1,503,849 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	14 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	1.22 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 220 million

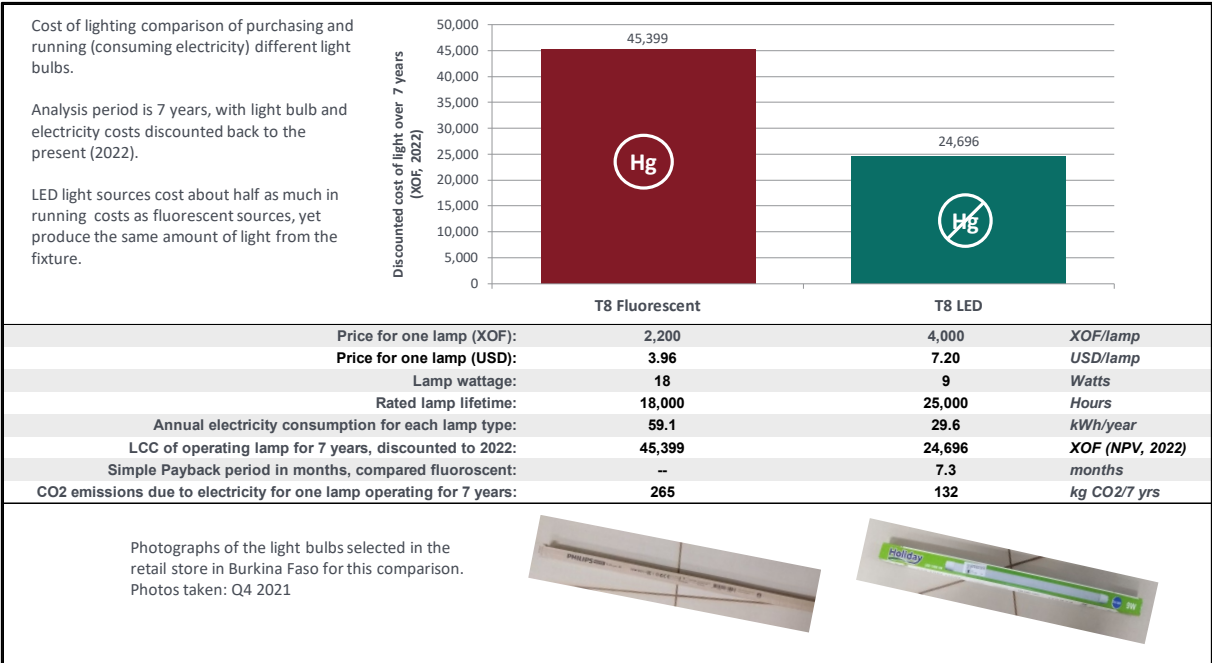
Important information about mercury and lighting in Burkina Faso:

- According to their MIA, mercury light sources contribute 26 Kg Hg/Year resulting in air and soil pollution. It is estimated that about 573,000 (very rough estimate) lamps are imported into the country annually. Their low cost, improved efficiency and porous borders mean that a lot more mercury containing lights make their way into Burkina's market.
- The Burkinabe government has rolled out several initiatives in recent years including the replacement of 1,926 inefficient streetlamps in Burkina Faso's major cities and has installed 3,000 LED streetlamps.
- As members of ECOWAS, Burkina Faso subscribe to the ECOWAS' energy efficiency plan to phase out incandescent lamps and replace them with high efficiency alternatives

The box below offers an economic analysis of a compact fluorescent lamp (CFL) and two light emitting diode (LED) retrofit bulbs. All of these lamps were selected and photographed in a retail store in Burkina Faso. Switching to LED in Burkina Faso offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately XOF 12,000 to 14,500 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Burkina Faso. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately XOF 20,000 over the lifetime of the LED lamp, yet the LED only costs XOF 1800 more at the time of purchase.



Cameroon



Table 2. Quantifying the Benefits of the African Lighting Amendment in Cameroon

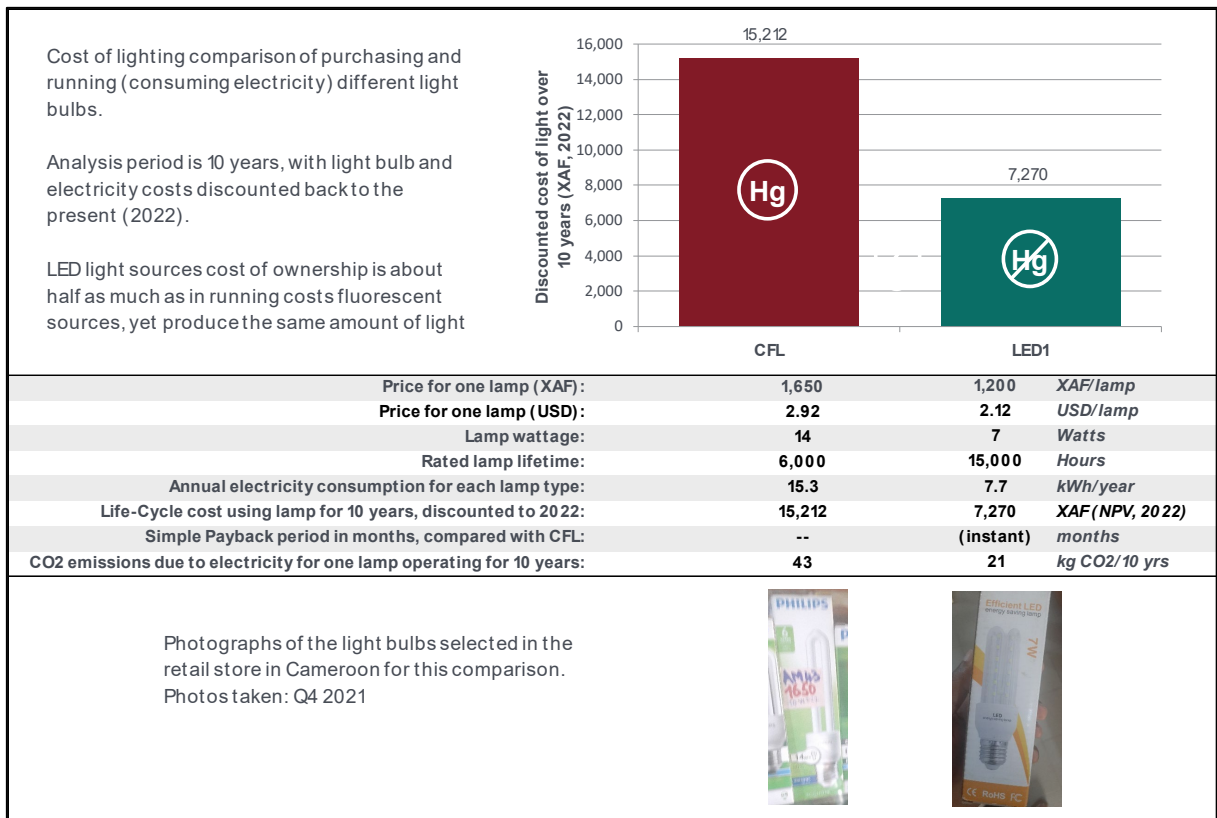
Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	2,211,769 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	6,082,023 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	5.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 710 million

Cameroon has a 10 year (2015 –2025) National Policy, Strategy and Action Plan to promote Energy Efficiency in the Electricity Sector of Cameroon, with specific strategy and action plan that includes:

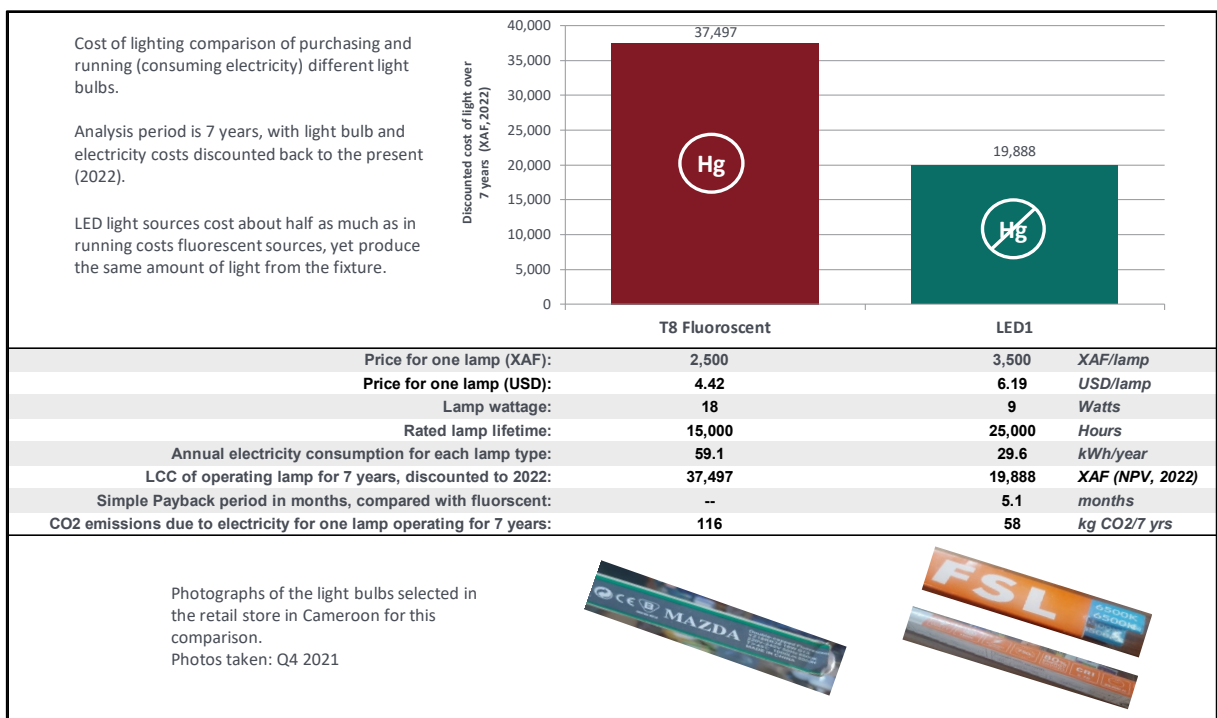
- Facilitating the Emergence of Bankable Energy Efficiency Projects,
- Development of a regulatory and normative framework promoting energy efficiency,
- Development of a program to optimize lighting efficiency
- Development of an energy efficiency code for the construction of new buildings and national regulations for the energy performance of existing buildings,
- Promotion of Compact Fluorescent Lamps (CFLs) or LEDs,
- Campaigns to raise awareness of energy efficiency among the general public Awareness campaigns for professionals on energy efficiency

In addition to this, Cameroon has an emerging green technology business Cameroon Energies which is looking to produce LED technologies. Mercury-free LED retrofit bulbs are highly cost-effective in Cameroon.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Cameroon. Switching to LED in Cameroon offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately XAF 8,000 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Cameroon. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately XAF 18,000 over the lifetime of the LED lamp, yet the LED only costs XAF 1000 more at the time of purchase.



Ethiopia



Table 3. Quantifying the Benefits of the African Lighting Amendment in Ethiopia

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	2,196,952 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	6,199,896 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	5.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 300 million

Important information about mercury and lighting in Ethiopia:

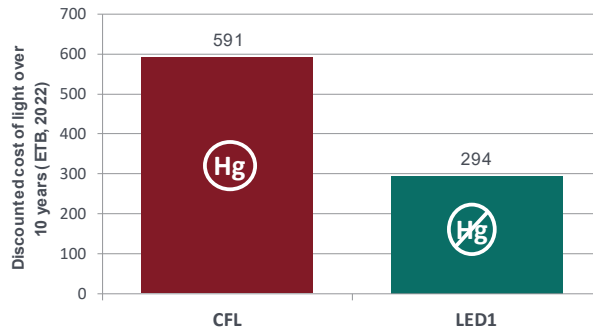
- There are several local manufacturers who either manufacture, import or assemble different lighting technologies and accessories including LED. They include ABC Electrical Manufacturing, Maensu, Fosera, Edison and others.
- Five or six years ago, the government purchased 10 million CFLs and distributed them to the people as part of an energy-efficient lighting initiative, the lamps contained 5 mg of mercury each.
- The use of mercury in consumer products, including lighting products, is approximately 14 percent of the total mercury released to the environment in Ethiopia.
- Ethiopia is revising its National Energy Policy and Strategy at the moment, and the plan is expected to ensure least life-cycle cost options are implement.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Ethiopia. Switching to LED in Ethiopia offers an instantaneous payback, because the LED lamp is the same price as the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately ETB 300 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost of ownership is about half of fluorescent sources, yet produce the same amount of light from



Price for one lamp (ETB):	75	75	ETB/lamp
Price for one lamp (USD):	1.58	1.58	USD/lamp
Lamp wattage:	15	7	Watts
Rated lamp lifetime:	8,000	25,000	Hours
Annual electricity consumption for each lamp type:	16.4	7.7	kWh/year
Life-Cycle cost using lamp for 10 years, discounted to 2022:	591	294	ETB (NPV, 2022)
Simple Payback period in months, compared with CFL:	--	(instant)	months
CO2 emissions due to electricity for one lamp operating for 10 years:	7	3	kg CO2/10 yrs

Photographs of the light bulbs selected in the retail store in Ethiopia for this comparison.

Photos taken: Q4 2021

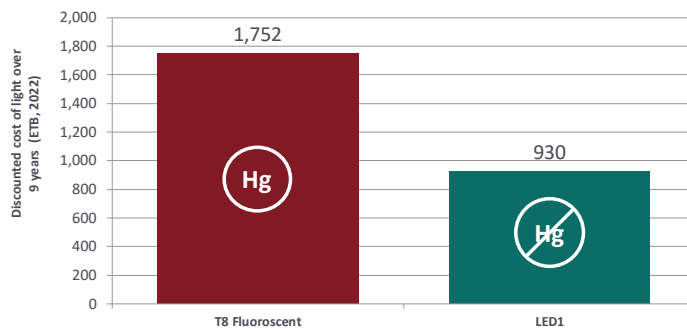


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Ethiopia. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately ETB 800 over the lifetime of the LED lamp, yet the LED only costs ETB 75 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 9 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost of ownership is about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (ETB):	95	170	ETB/lamp
Price for one lamp (USD):	2.00	3.57	USD/lamp
Lamp wattage:	18	9	Watts
Rated lamp lifetime:	13,000	30,000	Hours
Annual electricity consumption for each lamp type:	59.1	29.6	kWh/year
LCC of operating lamp for 9 years, discounted to 2022:	1,752	930	ETB (NPV, 2022)
Simple Payback period in months, compared with fluorescent:	--	10.7	months
CO2 emissions due to electricity for one lamp operating for 9 years:	21	11	kg CO2/9 yrs

Photographs of the light bulbs selected in the retail store in Ethiopia for this comparison.

Photos taken: Q4 2021



Gabon



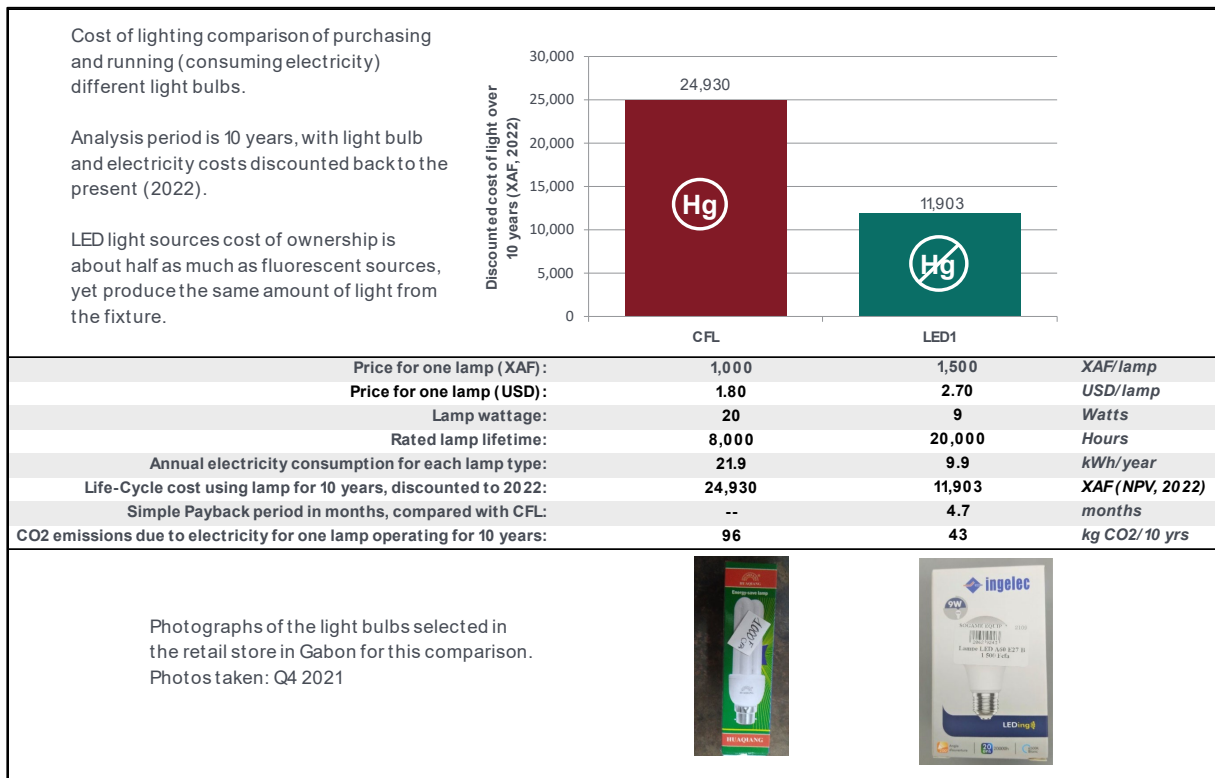
Table 4. Quantifying the Benefits of the African Lighting Amendment in Gabon

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	1,090,411 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	2,935,461 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	27 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	2.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 450 million

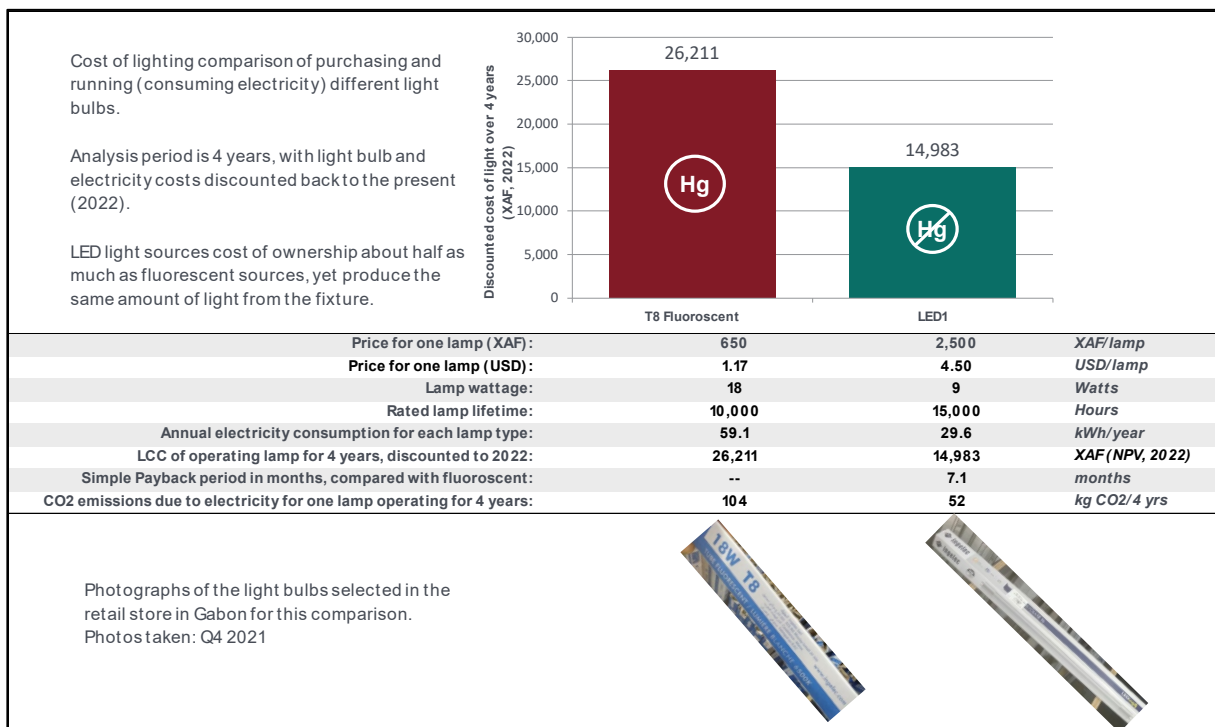
Important information about mercury and lighting in Gabon:

- Importers and traders include Foberd Gabon and Gabon Meca who import majorly LED lighting products, both lamps and luminaires.
- Gabon's oil product is in decline, thus the government is investing in the wider economy to diversify and develop new technologies and businesses.
- Gabon's strategy encourages private investment, both domestic and foreign, through the creation of Special Economic Zones (SEZ).
- Lighting regulations can be traced back 2011 by Decree n°0658/PR/MERH of the National Council for Water and Electricity (CNEE). This Decree gives this body the power to implement a national public lighting policy. Certainly, efforts are being made to popularize public lighting with LED lamps to the detriment of halogens.
- Mercury-free LED retrofit bulbs are highly cost-effective in Gabon.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Gabon. Switching to LED in Gabon offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately XAF 13,000 over the lifetime of the LED retrofit lamp – yet the LED only costs XAF 500 more.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Gabon. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately XAF 12,000 over the lifetime of the LED lamp, yet the LED only costs XAF 1800 more at the time of purchase.



Ghana



Table 5. Quantifying the Benefits of the African Lighting Amendment in Ghana

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	3,668,340 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	9,205,838 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	8.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 2.24 billion

Important information about mercury and lighting in Ghana:

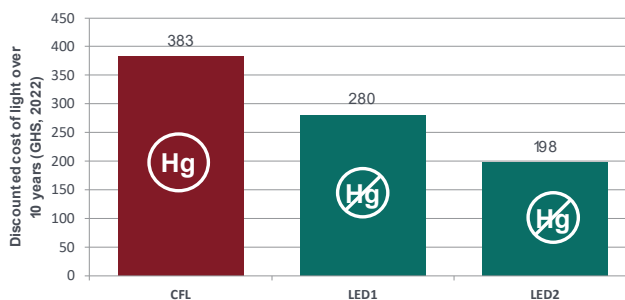
- Ghana is operating a Mandatory Appliance Standards and Labelling regime. Lighting technologies, sold in the country must meet minimum efficiency and performance standards approved by the Ghana Standards Authority (GSA). Appliance manufacturers who export to Ghana and retailers who sell in Ghana are obliged to display a label which indicates the energy efficiency rating of the product. It is therefore an offence under LI 1815 and LI 2353 to import, display for sale or sell lighting technologies in Ghana unless they meet the minimum performance standards and are properly labelled. The market is going through a transition with increased adoption of LED lighting technologies
- In 2007 the country implemented a programme to replace 6 million incandescent lamps with CFLs. Import duty and VAT were waived on the importation of CFLs in 2002 and on light emitting diode (LED) lamps in 2010
- Ghana is ahead of the curve with a local assembler of LED lighting technologies: Solid Home Appliances

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Ghana. Switching to LED in Ghana offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately GHS 100 to 200 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost of ownership is about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (GHS):	17	22	15	GHS/lamp
Price for one lamp (USD):	2.72	3.52	2.40	USD/lamp
Lamp wattage:	18	13	9	Watts
Rated lamp lifetime:	6,000	15,000	10,000	Hours
Annual electricity consumption for each lamp type:	19.7	14.2	9.9	kWh/year
LCC of operating lamp for 10 years, discounted to 2022:	383	280	198	GHS (NPV, 2022)
Simple Payback period in months, compared with CFL:	--	6.0	(instant)	months
CO2 emissions due to electricity for one lamp operating for 10 years:	71	51	35	kg CO2/10 yrs

Photographs of the light bulbs selected in the retail store in Ghana for this comparison.
Photos taken: Q4 2021

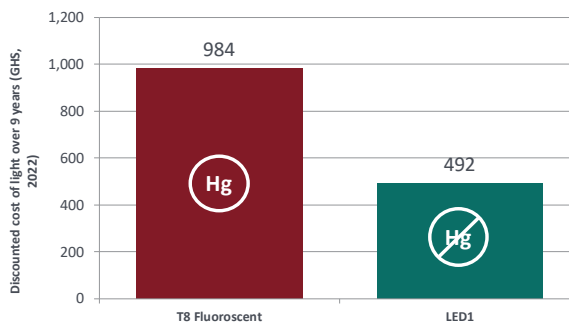


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Ghana. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately GHS 500 over the lifetime of the LED lamp, yet the LED only costs GHS 3 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 9 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost of ownership is about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (GHS):	7	10	GHS/lamp
Price for one lamp (USD):	1.12	1.60	USD/lamp
Lamp wattage:	18	9	Watts
Rated lamp lifetime:	8,000	30,000	Hours
Annual electricity consumption for each lamp type:	59.1	29.6	kWh/year
LCC of operating lamp for 9 years, discounted to 2022:	984	492	GHS (NPV, 2022)
Simple Payback period in months, compared with fluorescent:	--	0.7	months
CO2 emissions due to electricity for one lamp operating for 9 years:	192	96	kg CO2/9 yrs

Photographs of the light bulbs selected in the retail store in Ghana for this comparison.
Photos taken: Q4 2021



Kenya



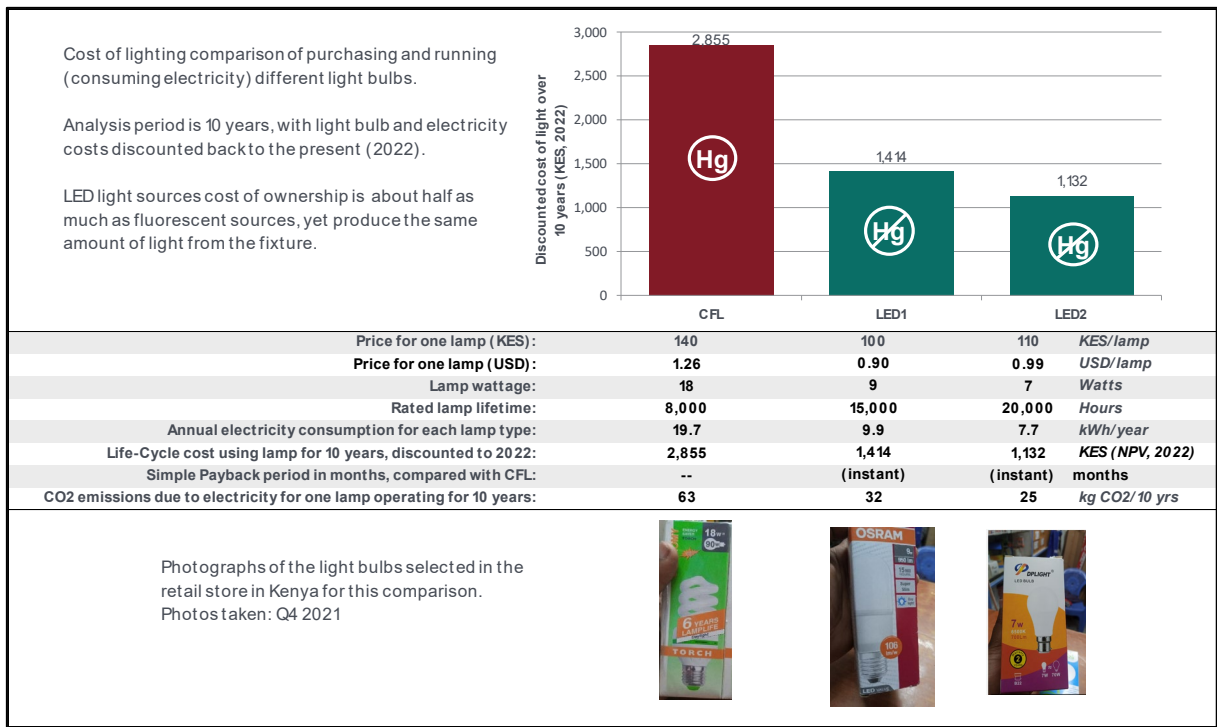
Table 7. Quantifying the Benefits of the African Lighting Amendment in Kenya

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	2,713,707 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	7,558,884 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	6.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 740 million

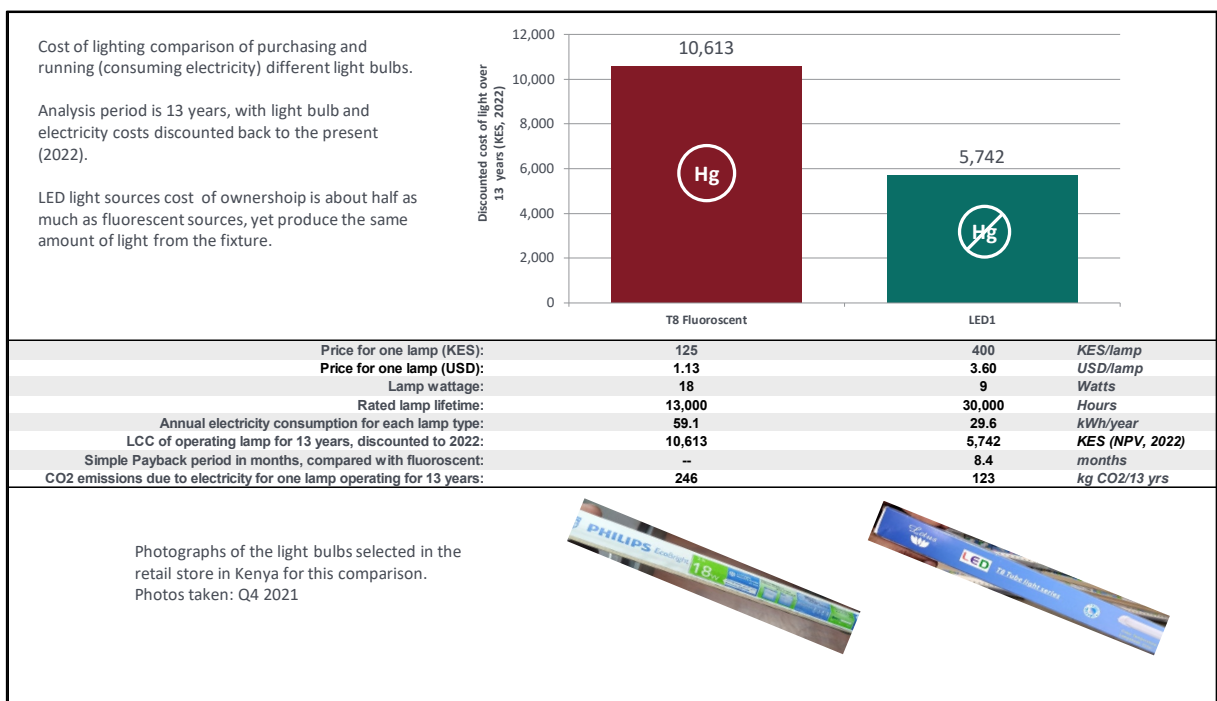
Important information about mercury and lighting in Kenya:

- Standards have already set limits for the mercury content in lighting products (the maximum allowable mercury of 2mg for single capped fluorescent lamps <50W while for lights >50-150W its set at 4.5mg). These regulations also identify the disposal requirements.
- Kenya has MEPS for general service lighting (GSL), directional & non directional lamps and LED that phases out fluorescent lighting (KS 2914:2002) and is in the process of being made mandatory.
- The lighting products (both DC and AC) led to increased uptake of Light Emitting Diode technology, which has quickly been adopted outside the solar segment, leading to increased awareness on efficiency of LED luminary products. The LED product also come in different shapes, and designs, that has further appealed to the consumers as they offer greater flexibility for internal and external lighting fixtures compared to CFLs. The narrowing price differentials between CFLs and LEDs, have translated to many households adopting LED bulbs as opposed to traditional halogens or incandescent bulbs, and currently slowly replacing CFLs
- Kenya is currently the largest market for LED products in the East Africa region; of the different applications; commercial, industrial, residential and other application sectors, the commercial sector accounts for the largest share.
- Kenya is ahead of the curve with a local assembler of LED lighting technologies: LEDMatix

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Kenya. Switching to LED in Kenya offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately KES 1,400 to 1,700 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Kenya. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately KES 5000 over the lifetime of the LED lamp, yet the LED only costs KES 275 more at the time of purchase.



Nigeria



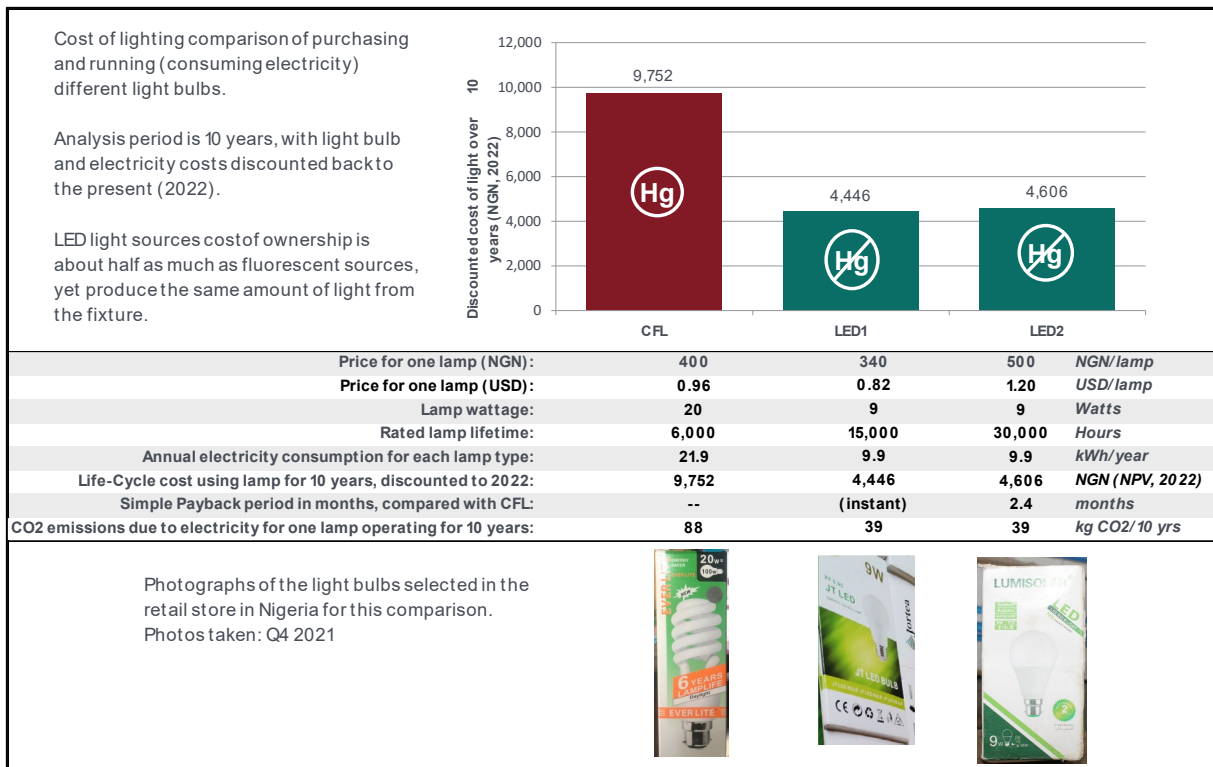
Table 8. Quantifying the Benefits of the African Lighting Amendment in Nigeria

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	10,306,161 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	31,106,907 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	300 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	25.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 2.47 billion

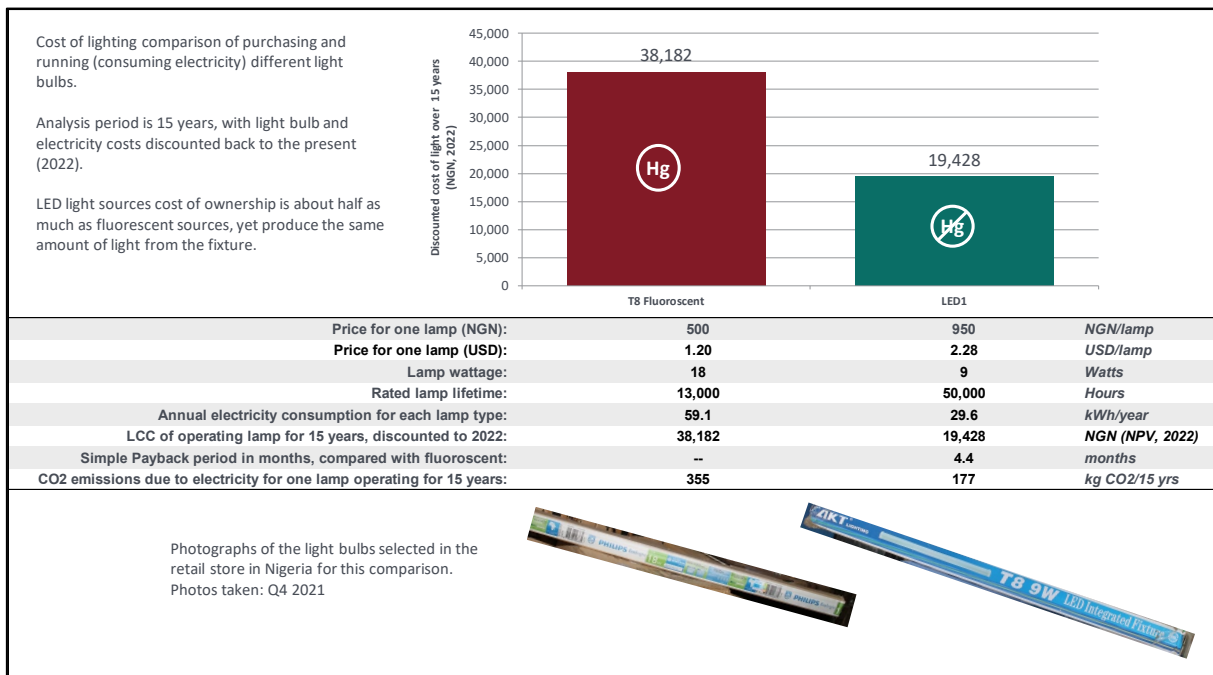
Important information about mercury and lighting in Nigeria:

- Nigeria adopted MEPs for lighting products including self-ballasted and tungsten filament GSL and is carrying out awareness raising on the phase out CFL through their energy efficiency policies.
- The Nigeria Energy Policy prioritized the replacement of all incandescent light bulbs in every home, industry, institution and establishments in Nigeria with LEDs and other energy saving lamps by the year 2025. Nigerian National Energy Efficiency Action Plan (NEEAP) also prioritize the use of EE lighting and target that 40% of households will use EE lighting by 2020 and 100% by 2030.
- The Nigerian Clean Energy Access Program (NCEAP) plans to distribute 150 million efficient bulbs over the next five years under the Clean Development Mechanism (CDM).
- Nigeria has an LED assembly company: Oretronics Technology and key association include Power9ja and Consumer Protection Council who carried out an awareness on LEDS for importers and dealers

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Nigeria. Switching to LED in Nigeria offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately NGN 5,300 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Nigeria. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately NGN 19,000 over the lifetime of the LED lamp, yet the LED only costs NGN 450 more at the time of purchase.



South Africa



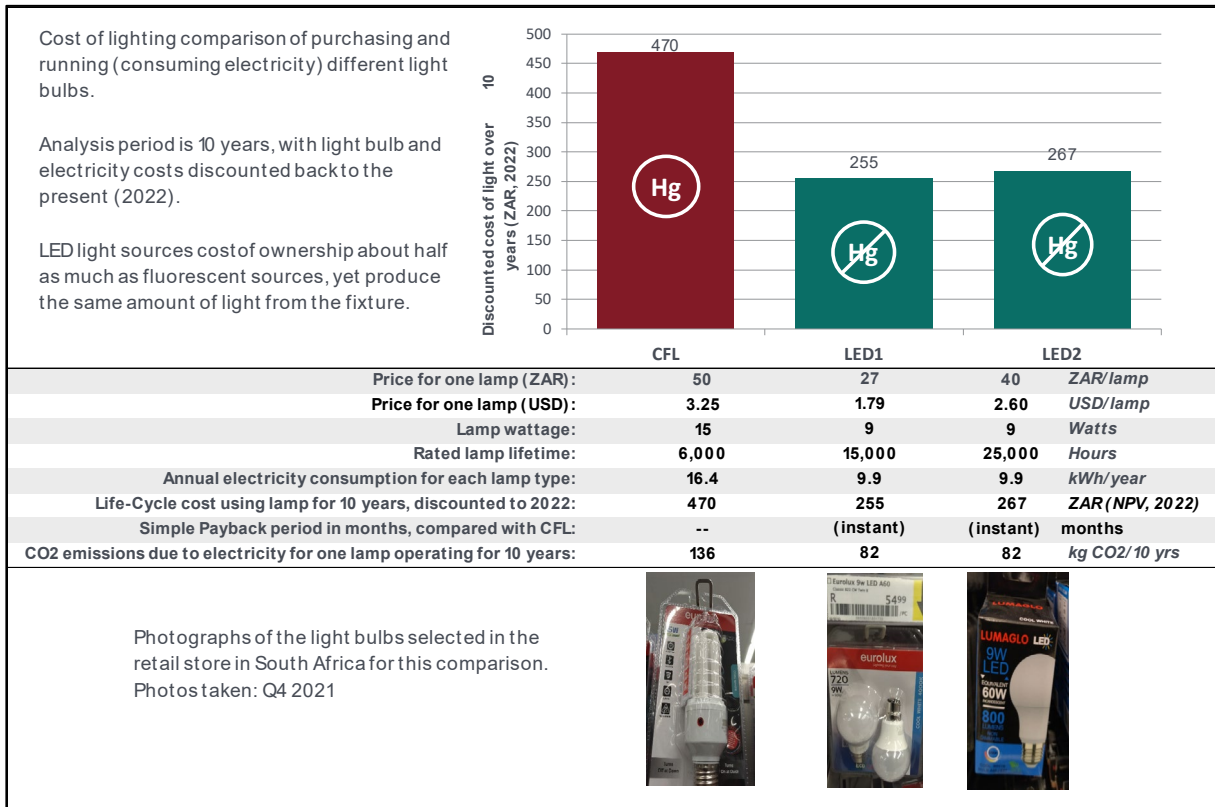
Table 9. Quantifying the Benefits of the African Lighting Amendment in South Africa

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	38,288,466 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	90,306,453 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	900 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	76.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 11.39 billion

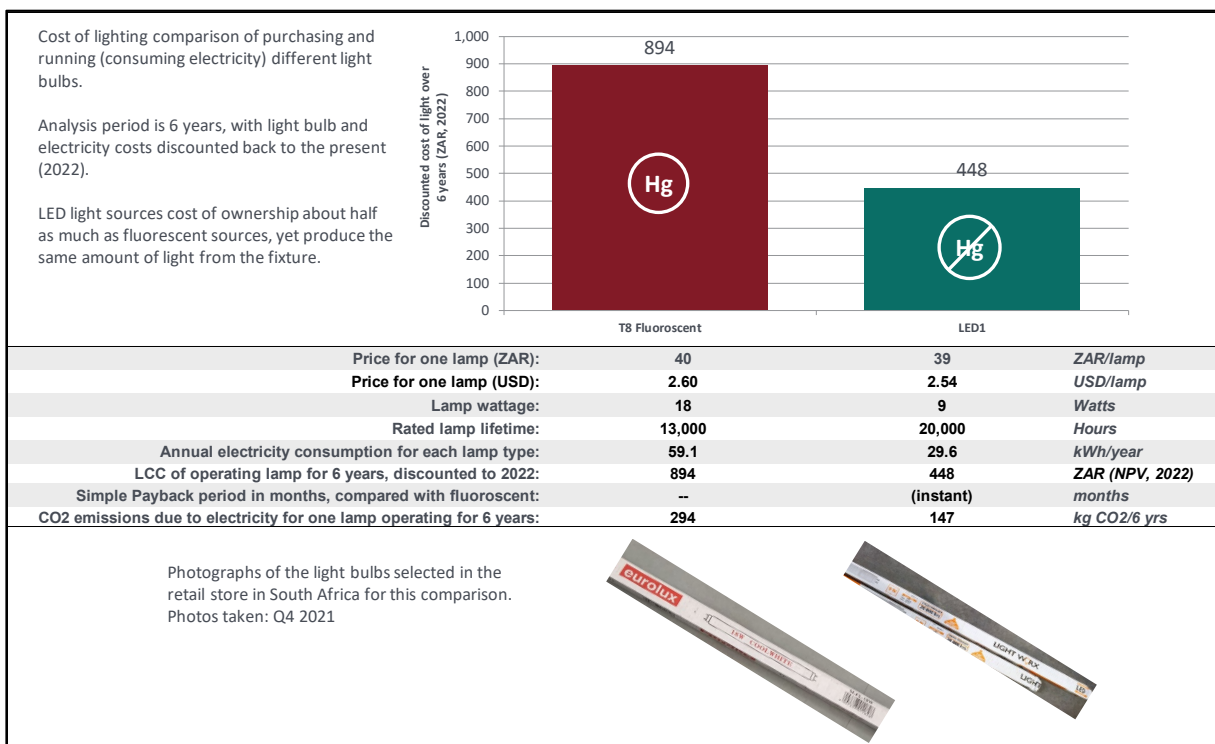
Important information about mercury and lighting in South Africa:

- South Africa has already a compulsory specification policy for General Service Lamps (GSLs) at an advanced stage. South Africa’s National Regulator for Compulsory Specification (NRCS) set out compulsory specifications for safety performance and energy efficiency and functional performance requirements of General Services Lamps: VC 9110 and VC9109 respectively. The proposed VCs will phase out lighting products which do not meet the specifications would be removed from the market in two phases, the first taking effect twelve (12) months from publication in the Gazette and the second phase taking effect in 2024. These new regulations for general-purpose light bulbs in South Africa will make it unlawful to continue selling the compact fluorescent lamps that are currently on the market.
- These specifications are in line with UNIDO program that is actively working to try and shift the general service lamp market to LED (phasing out all CFLs and halogens) by 2023: The UNIDO program which is focusing on adoption of regional MEPS for lighting has been adopted by SADCSTAN (SADC HT 109:2021). However, South Africa has not “domesticated” the SADCSTAN regionally harmonized standard.
- South Africa led the region in phasing out the use of incandescent lighting and is on track to abolish CFL lights

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in South Africa. Switching to LED in South Africa offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately ZAR 200 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in South Africa. The LED tube is less expensive than the fluorescent lamp on a first-cost basis, so the payback period is instantaneous. Furthermore, the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately ZAR 450 over the lifetime of the LED lamp.



Togo



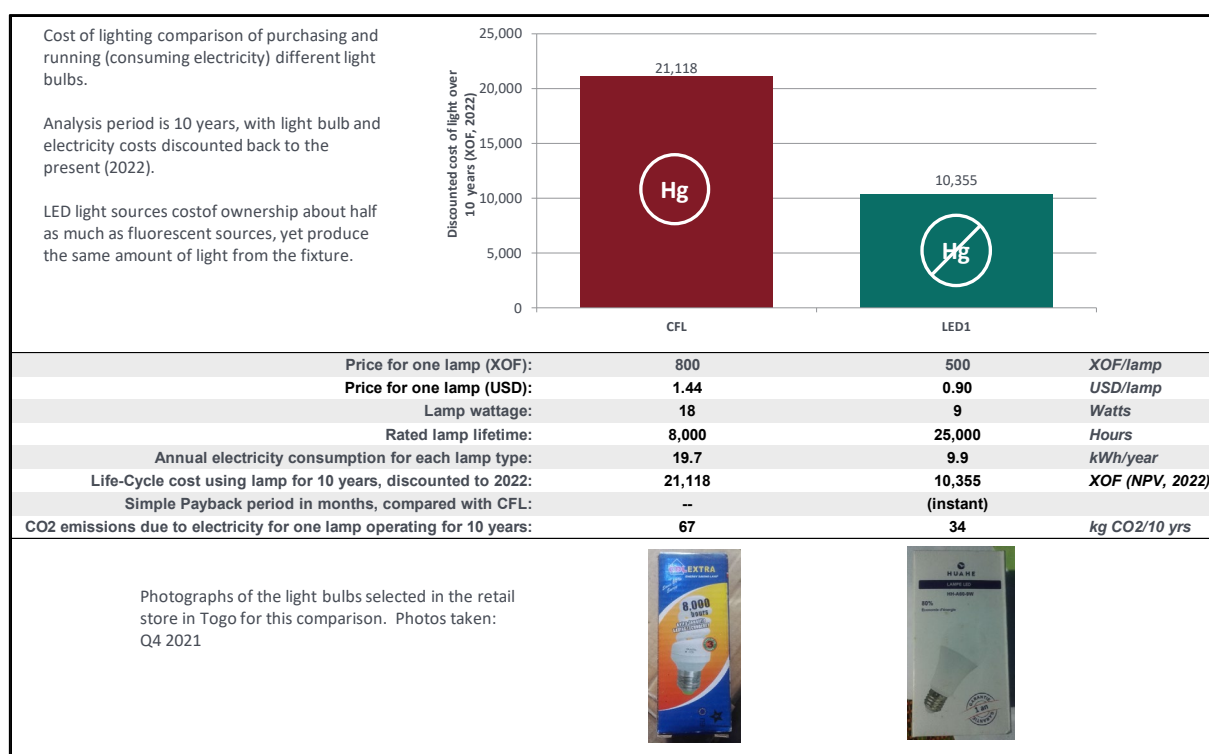
Table 10. Quantifying the Benefits of the African Lighting Amendment in Togo

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	174,237 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	495,033 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	5 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	0.40 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 70 million

Important information about mercury and lighting in Togo:

- Togo’s lighting market is transitioning to LED, driven by the strong economic benefits of switching away from mercury-containing fluorescent lamps.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Togo. Switching to LED in Togo offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately XOF 11,000 over the lifetime of the LED retrofit lamp.



Uganda



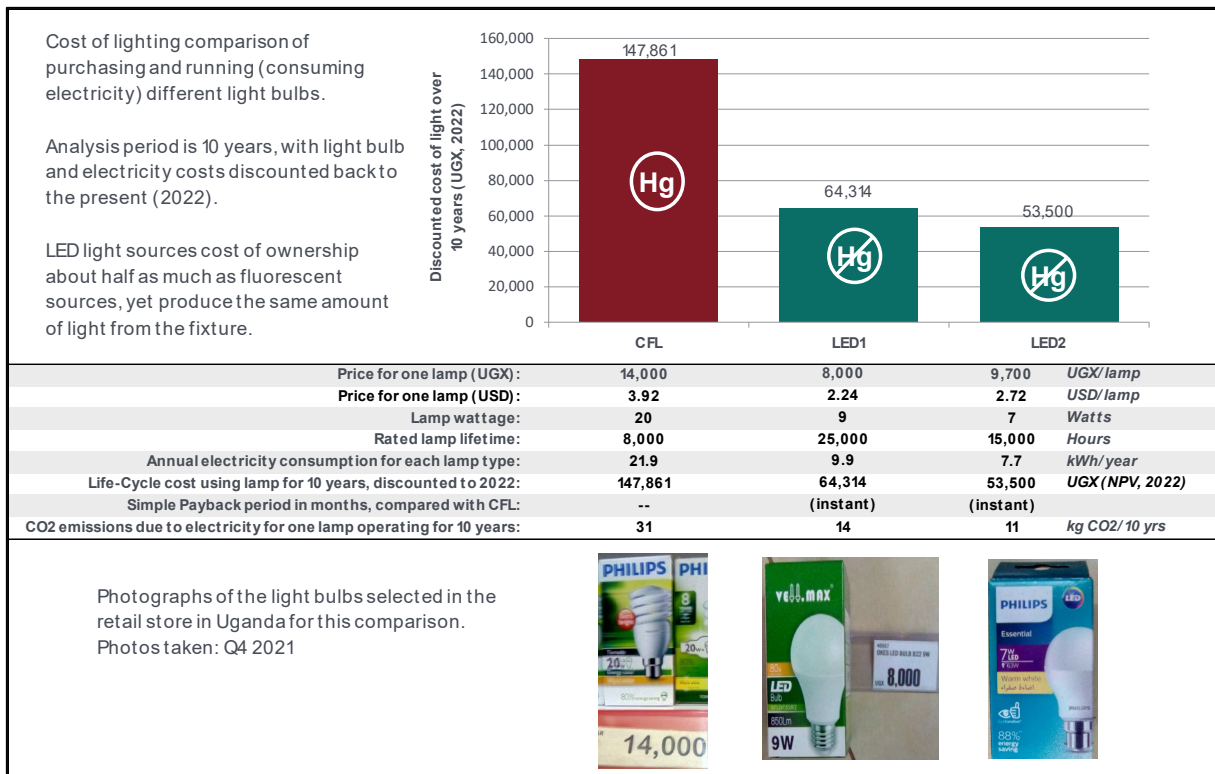
Table 11. Quantifying the Benefits of the African Lighting Amendment in Uganda

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	765,806 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	2,176,310 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	20 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	2.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 250 million

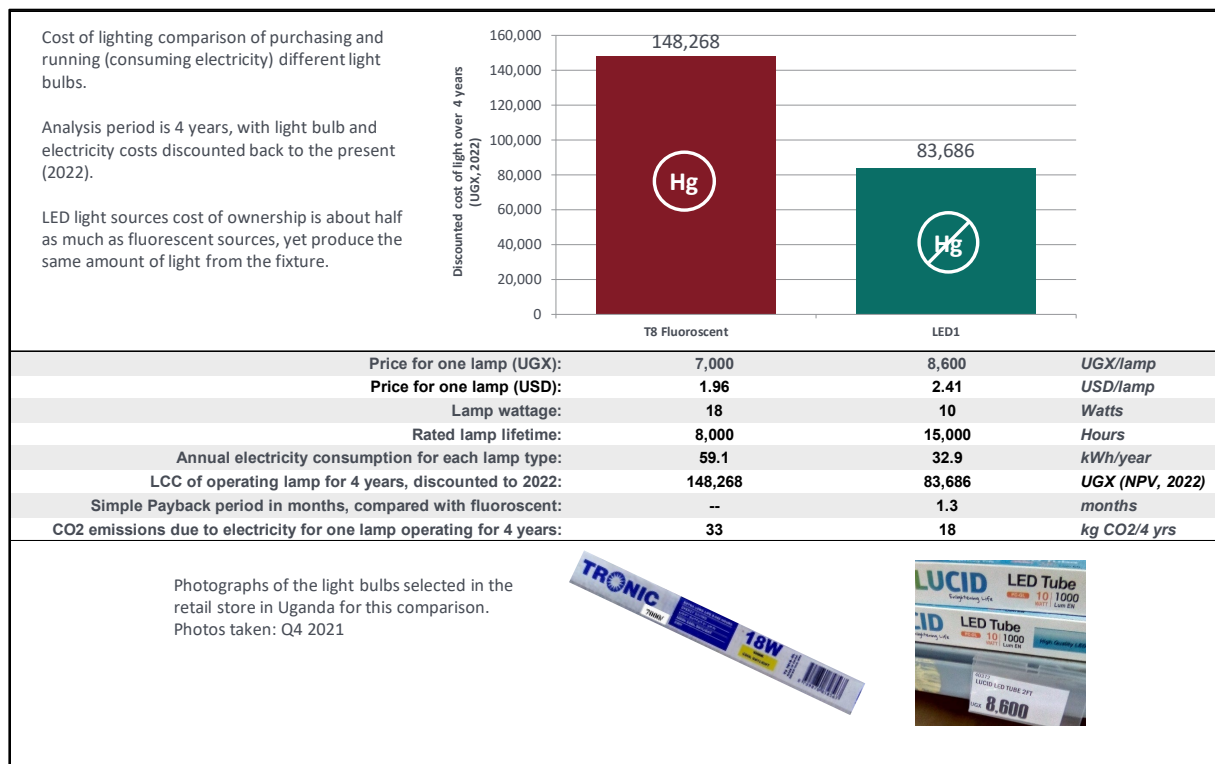
In Uganda, according to draft regulation 43 (of 17th June, 2021) of The National Environment (Management of Hazardous Chemicals and Products Containing Hazardous Chemicals), a person shall not import, manufacture, use or recycle any of the following:

- Compact fluorescent lamps for general lighting purposes that are less or equal to 30 watts with a mercury content exceeding 5 mg per lamp burner
- Triband phosphor linear fluorescent lamps for general lighting purposes of less than 60 watts with a mercury content exceeding 5 mg per lamp
- Halophosphate phosphor linear fluorescent lamps for general lighting purposes of less than 40 watts with a mercury content exceeding 10 mg per lamp
- High pressure mercury vapour lamps for general lighting purposes
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps for electronic displays of short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps for electronic displays of medium length (> 500 mm and $\leq 1\,500$ mm) with mercury content exceeding 5 mg per lamp
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps for electronic displays of long length ($> 1\,500$ mm) with mercury content exceeding 13 mg per lamp

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Uganda. Switching to LED in Uganda offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately UGX 80,000 to 90,000 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Uganda. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately UGX 65,000 over the lifetime of the LED lamp, yet the LED only costs UGX 1,600 more at the time of purchase.



Zambia



Table 12. Quantifying the Benefits of the African Lighting Amendment in Zambia

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	2,388,867 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	7,473,796 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	68 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	6.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 230 million

Important information about mercury and lighting in Zambia:

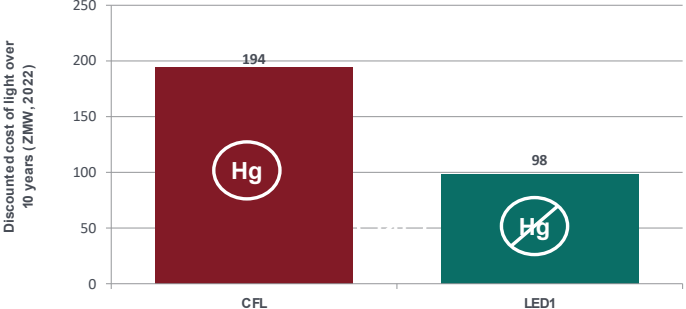
- The Zambia Electricity Supply Company (Zesco) has a programme to phase out energy consuming bulbs and replacing them with energy saving bulbs.
- Zesco is giving out Energy saving bulbs to communities so as to introduce the energy saving bulbs to the communities and the communities must compare and differentiate the energy saving bulbs from the energy consuming bulbs.
- In achieving the goal of transitioning households to LEDs, the Zambia Electricity Supply Company (Zesco) has made one brand of lighting bulbs called Woo Jong lighting, Model led A65 13 watts going at a price of k50. And it's a Mercury free product.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Zambia. Switching to LED in Zambia offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately ZMW 100 over the lifetime of the LED retrofit lamp.

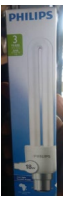
Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).


LED light sources cost of ownership is about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



	CFL	LED1
Price for one lamp (ZMW) :	35	30
Price for one lamp (USD) :	2.03	1.74
Lamp wattage:	18	9
Rated lamp lifetime:	6,000	15,000
Annual electricity consumption for each lamp type:	19.7	9.9
Life-Cycle cost using lamp for 10 years, discounted to 2022:	194	98
Simple Payback period in months, compared with CFL:	--	(instant)
CO2 emissions due to electricity for one lamp operating for 10 years:	20	10




PHILIPS



Tiger Head

Photographs of the light bulbs selected in the retail store in Zambia for this comparison.
Photos taken: Q4 2021



**Clean
Lighting
Coalition**

**Technical & Economic Assessment
of Mercury-Free Lighting:
Asia Pacific Region**

Asia Pacific Region

In 2021 the Clean Lighting Coalition engaged partner organisations in **35 countries across Africa, Latin America and Asia-Pacific and gathered over 1200 models** of both mercury-containing fluorescent and LED retrofits from those markets.

In April 2021, the African region proposed an amendment to Annex A of the Minamata Convention on Mercury to remove exemptions for mercury-containing fluorescent lamps, phasing out virtually all fluorescents by 2025. While these fluorescent exemptions may have been necessary in 2013 when the Convention was drafted, lighting technology has moved on rapidly – and today, the accessibility and affordability of mercury-free LED retrofit lamps makes the fluorescent lamp exemption unnecessary.

Adopting the proposed amendment at the fourth Conference of Parties (COP4) would lead to an accelerated global transition to LED lighting, which is non-toxic and climate friendly. Specifically, it would:

- avoid **232 metric tons** of mercury pollution from leaking into the environment between 2025-2050, both from the lamps themselves and from avoided burning of coal in power plants.
- avoid **3.5 gigatons** of CO₂ emissions which is equivalent to getting ALL passenger cars (globally) off the road for a whole year.

If adopted, the Asia Pacific Region would



75,900 kilograms

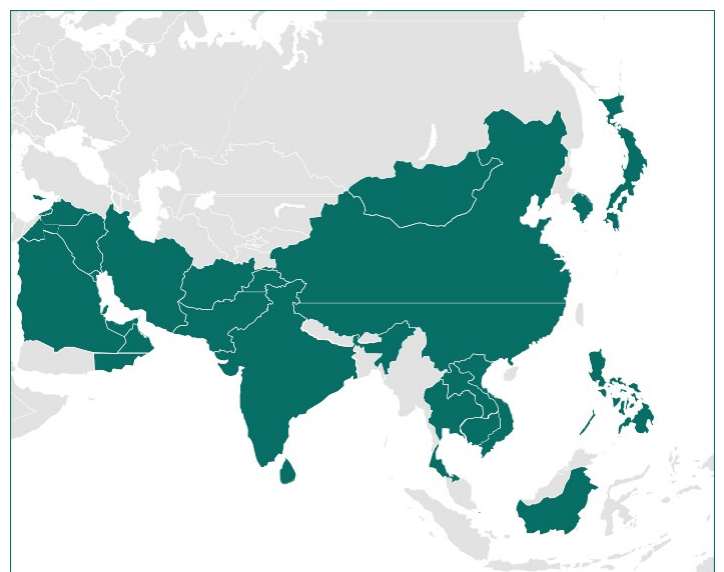
of mercury pollution and



3.28 gigatons

of CO₂ emissions cumulatively 2025-2050.

Countries in **green** are parties to the Minamata Convention on Mercury.



The data above reflects the benefits of a global fluorescent phase-out to all countries in Asia Pacific, not just parties to the Minamata Convention on Mercury.

Based on projections from [CLASP's MEPSY model](#), the table below provides country-level projections of avoided CO₂ emissions and mercury releases cumulatively 2025-2050.

COUNTRY	CO ₂ (MT)	MERCURY (KG)
BAHRAIN	4.0	96.9
BANGLADESH	26.2	558.7
BHUTAN	0.1	27.3
BRUNEI DARUSSALAM	1.3	35.2
CAMBODIA	4.8	84.3
CHINA	2,129.0	48,977.0
FIJI	1.4	8.8
FRENCH POLYNESIA	0.2	6.3
HONG KONG, CHINA (SAR)	12.3	345.2
INDIA	123.7	3,002.4
INDONESIA	123.7	2,096.9
IRAN (ISLAMIC REPUBLIC OF)	61.1	1,358.0
JAPAN	156.3	4,509.8
JORDAN	5.8	122.0
KAZAKHSTAN	46.2	775.6
KUWAIT	12.3	318.3
KYRGYZSTAN	1.2	68.8
LAO PEOPLE'S DEMOCRATIC REPUBLIC	1.2	25.7
LEBANON	5.6	107.2
MACAU	1.0	46.9
MALAYSIA	35.1	814.4
MALDIVES	0.3	5.5
MONGOLIA	5.8	57.8
NEPAL	0.2	41.3
OMAN	6.5	185.7
PAKISTAN	33.3	720.1
PAPUA NEW GUINEA	1.8	43.6
PHILIPPINES	35.6	779.9
REPUBLIC OF KOREA	92.1	3,620.7
SAUDI ARABIA	91.2	2,130.1
SINGAPORE	5.5	250.6
SOLOMON ISLANDS	0.1	2.0
SRI LANKA	5.4	140.4
SYRIAN ARAB REPUBLIC	5.9	115.9
TAJIKISTAN	0.7	94.9
THAILAND	52.8	1,546.1
TURKMENISTAN	8.4	120.9
UNITED ARAB EMIRATES	23.1	709.8
UZBEKISTAN	28.4	548.9

*Note: Table sums will not match above totals due to rounding. Additionally, for countries without values, there were not sufficient data to accurately project mercury and CO₂ figures.

Lighting Market Overview

The Asia Pacific region is a hub for manufacturing and exporting fluorescent and LED lighting products. In terms of fluorescent lamps manufacturing, China accounts for 73% of the global production. YaMing Lighting¹, Foshan, and Zhejiang Changhong Lighting Sources² might be the only remaining large scale producers. The second largest manufacturer is India, with nine manufacturers registered as suppliers of fluorescent lamps, including Philips, Bajaj, Surya, Havells, Crompton, CEMA, Osram, HPL, and Ecolink. Out of these, nine plants also produce LEDs.

The LED market is also dominated by Asia. In particular, five Asia-Pacific countries export 91% of the total trade value of US\$3.1 billion LED die chips and packaging globally³. Malaysia represents the main exporting country for this market segment (25% of the global exports in Table 1).

TABLE 1: LED DIE/CHIPS AND PACKAGES EXPORTS - MARKET SHARE OF ASIAN COUNTRIES & VALUE IN USD

COUNTRY	TRADE VALE IN US\$ BILLION	% GLOBAL EXPORTS
MALAYSIA	0.77	25%
JAPAN	0.66	21%
CHINA	0.55	18%
TAIWAN	0.42	14%
SOUTH KOREA	0.34	11%
VIETNAM	0.06	2%
TOTAL	2.8	91%

China is the main global exporter of LED lamps and luminaires, representing respectively 89% and 56% of the total exporting value (US\$ 5.35 billion and US\$ 15.52 billion).

As a key producer and exporter of LED and fluorescent lighting products, phasing-out fluorescents would not only provide a safer and cost-accessible lighting technology in Asia, but also drive the transition to clean lighting globally.

Comparing Costs: LEDs vs CFL/LFL

Based on projections from **CLASP's MEPSY model**, transitioning to efficient LED lighting would avoid the sale of 2.6 billion compact fluorescent lamps and 8.4 billion linear fluorescent lamps. Taken together, this will avoid 75,900 kilogrammes of mercury in the lamps and save approximately 6,800 TWh of the Asia Region's total electricity consumption between 2025 and 2050. Over the 25 year analysis period, Asia would save \$691.8 billion USD and 3,279 million metric tonnes of CO₂.

Tables 2 and 3 provide comparative information about the cost of light for CFL and LFL vs LED lamps across countries. They show the prices that were recorded in retail stores and on-line shops in each country.

1 http://www.yamingchina.com/About_En.asp

2 <http://www.ch-lighting.com/>

3 Guidehouse (2021). 2020 LED Manufacturing Supply Chain 2020.

The next two columns illustrate the benefits associated with switching to mercury-free LED technology. The Payback Period column shows the amount of time needed for the energy savings from the LED lamp to pay for its higher cost. If the LED lamp is less expensive than the fluorescent lamp, then the payback is 'instantaneous'. The column labelled 'energy savings with LED' indicates the savings on energy bills over the lifetime of the LED lamp.

The tables also detail comparative cost across countries. Please note that the value in brackets is the equivalent cost in US\$.

TABLE 2

THE TRUE COST OF LIGHT – GENERAL SERVICE LAMPS











 COUNTRY	 CFL PRICE	 LED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Bangladesh	BDT 280 (US\$ 3.36)	BDT 330 (US\$ 3.96)	9.1 months	BDT 755 (US\$ 9.06)
India	INR 160 (US\$ 2.08)	INR 155 (US\$ 2.02)	Instantaneous	INR 590 (US\$ 7.67)
Philippines	PHP 120 (US\$ 2.40)	PHP 180 (US\$ 3.60)	1 year	PHP 606 (US\$ 12.12)
Sri Lanka	LKR 375 (US\$ 1.84)	LKR 495 (US\$ 2.43)	6.7 months	LKR 2206 (US\$ 10.81)
Pakistan	PKR 130 (US\$ 0.74)	PKR 100 (US\$ 0.57)	Instantaneous	PKR 1,297 (US\$ 7.39)
Vietnam	VND 15,000 (US\$ 0.66)	VND 30,000 (US\$ 1.33)	11 months	VND 154,480 (US\$ 6.83)
Indonesia	IDR 31,950 (US\$ 2.24)	IDR 21,600 (US\$ 1.51)	Instantaneous	IDR 133,976 (US\$ 9.38)

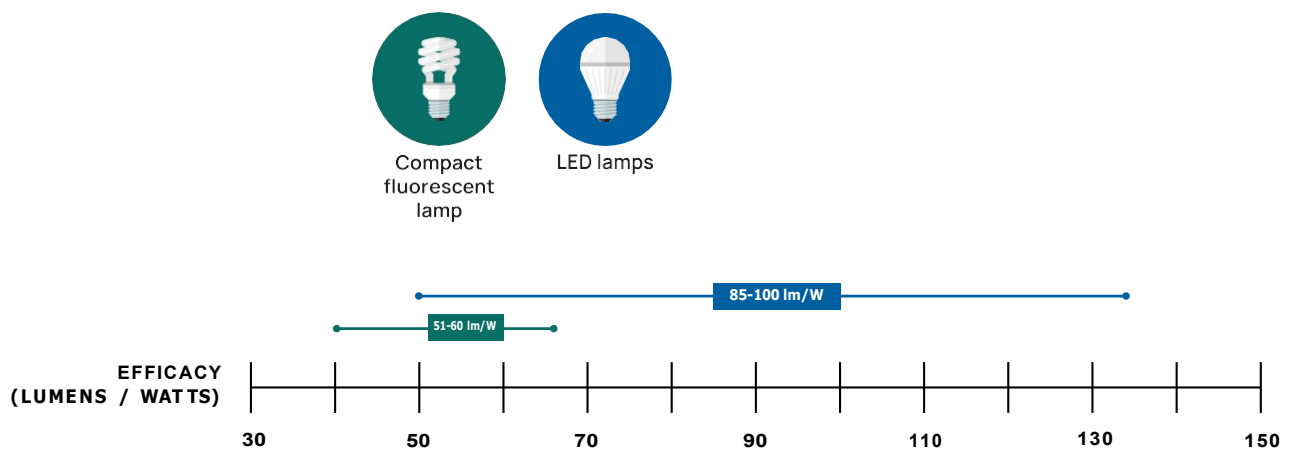
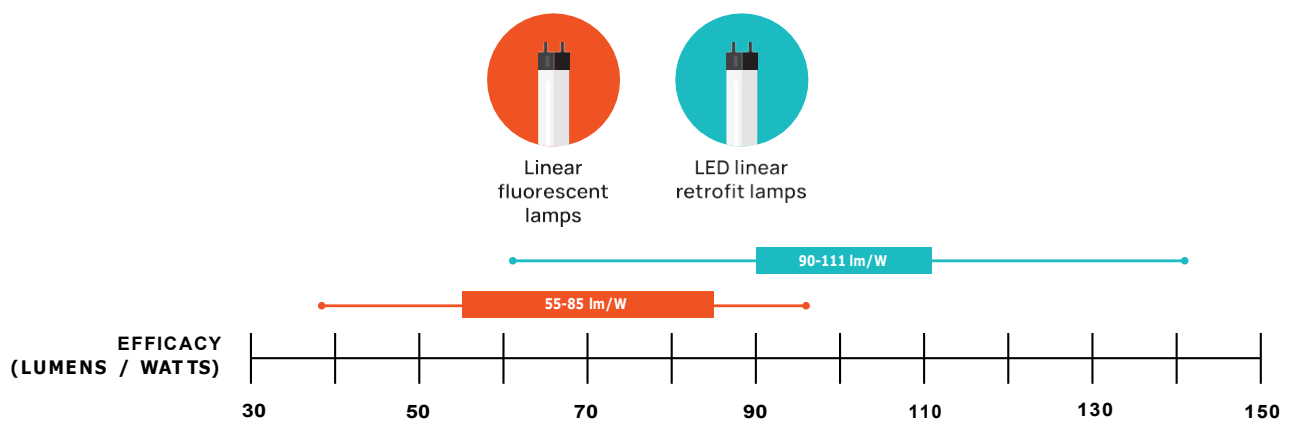
TABLE 3

THE TRUE COST OF LIGHT – LINEAR LAMPS

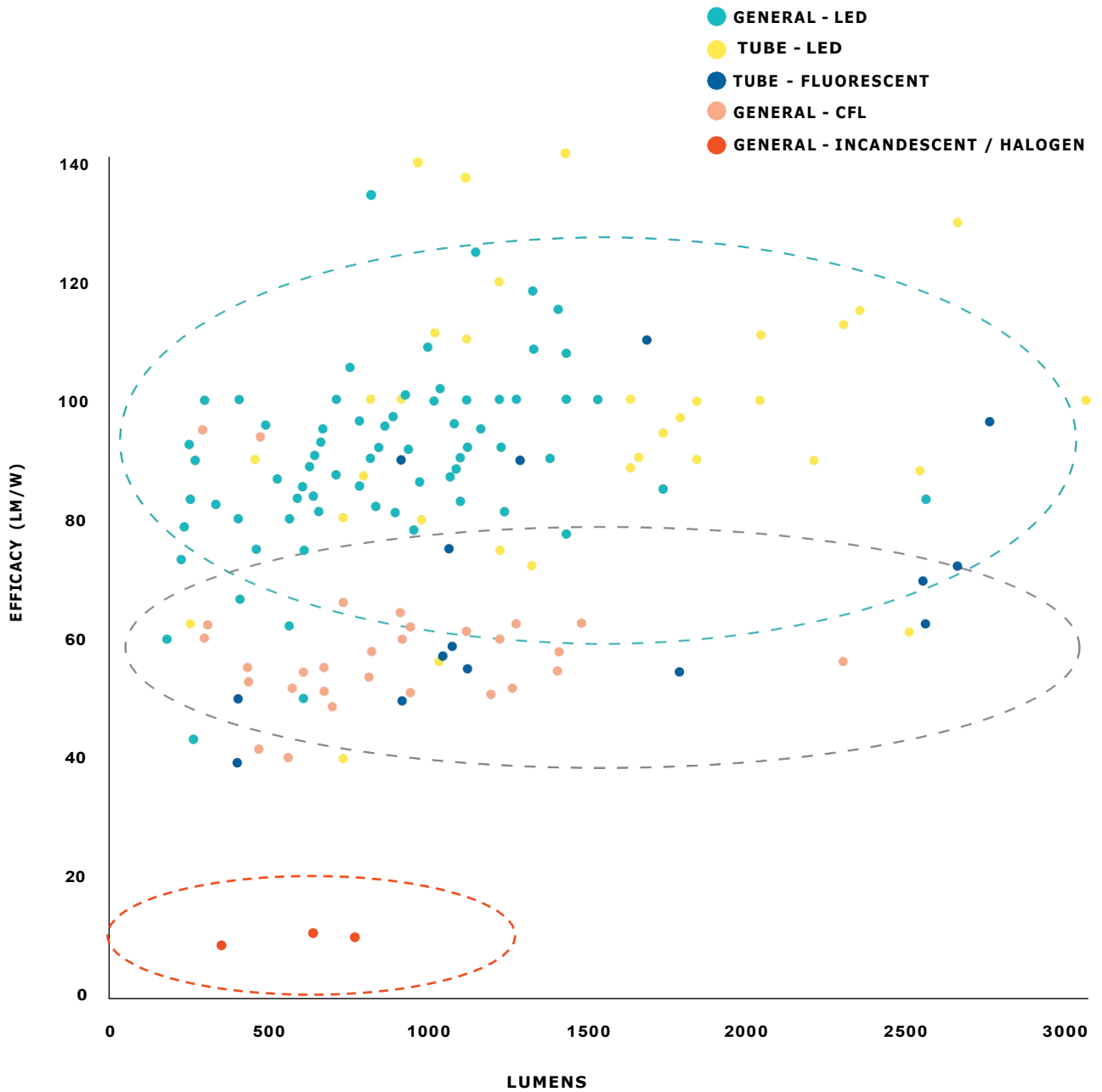
 COUNTRY	 LFL PRICE	 TLED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Bangladesh	BDT 320 (US\$ 3.84)	BDT 580 (US\$ 6.96)	11.9 months	BDT 2340 (US\$ 28.08)
India	INR 58 (US\$ 0.75)	INR 346 (US\$ 4.50)	5.7 months	INR 2680 (US\$ 34.84)
Philippines	PHP 84 (US\$ 1.68)	PHP 170 (US\$ 3.40)	1.9 months	PHP 3,175 (US\$ 63.51)
Pakistan	PKR 210 (US\$ 1.20)	PKR 650 (US\$ 3.71)	5.1 months	PKR 6,975 (US\$ 39.76)
Vietnam	VND 20,000 (US\$ 0.88)	VND 40,000 (US\$ 1.76)	4.5 months	VND 818,377 (US\$ 36.01)
Indonesia	IDR 36,000 (US\$ 2.52)	IDR 75,100 (US\$ 5.26)	5.6 months	IDR 495,148 (US\$ 34.66)
Japan	JPY 583 (US\$ 5.07)	JPY 980 (US\$ 8.53)	6.9 months	JPY 8905 (US\$ 77.47)

Energy Efficiency Comparison

The energy efficiency of a light bulb is measured in lumens/watt. Based on data collected in Q4 2021, the graphic below depicts the ranges of energy efficiency of different types of bulbs available across Asia-Pacific markets. It represents efficiency quartiles (0%,25%,50%,75%,100%) of the data we collected when sorted from lowest to highest efficiency. The box with numbers represents the 25th-75th quartile while the thin lines with the dots represent the lowest and highest efficiency per technology on either end.



The graph below shows the energy efficiency of individual samples collected across the region. LEDs are up to 2-3 times more efficient than the other lighting technologies, therefore use less overall electricity to provide the same or better lighting service.



Lighting Policy & Legislative Landscape

Many countries in the region are shifting towards LED-only markets through energy efficiency policy and/or mercury regulation. Some of the notable initiatives and regulations include:

- **India:** India's Electric Lamp and Component Manufacturers Association (ELCOMA) published [Vision 2024 Roadmap](#) to transition lighting market to LED by 2024.
- **Indonesia:** In 2021 Indonesia approved a Roadmap for High Efficiency Lamps for Indonesia, which includes phasing out lamps that contain mercury in government agencies and state-owned enterprises' buildings by 2022.
- **Pakistan:** Pakistan developed [MEPS for LEDs in 2020](#) and a national efficient lighting strategy to accelerate the [transition to LEDs, already at 70% penetration](#) in Pakistan's domestic market
- **Philippines:** Philippines' [House Bill No. 262](#) (pending approval) aims to require all government offices to use LEDs instead of incandescent and CFL bulbs and fluorescent tubes.
- **Singapore:** Singapore's National Environment Agency is aiming for all bulbs sold to be minimally as efficient as [LEDs from 2023](#) onwards.
- **Sri Lanka:** Sri Lanka is implementing a project (2021-2023) under the Minamata Specific International Program to strengthen the national capacity for phasing out mercury-added products, including through [alternatives to CFLs and LFLs](#). [MEPS for LEDs](#) were first adopted in 2016 and revised in 2019.
- **Thailand:** Thailand's 2021 Long-term [Low Greenhouse Gas \(GHG\) Development Strategy](#) includes LEDs as part of the technologies for a successful transition to low GHG development. Voluntary MEPS for LEDs are in place since 2013.
- **Vietnam:** In 2020 GEF approved a [UNDP project](#) that supports Vietnam's transition to [non-mercury lighting](#) (among others). In 2019 MOIT issued [Circular No. 08/2019/TT-BKHCHN](#) that mandates certification requirements for domestically produced and imported LED products.

Compatibility/Retrofits for LED tubes

In all Asia-Pacific markets where data was collected, LED retrofits were easily available for both general service lamps and tube lamps. This availability confirms that in nearly all cases, rewiring of old lighting fixtures will not be necessary. In the few cases (6 to 9%) where the LED tubes available in the market are not compatible with the fixtures, the ballast can be 'bypassed' with mains voltage at the sockets, so that the fixture can remain in place.

End of Life Management for Lighting

Collecting fluorescent lamps at the end of life is a global problem that has existed since the introduction of fluorescents. Mercury released during the lifecycle of fluorescent lamps contaminate the atmosphere, land and water. This contamination may occur from lamp breakage when: a) old lamps are comingled with general household waste; b) during installation, collection or transport of discarded lamps, processing or recycling of spent lamps; or c) when lamps are landfilled, incinerated or otherwise disposed of.

Collection and safe recycling/disposal of fluorescent lamps is difficult – especially in regions with low levels of general e-waste collection and processing. For example, countries in the Association of Southeast Asian Nations (ASEAN) do not recycle mercury-containing lamps. The countries that have recycling facilities, such as Indonesia, Malaysia, Philippines, Thailand only dismantle or crush fluorescent lamps locally and export them to other countries, including Germany and Japan^{1,2}. In addition, statistics indicate that collection of lamps is inefficient. In Sri Lanka for example, only 39% of fluorescent lamps are collected.

While LED lamps are also considered e-waste, they are not toxic nor considered hazardous waste. Also, transitioning to LEDs would eliminate fluorescent e-waste lamp trade from developing countries to countries equipped with dismantling facilities, therefore posing additional environmental pollution and health safety concerns from exposure to mercury globally. The proposed African Lighting Amendment would remove toxic e-waste from the market more quickly.



1 https://asiacleanenergyforum.adb.org/wp-content/uploads/2016/04/Prasanna-Maldeniya_Interventions-in-EE-lighting.pdf

2 UNEP (2017). Regional Study on Mercury Waste Management in the ASEAN Countries. Available [here](#).

Annex of Country Level Data

Bangladesh



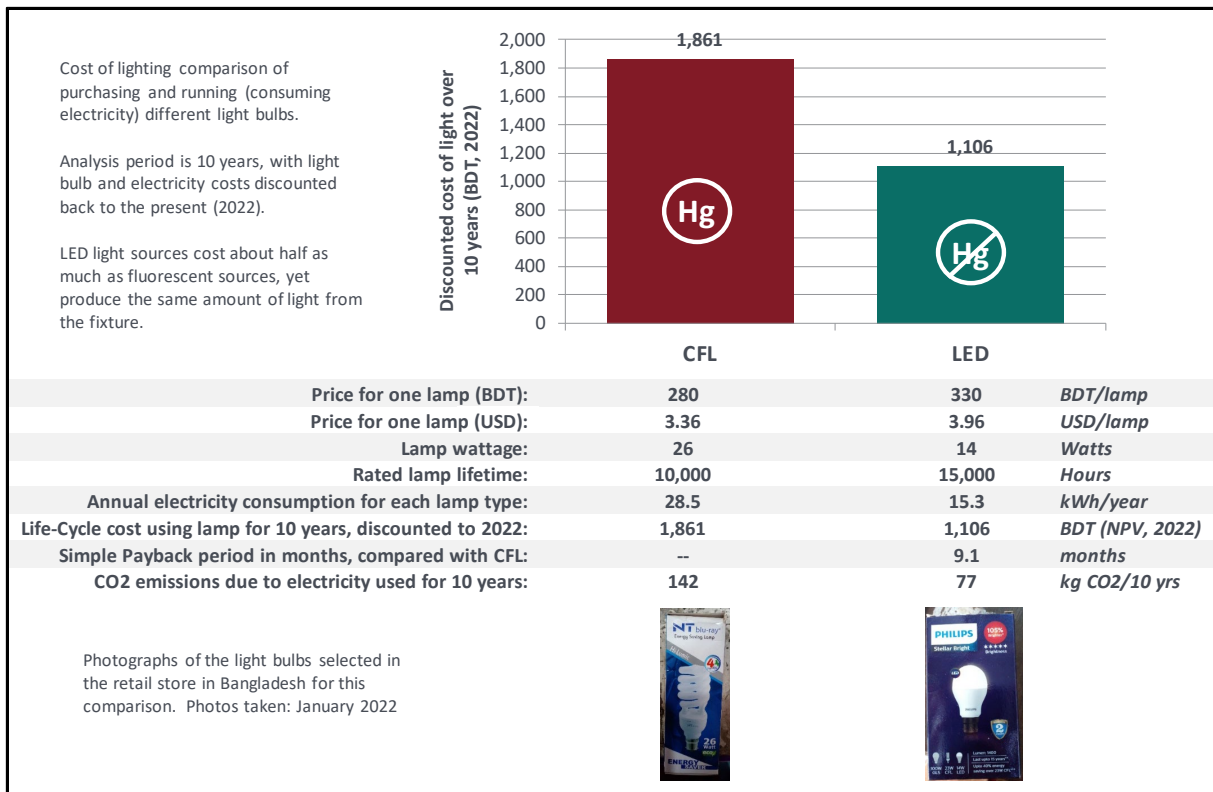
Table 1. Quantifying the Benefits of the African Lighting Amendment in Bangladesh

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	18,618,377 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	62,085,984 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	600 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	50.19 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 3 billion

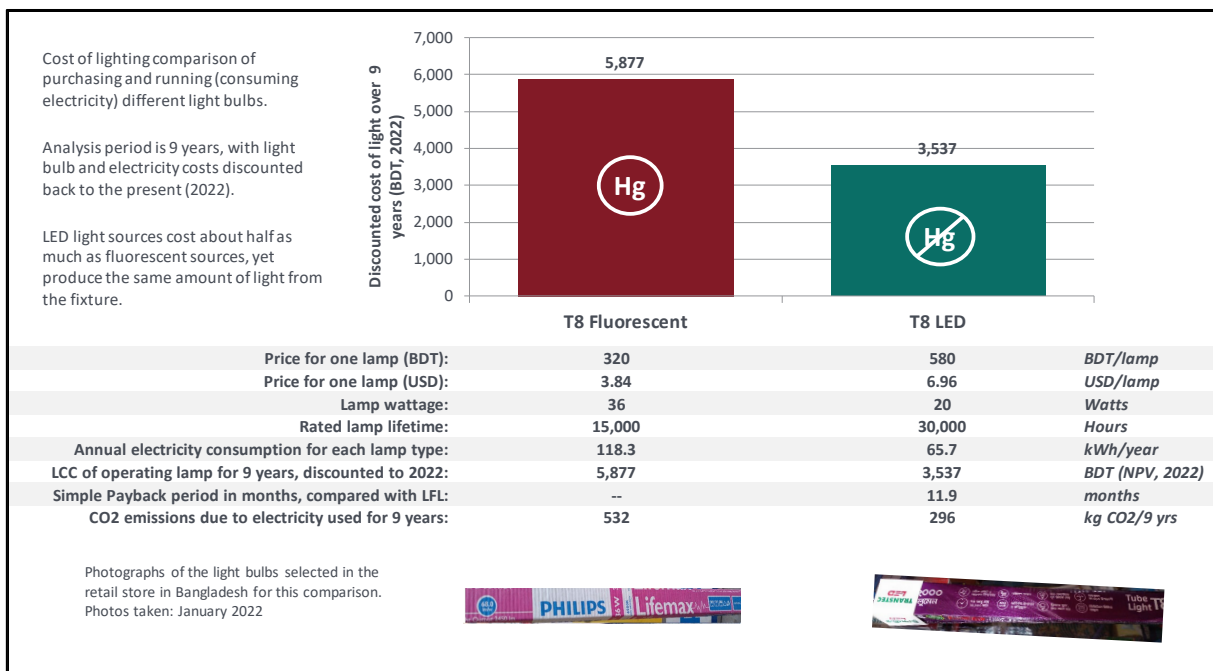
Important information about mercury and lighting in Bangladesh:

- Bangladesh’s MIA (2019) marks the phasing out of fluorescent lamps as a “high” priority plan (Source: [MIA 2019](#)).
- Mercury emissions from the use and disposal of mercury-containing lamps is estimated to be 359 kg/yr (Source: [MIA 2019](#)).
- [Bangladesh’s 8th Five Year Plan](#) (2020-2025) mentions mercury’s harm to human and environmental health and sets a goal of energy efficient and low maintenance street and community lighting systems, in addition to overall energy efficiency objectives.

The box below offers an economic analysis of a compact fluorescent lamp (CFL) and two light emitting diode (LED) retrofit bulbs. All of these lamps were selected and photographed in a retail store in Bangladesh. The LED lamp is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately BDT 700 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Bangladesh. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately BDT 2,400 over the lifetime of the LED lamp, yet the LED only costs BDT 200 more at the time of purchase.



India



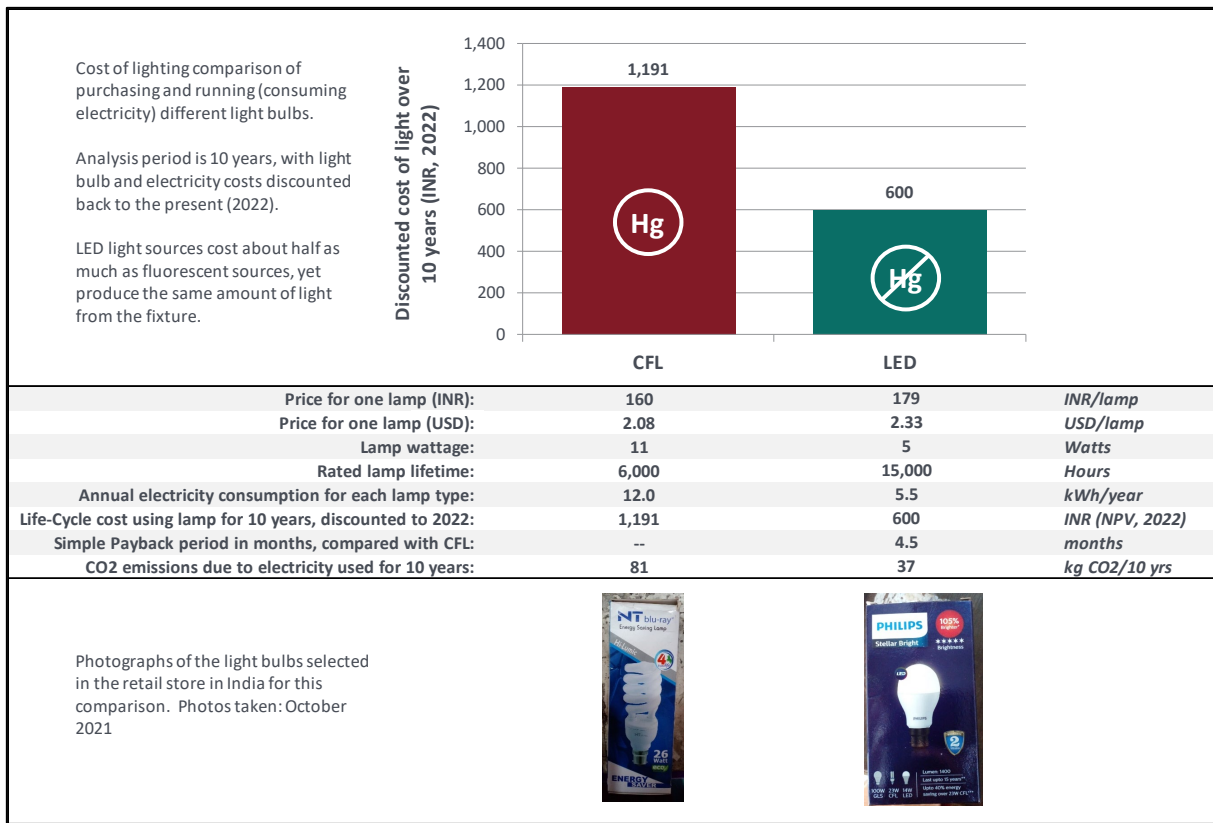
Table 2. Quantifying the Benefits of the African Lighting Amendment in India

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	111,773,729 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	325,799,769 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	3,000 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	269.26 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 27 billion

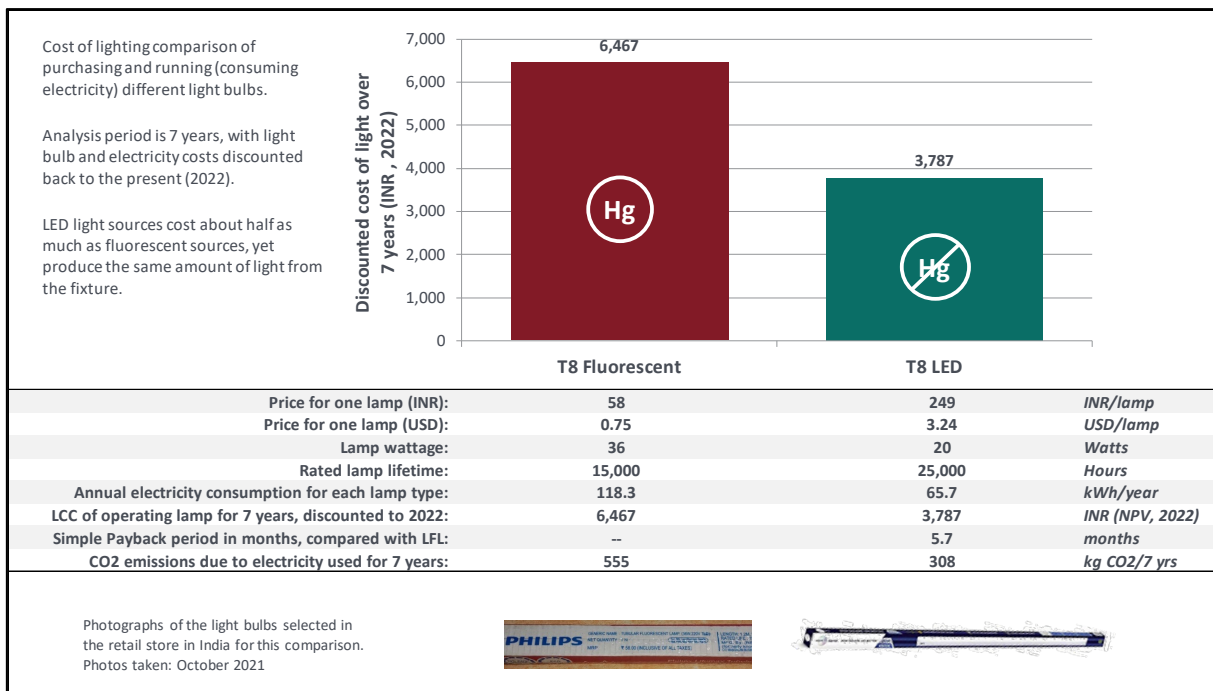
Important information about mercury and lighting in India:

- India's [Electric Lamp and Component Manufacturers Association](#) (ELCOMA) published [Vision 2024 Roadmap](#) to transition lighting market to LED by 2024.
- As per ELCOMA, India manufactured about 1.4 billion lamps (ICL, CFL and LED) and tubular fluorescent lights and linear LED in 2018-19. The lighting market is dominated by conventional lighting – incandescent lamp, linear fluorescent and CFL with (54%) followed by LED -lamps and tube lights (46%), where the combined share of CFL and fluorescent tubes accounts for 11%.
- In the absence of an environmentally sound mercury management for collection and disposal of discarded fluorescent lamps, using ELCOMA's production data for 2010-2018, approximately 22 tons of mercury were used in the CFLs and fluorescent tubes and that mercury is likely to have been released into the environment from the discarded lamps.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in India. The LED lamp is more expensive than the fluorescent lamp on a first-cost basis, but the payback period is just of 4.5 months. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately INR 600 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in India. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately INR 3,000 over the lifetime of the LED lamp, yet the LED only costs INR 190 more at the time of purchase.



Pakistan



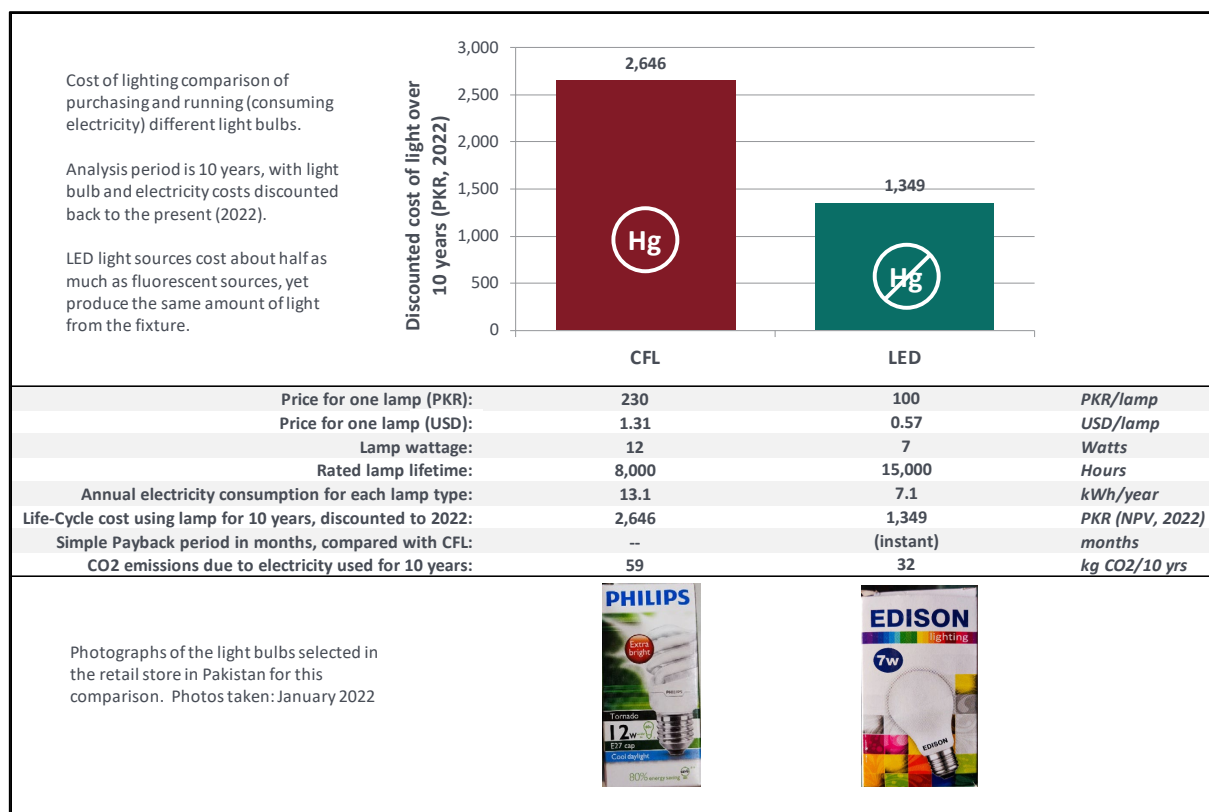
Table 3. Quantifying the Benefits of the African Lighting Amendment in Pakistan

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	26,930,338 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	78,065,917 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	700 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	64.68 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 6.5 billion

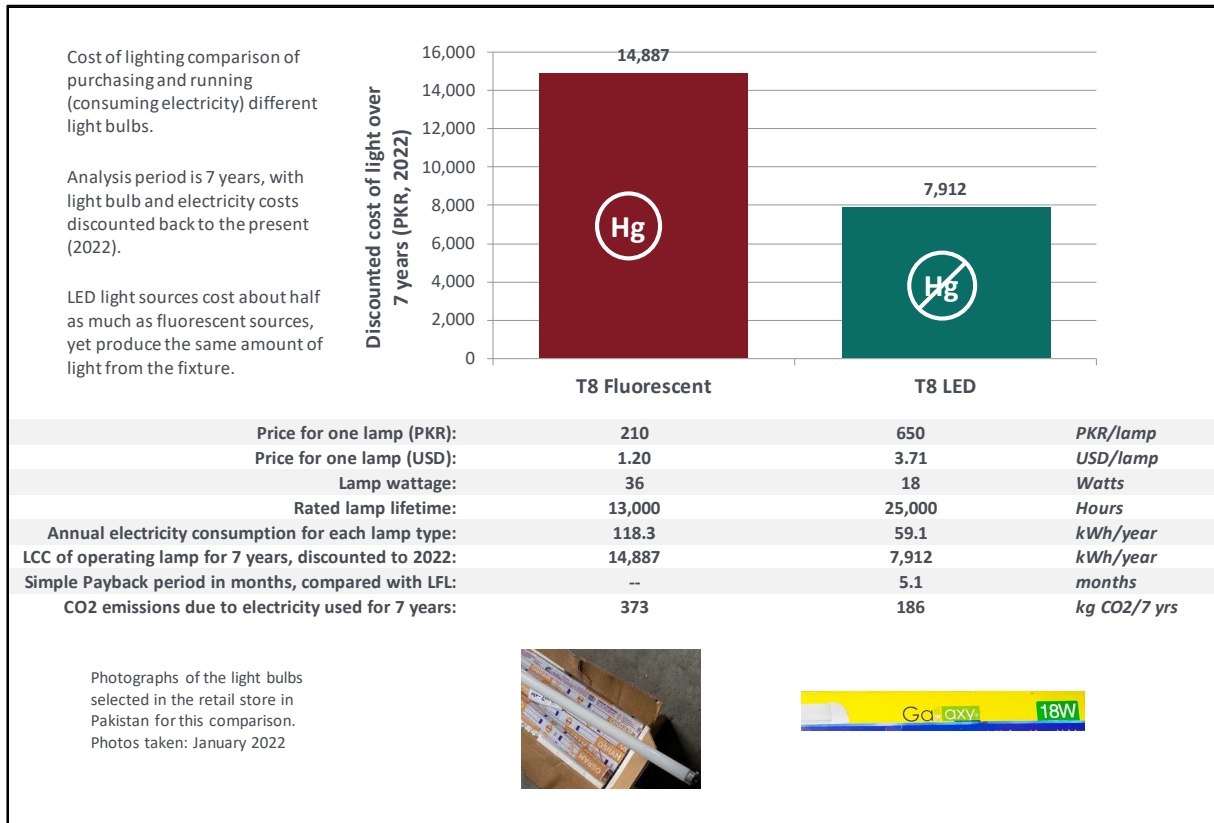
Important information about mercury and lighting in Pakistan:

- Pakistan’s 2021 Nationally Determined Contribution states mitigation objective of increasing energy efficiency 1.5% per year, with specific mention of LEDs (Source: [NDC 2021](#)).
- Pakistan started regulating LED bulbs, downlights, tubes and outdoor lighting through [minimum energy performance standards](#) in 2020 with the objective to enhance the best quality LED products, for a rapid phase-out of CFL lamps and incandescent bulbs (Source: [U4E 2020](#)).

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Pakistan. Switching to LED in Pakistan offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately PKR 1,300 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Pakistan. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately PKR 7,000 over the lifetime of the LED lamp, yet the LED only costs PKR 400 more at the time of purchase.



Philippines



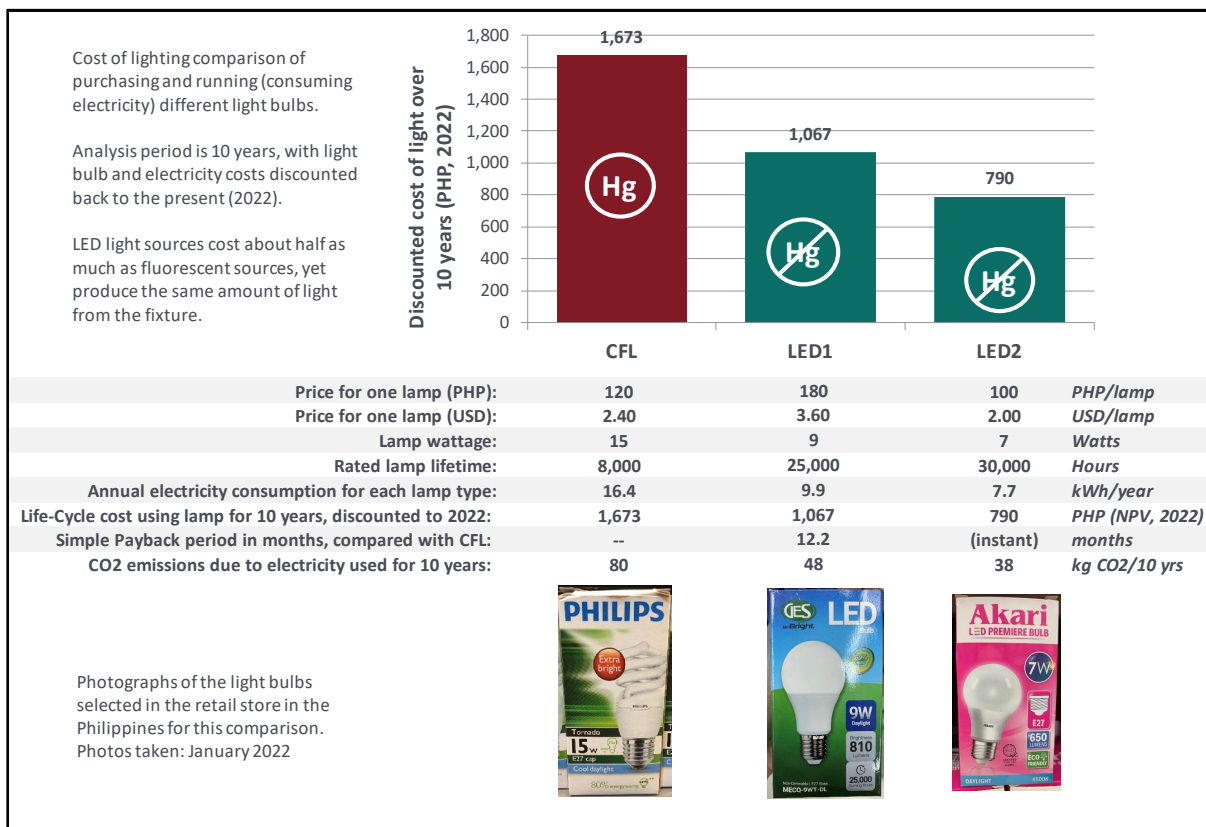
Table 4. Quantifying the Benefits of the African Lighting Amendment in the Philippines

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	27,796,067 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	85,456,923 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	800 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	70.16 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 12.6 billion

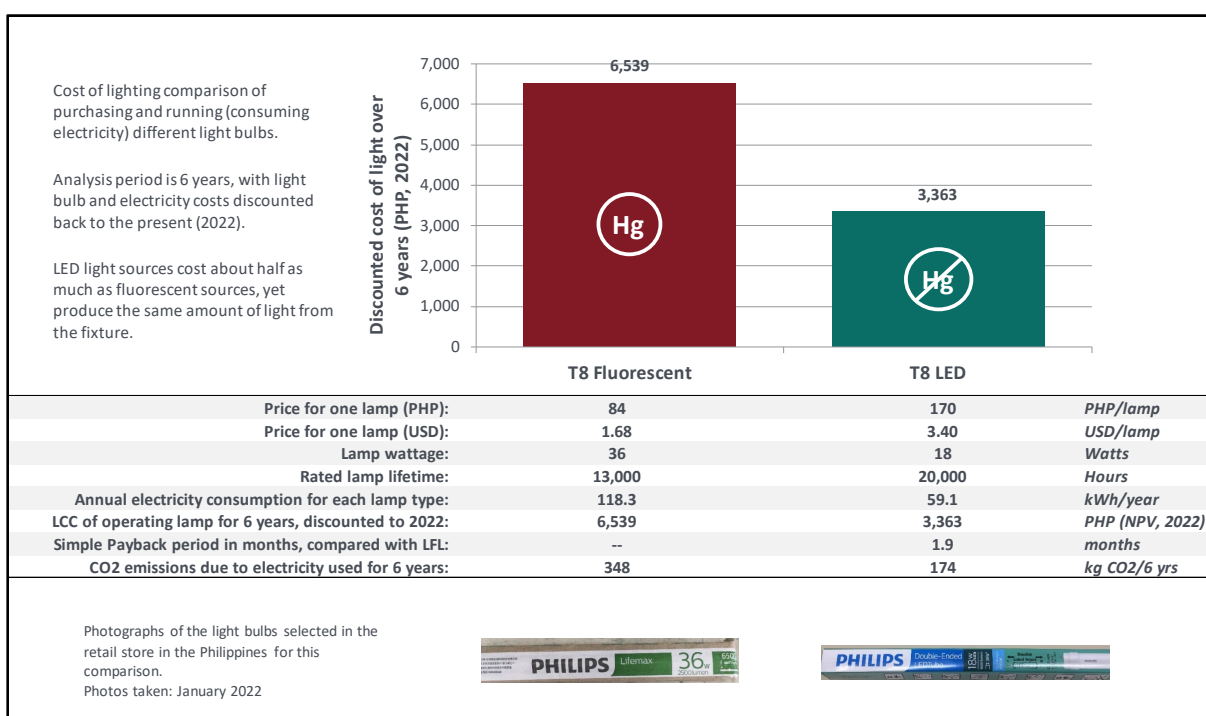
Important information about mercury and lighting in Philippines:

- Double-end fluorescent tubes and compact fluorescent lamps are among the major sources of mercury and mercury-containing waste in the Philippines. It is estimated they emit or release 23.5 and 2.20 tons of mercury per year, respectively (Source: [IPEN 2018](#) and [Mercury Assessment Environmental Management Bureau 2008](#)).
- Philippines lamp waste is of about 50 million pieces per year. Out of these, 42 million pieces (84%) are disposed of as garbage (Source: [IPEN 2018](#)).
- [House Bill No.262](#) is pending approval and requires all government offices to use LEDs instead of incandescent and CFL bulbs and fluorescent tubes.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in the Philippines. Switching to LED in the Philippines can offer an instantaneous payback, because some LED lamp alternatives are less expensive than CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately between PHP 600 and 900 over the lifetime of the LED retrofit lamp – yet the more expensive LED only costs only PHP 60 more.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in the Philippines. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately PHP 3,000 over the lifetime of the LED lamp, yet the LED only costs PHP 90 more at the time of purchase.



Sri Lanka



Table 5. Quantifying the Benefits of the African Lighting Amendment in Sri Lanka

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	5,018,524 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	15,379,438 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	12.14 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 1.4 billion

Important information about mercury and lighting in Sri Lanka:

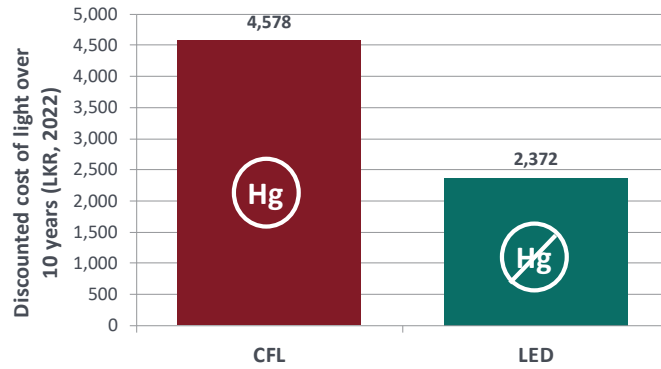
- Between 2013-2016, 99% of the mercury-containing lamps imported to Sri Lanka were fluorescent lamps, from which over 87% were comprised of CFL ([MIA 2019](#)).
- Orange Electric has a market share of 48% of CFLs. Orange Electric also owns the [only CFL recycling company in the country](#), which exports the extracted mercury to Germany. CFL collection is however not very effective, also according to the Sri Lanka Sustainable Energy Authority (Source: [Sri Lanka Sustainable Energy Authority](#)).
- The country is implementing a project (2021-2023) under the Minamata Specific International Program to strengthen the national capacity for phasing out mercury-added products, including through alternatives to fluorescent lighting. (Source: [Minamata Convention on Mercury 2021](#)).

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Sri Lanka. The LED lamp is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save over LKR 2,000 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

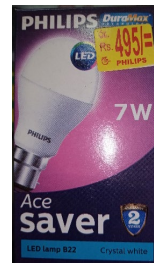
Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (LKR):	375	495	LKR/lamp
Price for one lamp (USD):	1.84	2.43	USD/lamp
Lamp wattage:	15	7	Watts
Rated lamp lifetime:	8,000	15,000	Hours
Annual electricity consumption for each lamp type:	16.4	7.7	kWh/year
Life-Cycle cost using lamp for 10 years, discounted to 2022:	4,578	2,372	LKR (NPV, 2022)
Simple Payback period in months, compared with CFL:	--	6.7	months
CO2 emissions due to electricity used for 10 years:	130	61	kg CO2/10 yrs

Photographs of the light bulbs selected in the retail store in Sri Lanka for this comparison. Photos taken: January 2022



Vietnam



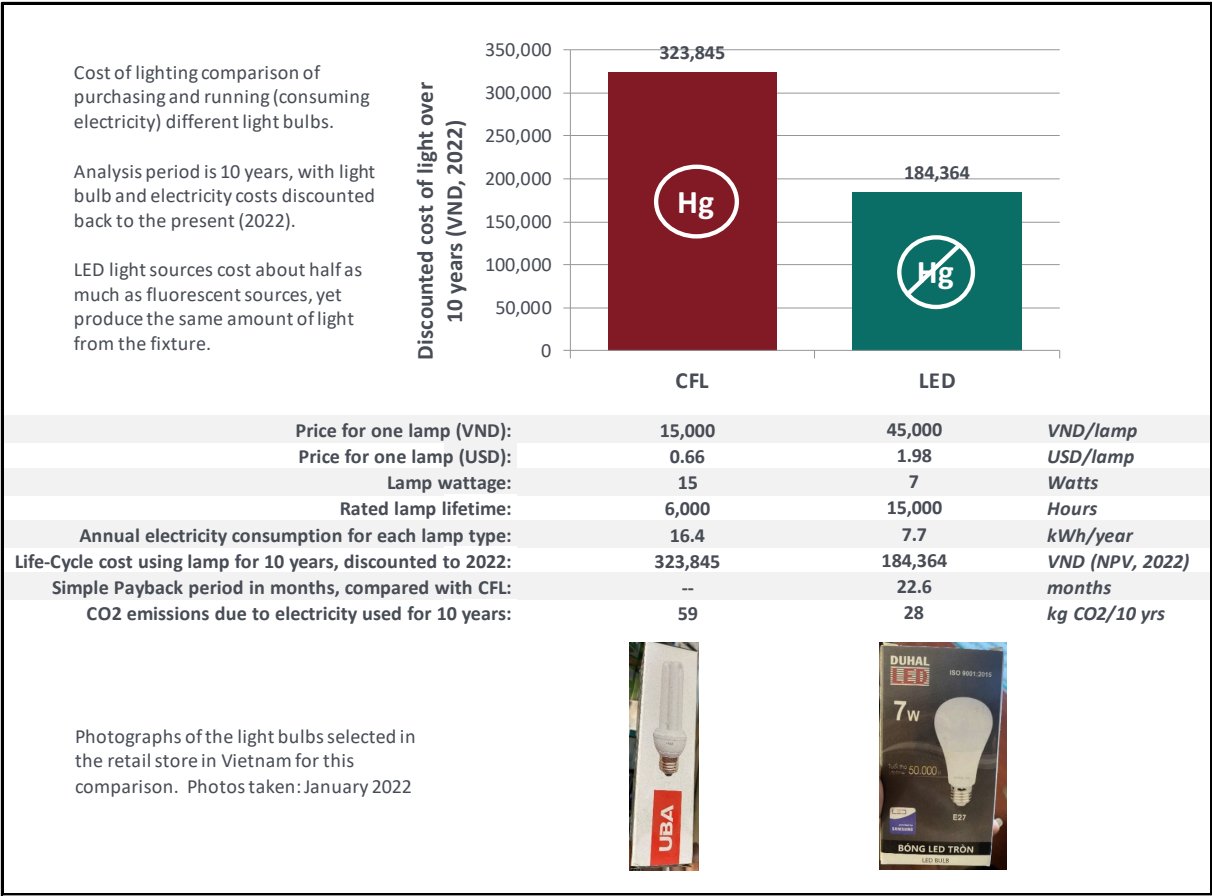
Table 7. Quantifying the Benefits of the African Lighting Amendment in Vietnam

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	49,696,592 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	145,373,302 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	1,300 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	118.53 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 9.5 billion

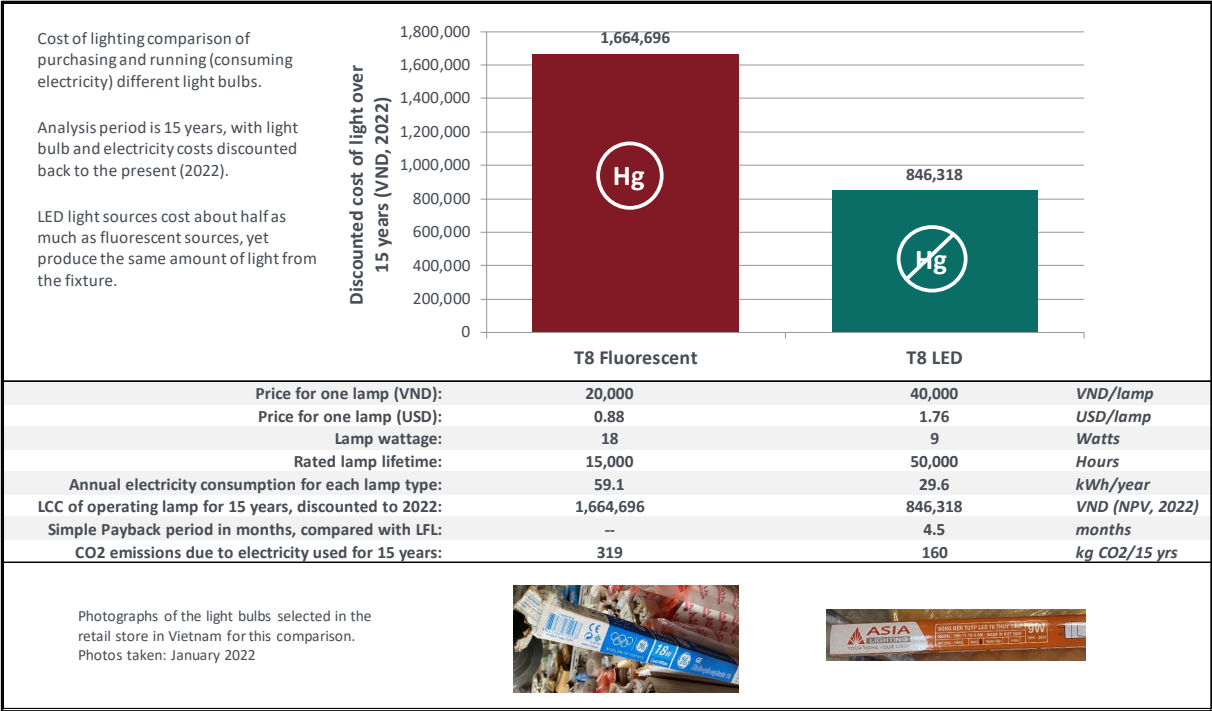
Important information about mercury and lighting in Vietnam:

- In 2019 a Hanoi light bulb warehouse fire leaked 15-27 kilos of mercury as 480,000 fluorescent lightbulbs were burnt (Source: [VNExpress international](#)).
- In 2020 GEF approved a project to support Vietnam’s transition to non-mercury lighting, among others. According to GEF, Vietnam is preparing the shift from CFL to LED which will be further driven by the Minamata Convention on Mercury (Source: [GEF 2020](#)).
- In 2019 MOIT issued [Circular No. 08/2019/TT-BKHHCN](#) that mandates certification requirements for domestically produced and imported LED products.
- Vietnam accounts for 2% of the total global LED die and chips exports ([US DOE & Guidehouse 2021](#)).

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Vietnam. The LED lamp is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately VND 140,000 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Vietnam. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately VND 800,000 over the lifetime of the LED lamp, yet the LED only costs VND 20,000 more at the time of purchase.



Japan



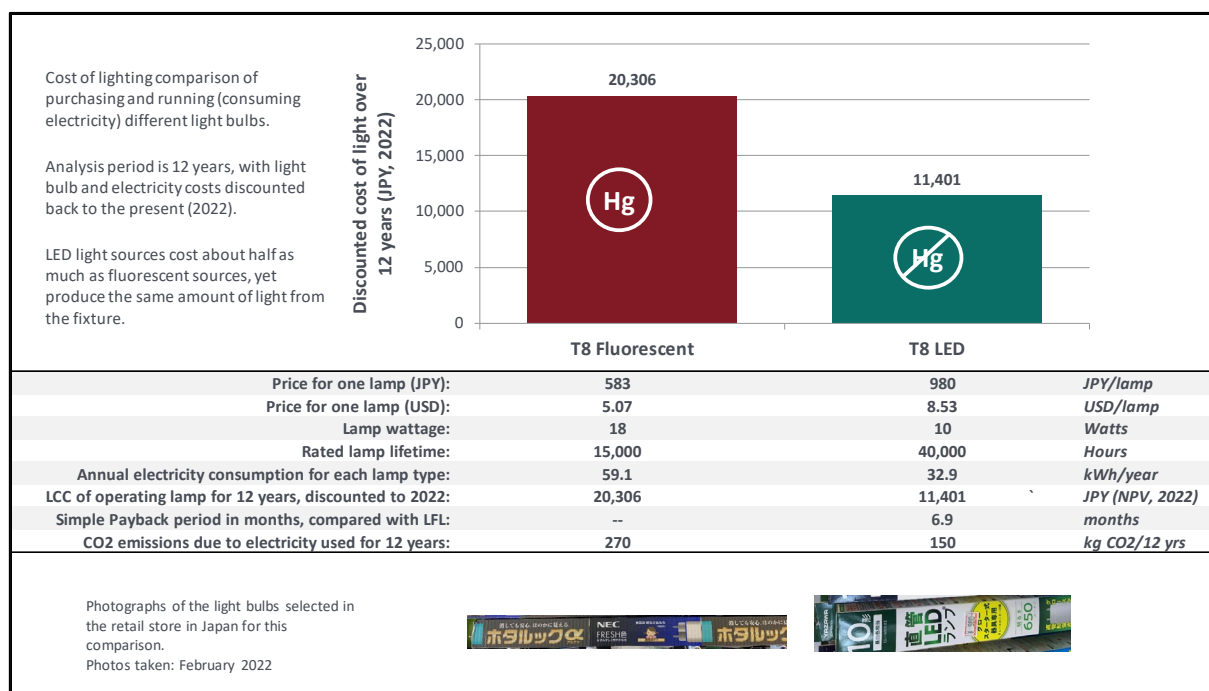
Table 8. Quantifying the Benefits of the African Lighting Amendment in Japan

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	117,822,782 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	522,753,035 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	4,500 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	419.13 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 96.4 billion

Important information about mercury and lighting in Japan:

- LED die and chips exports from Japan account for 21% of total global exports ([US DOE & Guidehouse 2021](#)).
- In 2019 energy conservation lighting policies were introduced to regulate incandescent lightbulbs alongside LEDs and fluorescent lighting and lighting equipment regulations were introduced to regulated LEDs alongside fluorescent lamps starting in 2020 (Source: [METI 2019](#)).
- In 2017 the use of mercury in lighting was 25% out of a total 5.6 ton of material flow of mercury (Source: [Ministry of Environment 2017](#)).

The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Japan. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately JPY 9,000 over the lifetime of the LED lamp, yet the LED only costs JPY 400 more at the time of purchase.



Indonesia



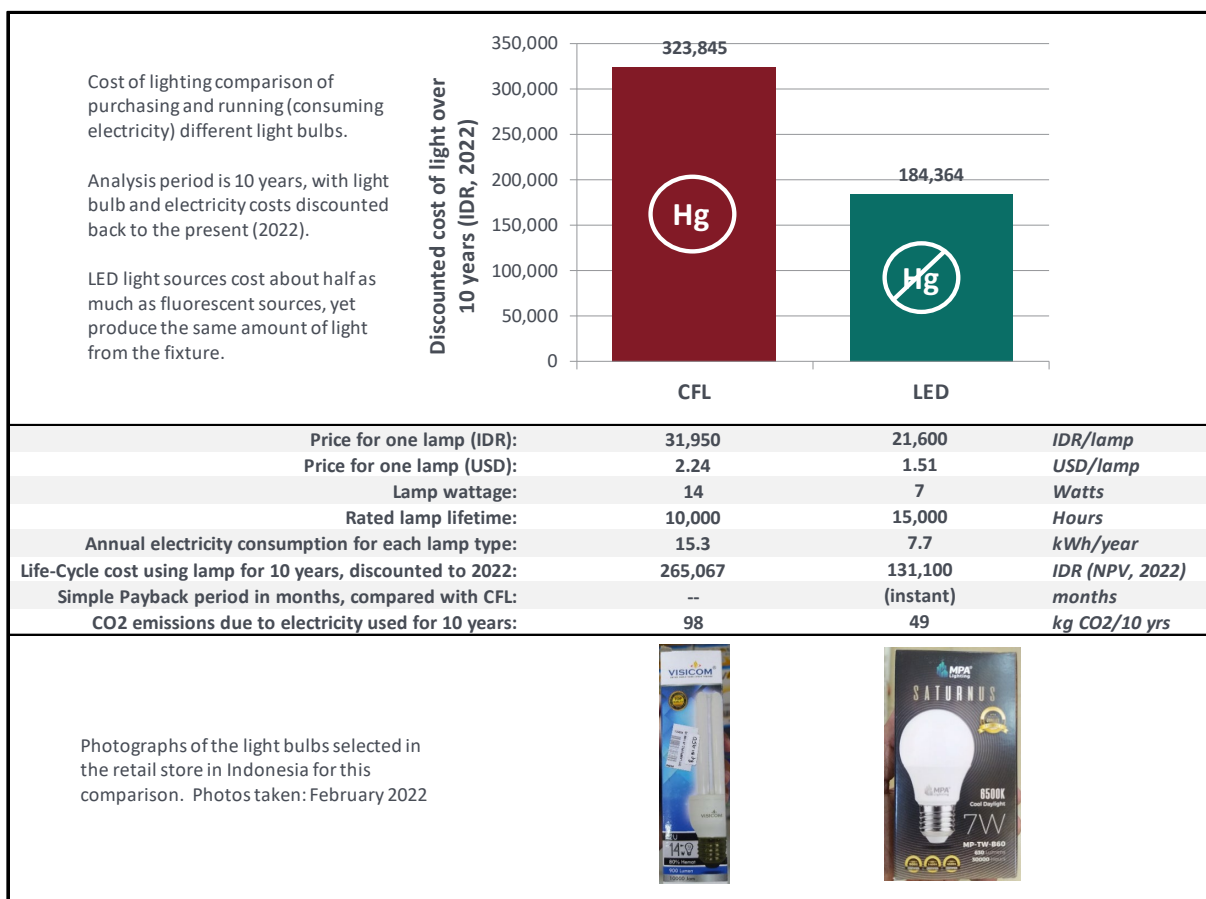
Table 9. Quantifying the Benefits of the African Lighting Amendment in Indonesia

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	75,779,834 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	229,062,513 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	2,100 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	188.01 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 18.8 billion

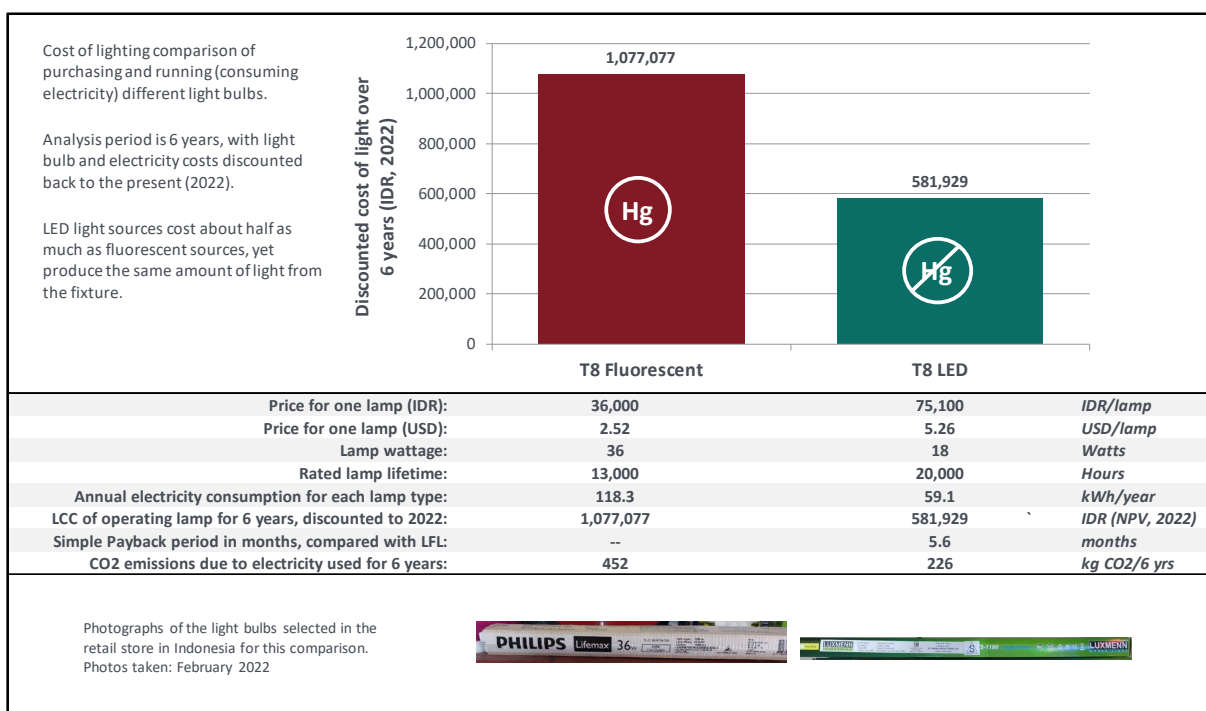
Important information about mercury and lighting in Indonesia:

- Indonesia is hosting COP4 in Bali. Due to the COVID-19 pandemic, the Conference of the Parties had to be held in two parts, one on-line in November 2021 and one in-person in March 2022. Indonesia proposed the [Bali Declaration on Combating Illegal Trade in Mercury](#). The proposed non-binding declaration invites all countries to join in the fight and form strong international cooperation in combating cross-border illegal mercury trade.
- The LED lighting industry shows a strong growth in the country. In 2021 Indonesia approved a [Roadmap for High Efficiency Lamps for Indonesia](#), which includes, among others, phasing out lamps that contain mercury in government agencies and state-owned enterprises buildings by 2022.
- LEDs are primarily imported from China. Virtually no general service lighting local manufacturing exists in Indonesia.
- The National Action Plan to Eliminate and Reduce Use of Mercury from 2018 to 2030 ([RAN PPM, Perpres 21/2019](#)) aims to reduce mercury use in manufacturing (among others) by 50% in 2030 against 2018 levels. According to the Plan, the use of Mercury for lamp production was 163 kg / year in 2018.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Indonesia. Switching to LED in Indonesia offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately IDR 135,000 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Indonesia. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately IDR 500,000 over the lifetime of the LED lamp.



A nighttime photograph of a city skyline with numerous illuminated skyscrapers and buildings. In the foreground, a highway shows long, bright light trails from moving vehicles. The sky is a deep blue, and the overall scene is lit with a mix of warm yellow and cool blue tones.

Technical & Economic Assessment of Mercury-Free Lighting: Latin America & the Caribbean Region

Clean
Lighting
Coalition

Latin America and Caribbean Region

In 2021 the Clean Lighting Coalition engaged partner organisations in **35 countries across Africa, Latin America and Asia** and gathered over 1200 models of both mercury-containing fluorescent and LED retrofits from those markets.

In April 2021, the African region proposed an amendment to Annex A of the Minamata Convention on Mercury to remove exemptions for mercury-containing fluorescent lamps, phasing out virtually all fluorescents by 2025. While these fluorescent exemptions may have been necessary in 2013 when the Convention was drafted, lighting technology has moved on rapidly – and today, the accessibility and affordability of mercury-free LED retrofit lamps makes the fluorescent lamp exemption unnecessary.

Adopting the proposed amendment at the fourth Conference of Parties (COP4) would lead to an accelerated global transition to LED lighting, which is non-toxic and climate friendly. Specifically, it would:

- avoid **232 metric tons** of mercury pollution from leaking into the environment between 2025-2050, both from the lamps themselves and from avoided burning of coal in power plants.
- avoid **3.5 gigatons** of CO₂ emissions which is equivalent to getting ALL passenger cars (globally) off the road for a whole year.

If adopted, the Latin American Region would avoid



11,300 kilograms

of mercury pollution and



239 mega tons

of CO₂ emissions cumulatively 2025-2050.

Countries in green are parties to the Minamata Convention on Mercury.



The data above reflects the benefits of a global fluorescent phase-out to all countries in Latin America and the Caribbean, not just parties to the Minamata Convention on Mercury.

Based on projections from [CLASP's MEPSY model](#), the table below provides country-level projections of avoided CO2 emissions and mercury releases cumulatively 2025-2050.

COUNTRY	CO2 (MT)	MERCURY (KG)
ARGENTINA	20.4	737.9
BAHAMAS	0.5	13.8
BARBADOS	0.3	9.6
BELIZE	0.2	7.1
BOLIVIA	2.2	67.9
BRAZIL	79.4	5042.8
CHILE	14.2	575.5
COLOMBIA	10.5	652.4
COSTA RICA	0.9	78.8
DOMINICAN REPUBLIC	4.0	109.3
ECUADOR	6.8	229.5
EL SALVADOR	1.4	54.4
GUATEMALA	3.2	102.6
GUYANA	0.6	12.8
HAITI	0.5	3.4
HONDURAS	2.3	57.9
JAMAICA	1.2	23.3
MEXICO	56.7	2,207.8
NICARAGUA	0.8	20.9
PANAMA	2.1	74.7
PARAGUAY	0.4	93.6
PERU	8.2	373.1
SURINAME	0.7	19.7
TRINIDAD AND TOBAGO	1.7	57.9
URUGUAY	1.3	104.5
VENEZUELA	19.3	582.0

*Note: Table sums will not match above totals due to rounding. There were not sufficient data to accurately project mercury and CO2 figures for the following countries: Antigua and Barbuda, Cuba, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, and St. Vincent and the Grenadines.

Lighting Market Overview

The LAC region is a net importer of fluorescent lamps, with nearly no manufacturing of fluorescent lighting. Most CFL manufacturers have already transitioned to producing LEDs. Furthermore, there are many LED manufacturing and assembly companies in several countries in the region, accounting for an important share of the LAC LED market (19 of the top 50 LED companies in LAC are local, and together, these account for 12.7% of the LAC market share, or 395.72 million USD).

Key LED players in the region are:

- **Mexico** - 4.6% of global exports of LED luminaires and 0.6% of LED packages/dies. LED companies identified include: Construlita, Argos, Iluminación LED Hércules, and LEDsmex
- **Brazil** - 13 of the top 50 LED companies in the region are in Brazil, including Taschibra - 2nd in the region (after Signify) with a market share of 4.4% (131.6 million USD).

As an import-based market, a complete phase-out of fluorescents in this region would further encourage the growth of the local LED industry, stimulating economic growth, generating employment opportunities, and reducing reliance on lighting product importation.

Comparing Costs: LEDs vs CFL/LFL

Based on projections from [CLASP's MEPSY model](#), transitioning to efficient LED lighting would avoid the sale of **893 million compact fluorescent lamps and 913 million linear fluorescent lamps in the GRULAC region**. Taken together, this will avoid 11,300 kilogrammes of mercury in the lamps and save approximately 806 TWh of the GRULAC Region's total electricity consumption between 2025 and 2050. Over the 25-year analysis period, Latin America and the Caribbean would save \$90.9 billion USD and 239 million metric tonnes of CO₂. The following tables detail the comparative cost across countries. Please note that the value in parentheses is the equivalent cost in USD.

TABLE 1

THE TRUE COST OF LIGHT - GENERAL SERVICE LAMPS











 COUNTRY	 CFL PRICE	 LED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Antigua & Barbuda	XCD 19.95 (US\$ 7.38)	XCD 18.95 (US\$ 7.01)	Instantaneous	XCD 78.51 (US\$ 29.05)
Belize	BZD 9.75 (US\$ 4.82)	BZD 6.41 (US\$ 3.17)	Instantaneous	BZD 37.58 (US\$ 18.56)
Brazil	BRL 10.9 (US\$ 2.15)	BRL 7.99 (US\$ 1.58)	Instantaneous	BRL 57.78 (US\$ 11.41)
Peru	PEN 9.9 (US\$ 2.64)	PEN 9.9 (US\$ 2.64)	Instantaneous	PEN 76.36 (US\$ 20.38)
Guyana	GYD 700 (US\$ 3.34)	GYD 550 (US\$ 2.64)	Instantaneous	GYD 6,144.66 (US\$ 29.28)
Mexico	MXN 40 (US\$ 1.88)	MXN 42 (US\$ 1.97)	4 months	MXN 89.33 (US\$ 4.26)
Argentina	CFL not available	ARS 249 (US\$ 2.29)	Instantaneous	ARS 891.83 (US\$ 8.22)
Chile	CLP 3,490 (US\$ 4.33)	CLP 2,190 (US\$ 2.72)	Instantaneous	CLP 12,928.53 (US\$ 16.03)
Uruguay	UYU 70 (US\$ 1.63)	UYU 77 (US\$ 1.76)	1.3 months	UYU 627.11 (US\$ 14.42)
Colombia	COP 7,900 (US\$ 1.98)	COP 3,690 (US\$ 0.92)	Instantaneous	COP 58,171.28 (US\$ 15.40)
Jamaica	JMD 393 (US\$ 2.55)	JMD 560 (US\$ 3.61)	6 months	JMD 3,357.89 (US\$ 21.65)
Trinidad & Tobago	TTD 41.65 (US\$ 6.11)	TTD 33.75 (US\$ 4.95)	Instantaneous	TTD 61.75 (US\$ 9.06)
Panama	PAB 1.99 (US\$ 1.99)	PAB 2.99 (US\$ 2.99)	5 months	PAB 23.73 (US\$ 23.73)

TABLE 2

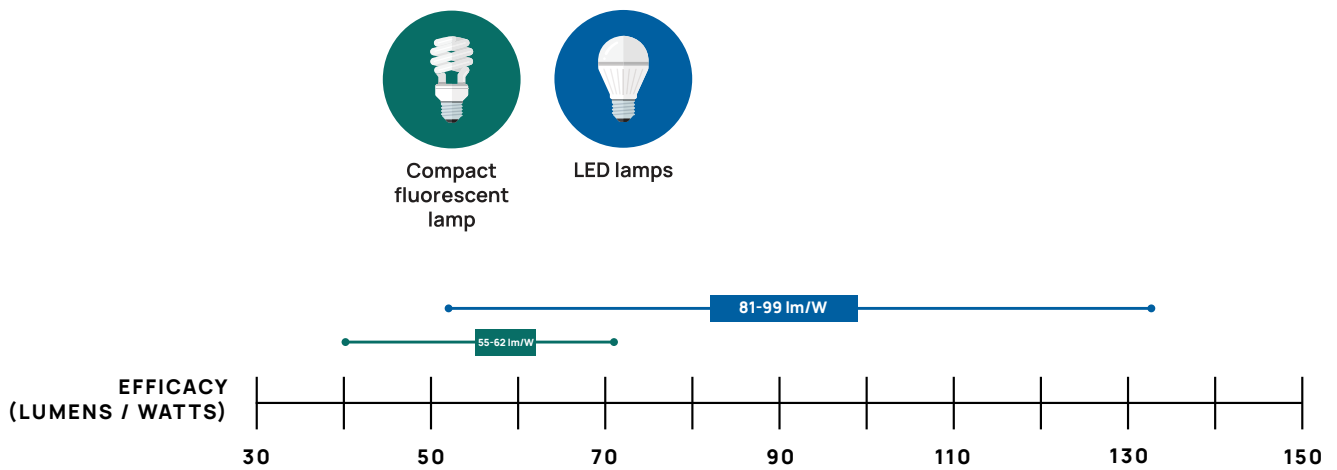
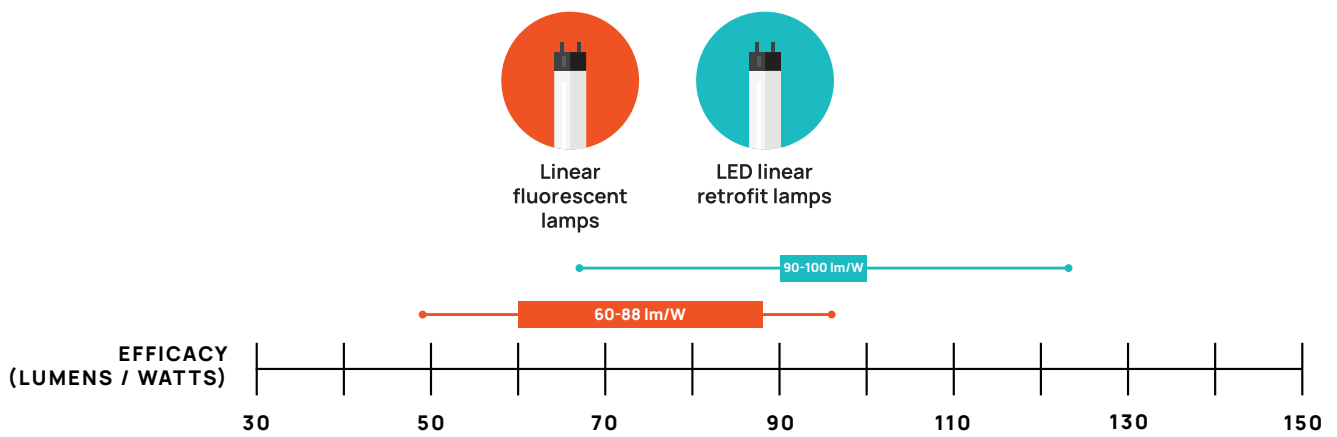
THE TRUE COST OF LIGHT - LINEAR LAMPS

 COUNTRY	 LFL PRICE	 TLED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Antigua & Barbuda	XCD 16.48 (US\$ 6.10)	XD 55 (US\$ 20.35)	6 months	XCD 1063.78 (US\$ 393.62)
Belize	BZD 4.50 (US\$ 2.25)	BZD 18 (US\$ 9)	10 months	BZD 101.27 (US\$ 50.03)
Brazil	BRL 14.90 (US\$ 2.94)	BRL 29.99 (US\$ 5.92)	5 months	BRL 271.85 (US\$ 53.70)
Peru	PEN 6.90 (US\$ 1.64)	PEN 14.90 (US\$ 3.98)	4 months	PEN 93.31 (US\$ 24.90)
Guyana	LFL not available	GYD 1,000 (US\$ 4.80)	--	--
Mexico	LFL not available	MXN 174 (US\$ 8.31)	--	--
Argentina	LFL not available	ARS 399 (US\$ 3.68)	--	--
Chile	CLP 1,790 (US\$ 2.15)	CLP 2,390 (US\$ 2.96)	2 months	CLP 25,519 (US\$ 31.64)
Uruguay	LFL not available	UYU 199 (US\$ 4.60)	--	--
Colombia	COP 2,200 (US\$ 0.55)	COP 7,900 (US\$ 1.98)	4 months	COP 161,105.84 (US\$ 42.66)
Jamaica	JMD 488 (US\$3.15)	JMD 718.75 (US\$ 4.60)	7 weeks	JMD 7,217 (US\$ 46.53)
Trinidad & Tobago	TTD 70 (US\$ 10.50)	TTD 45 (US\$ 6.60)	Instantaneous	TTD 312.72 (US\$ 47.19)
Panama	PAB 1.59 (US\$ 1.59)	PAB 3.99 (US\$ 3.99)	4 months	PAB 29.45 (US\$ 29.45)

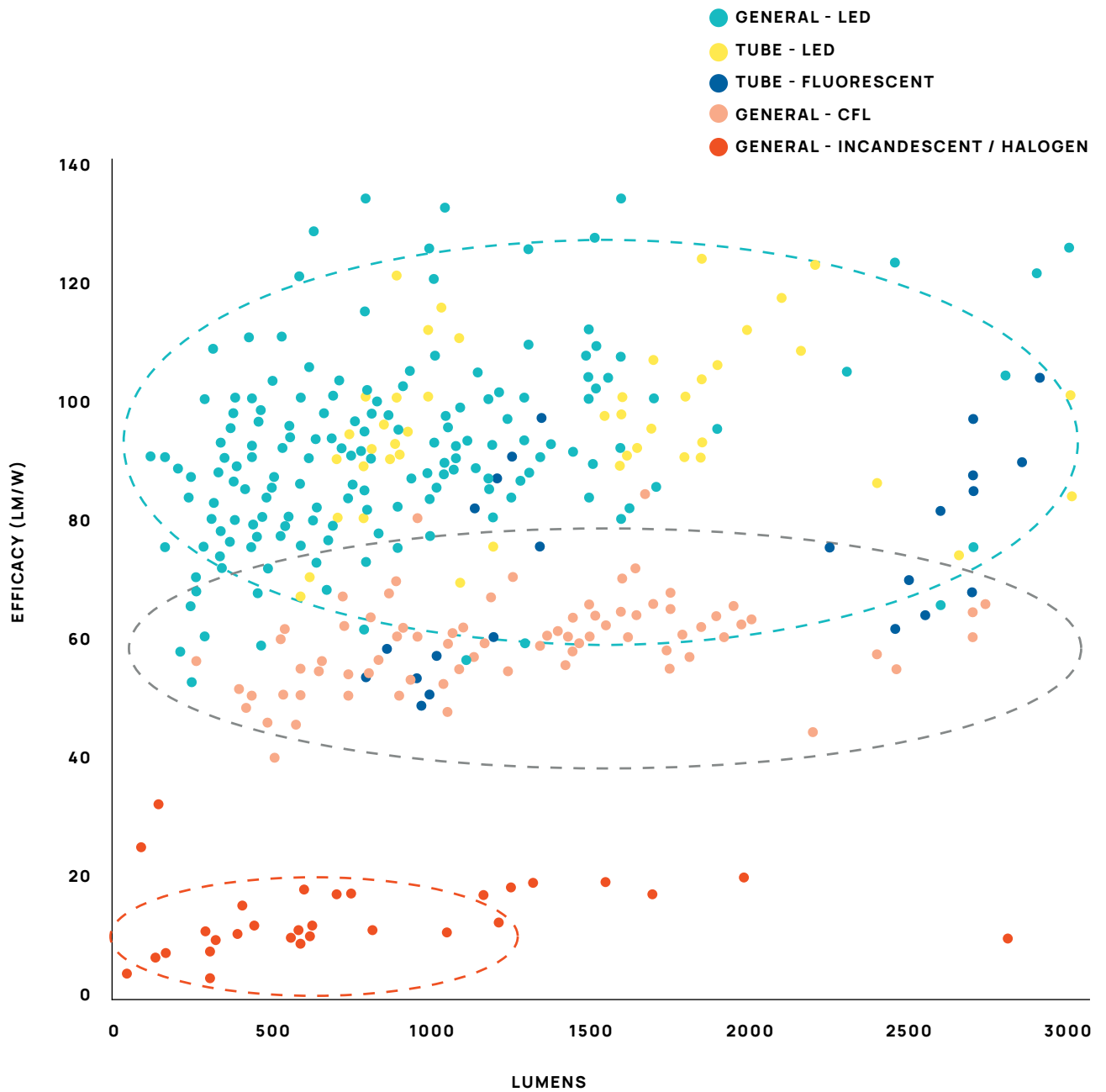
Energy Efficiency Comparison

The energy efficiency of a light bulb is measured in lumens/watt.

Based on data collected in Q4 2021, the scales below depict the ranges of energy efficiency of different types of bulbs available across LAC markets.



The graph below shows the energy efficiency of individual samples collected across the region. LEDs are up to 2-3 times more efficient than the other lighting technologies, therefore use less overall electricity to provide the same or better lighting service.



Lighting Policy & Legislative Landscape

Many countries in the region are shifting towards LED only markets through energy efficiency policy and/or mercury regulation. Some of the notable regulations include:

- **Chile** - [Updated MEPS for general lighting](#), to phase out inefficient lamps: 40 lm/W by 2021, 70 lm/W by 2023, 85 lm/W by 2025. Shifts market to LED by 2023.
- **Uruguay** - [Decree No. 15/019](#). Since 2020, it prohibits fluorescent lamps unless the manufacturer/importer presents and implements a comprehensive end-of-life management plan. Practically shifted market to LED since 2020.
- **Mexico** - [NOM-030-ENER-2016](#) establishes minimum energy efficiency and safety standards for LED lamps. Having these standards is an important step to ensure the quality of the LEDs available in the local market.
- **Argentina** - [Efficient Lighting Plan \(PLAE\)](#) will replace existing luminaires in public lighting by LED technology.

Compatibility/Retrofits for LED tubes

In all LAC markets where data was collected, LED retrofits were easily available for both general service lamps and tube lamps. This availability confirms that in nearly all cases, rewiring of old lighting fixtures will not be necessary. In the few cases (6 to 9%) where the LED tubes available in the market are not compatible with the fixtures, the ballast can be 'by-passed' with mains voltage at the sockets, so that the fixture can remain in place.

End of Life Management for Lighting

Collecting fluorescent lamps at the end of life has been a global challenge since the introduction of fluorescents. In addition, mercury released during the lifecycle of fluorescent lamps contaminate the atmosphere, land, and water. This contamination may occur from lamp breakage when old lamps are comingled with general household waste, and during installation, collection, or transport of discarded lamps, processing, or recycling of spent lamps, or when lamps are landfilled, incinerated, or otherwise disposed of.

Collection and safe recycling/disposal of fluorescent lamps is difficult – especially in regions with low levels of general e-waste collection and processing. Several e-waste or mercury waste regulations are in force in countries in the region, such as Uruguay, Mexico, and Colombia. Mercury treatment facilities have been identified in the region, however, there are still important awareness, logistics and infrastructure issues that limit the region's capabilities to manage mercury-containing lamps soundly at end-of-life. There are few fluorescent lamps recycling programs, and they are usually focused on commercial rather than residential users. Some companies and non-governmental organizations, such as Alianza Contaminación Cero in Panama, are working on awareness-raising campaigns and encouraging governments to enforce fluorescent lamp recycling programs. Some local businesses have lamp collection programs in place, and the United Nations Environment Programme has supported several governments in the region in the development mercury inventories and sound end-of-life policy proposals. Despite these efforts, the regional share of sound end-of-life management of electronic waste (including fluorescent lamps) is estimated at 2.7%, according to a UNIDO-GEF report [published this year](#). While LED lamps are also considered e-waste, they are not toxic or considered hazardous waste.



Annex of Country Level Data

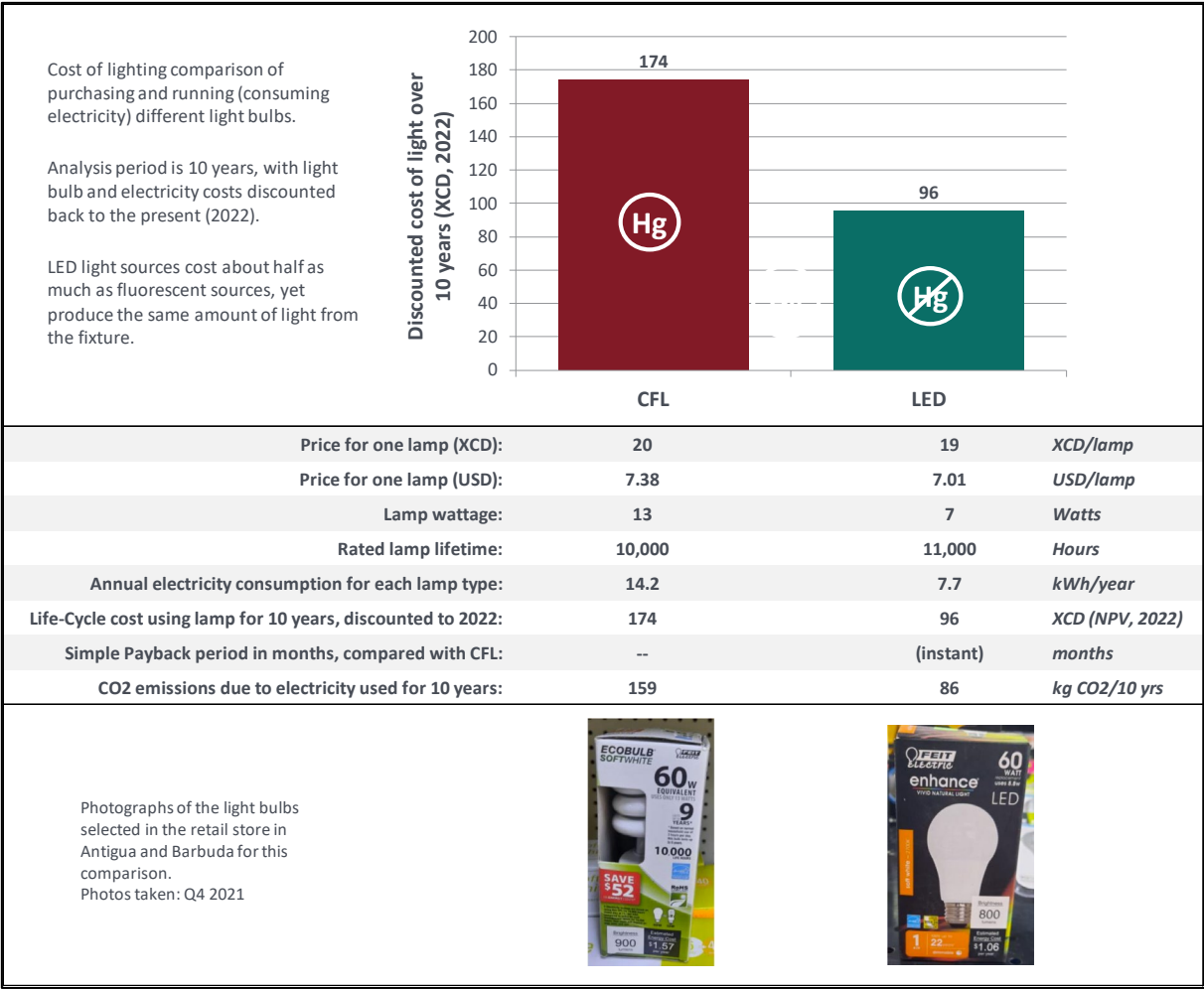
Antigua & Barbuda



Important information about mercury and lighting in Antigua & Barbuda:

- There are mandatory energy efficiency labels and testing methods for LED lamps (IEC ABNS 62612:2013) and for CFLs (IEC ABNS 60969:2016).
- The Ministry of Energy, the Antigua Public Utility Authority, the Department of Environment and the Environmental Awareness Group are all public sector actors with interests in the health of society and the ecosystem. They have supported initiatives to phase out mercury projects.
- The National Solid Waste Management Authority Act, 2005 was created to maintain the distribution and pollution by solid waste in the country of Antigua and Barbuda. This kind of waste includes biomedical, hazardous and any litter.
- Zero Waste Antigua and Barbuda is working to reduce the use and importation of mercury and mercury products, and to implement use of proper disposal methods and containers. The organisation carried out its first project, Phase Down/Phase Out Mercury with the aim of decreasing the amount of mercury on the islands by 10% to 20%. The project was executed from 2019 to 2021.
- The Mercury Phase Out Programme, implemented by The Marine Protected Areas Trust, the Medical Association of Antigua and Barbuda, the Christian Union Church, and Zero Waste Antigua and Barbuda, supported by GEF/UNDP, raised awareness about mercury in fluorescent lamps and placed lamp collection bins throughout the country. With this program, an amount equivalent to 5% of the fluorescent lamps sold in the country each year were collected, destroyed and contained.
- Findings of the market study carried out by our NGO partners show that LED lamps for general use are already more affordable than CFLs in Antigua and Barbuda.

The box below offers an economic analysis of a compact fluorescent lamp (CFL) and two light emitting diode (LED) retrofit bulbs. All of these lamps were selected and photographed in a retail store in Antigua & Barbuda. Switching to LED in Antigua & Barbuda offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately XCD 78 over the lifetime of the LED retrofit lamp.

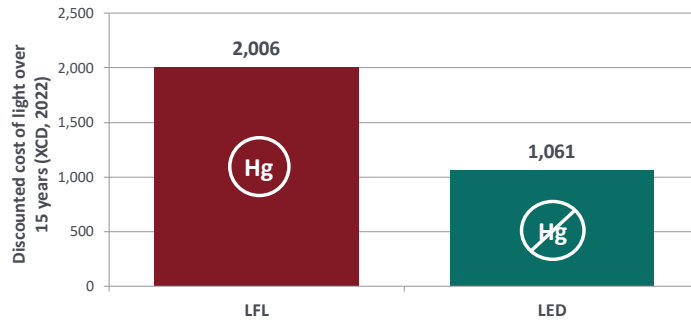


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Antigua & Barbuda. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately XCD 1000 over the lifetime of the LED lamp, yet the LED only costs XCD 60 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 15 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (XCD):	16	75	XCD/lamp
Price for one lamp (USD):	6.10	27.77	USD/lamp
Lamp wattage:	40	20	Watts
Rated lamp lifetime:	24,000	50,000	Hours
Annual electricity consumption for each lamp type:	131.4	65.7	kWh/year
Life-Cycle cost using lamp for 15 years, discounted to 2022:	2,006	1,061	XCD (NPV, 2022)
Simple Payback period in months, compared with LFL:	--	10.7	months
CO2 emissions due to electricity used for 15 years:	2,208	1,104	kg CO2/15 yrs

Photographs of the light bulbs selected in the retail store in Antigua and Barbuda for this comparison.



Argentina

Table 2. Quantifying the Benefits of the African Lighting Amendment in Argentina

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	58,464,107 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	59,407,335 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	738 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	52.5 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 5.8 billion

Important information about mercury and lighting in Argentina:

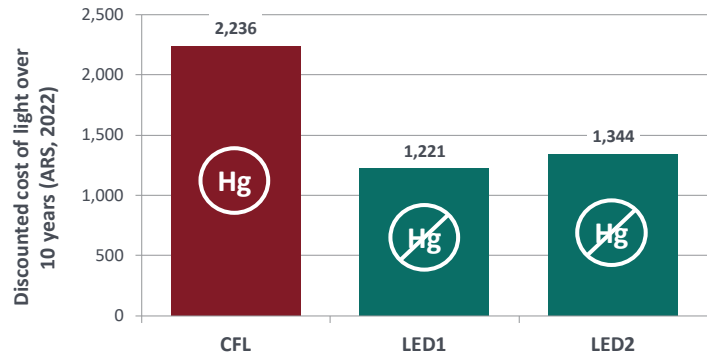
- Resolution 71/2019 established the need for a Prior Informed Consent for import and export of products with added mercury.
- Resolution 75/2019 prohibited the production, import and export of products with mercury as of January 1, 2020, as specified in the Minamata Convention Annex A, including compact fluorescent lamps ≤ 30 W with more than 5 mg of mercury, triband phosphor linear fluorescent lamps < 60 W with more than 5 mg of mercury, halophosphate phosphor lamps ≤ 40 W with more than 10 mg of mercury, high pressure mercury vapor lamps, and cold cathode fluorescent as specified in Annex A.
- The Efficient Lighting Plan (Plan de Alumbrado Eficiente – PLAE) promotes the replacement of public lighting by LED technology. The incorporation of this higher efficiency technology can represent up to 50% of energy savings over current consumption. (IRAM AADL J 2022-2.) PLAE beneficiaries are offered non-refundable contributions to make LED technology replacements in public lighting systems throughout Provinces and / or Municipalities of the country that meet the requirements and criteria established in the [General Regulations](#), including:
 - Potential for energy savings and/or efficiency.
 - Adequate infrastructure or adequacy capacity.
 - Ability to execute the work in a timely manner.
 - Speed of execution of work.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Argentina. Switching to LED in Argentina can offer an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately ARS 1000 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (ARS):	249	369	249	ARS/lamp
Price for one lamp (USD):	2.47	3.65	2.47	USD/lamp
Lamp wattage:	15	7	9	Watts
Rated lamp lifetime:	6,000	11,000	11,000	Hours
Annual electricity consumption for each lamp type:	16.4	7.7	9.9	kWh/year
Life-Cycle cost using lamp for 10 years, discounted to 2022:	2,236	1,221	1,344	ARS (NPV, 2022)
Simple Payback period in months, compared with CFL:	--	14.8	(instant)	months
CO2 emissions due to electricity used for 10 years:	57	27	34	kg CO2/10 yrs

Photographs of the light bulbs selected in the retail store in Argentina for this comparison. Photos taken: Q4 2021



Belize

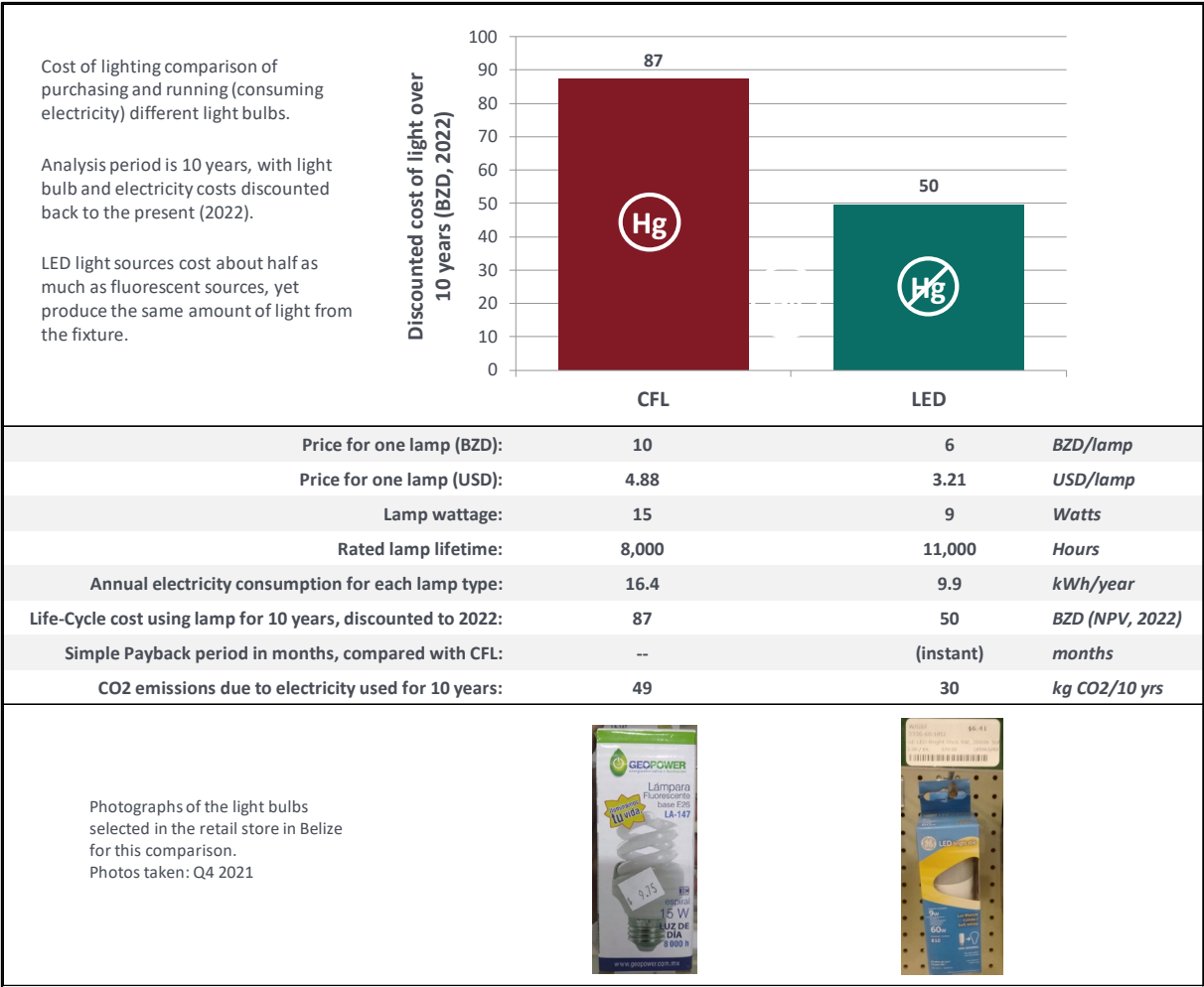
Table 3. Quantifying the Benefits of the African Lighting Amendment in Belize

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	601,034 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	544,158 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	7 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	0.5 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 87.1 million

Important information about mercury and lighting in Belize:

- In 2013, Belize was one of the co-signatories of the Central American Regional Efficient Lighting Strategy, a document developed in the framework of Proyecto Mesoamerica with the support of the UNEP/GEF en.lighten initiative (United for Efficiency).
- Energy efficiency is the first priority of Belize's five pillars that constitute its Sustainable Energy Roadmap 2030. In this framework, Belize is working to develop energy standards and labels for lighting and other appliances, with the support of the OAS-SECBI.
- The Energy Unit within the Ministry of the Public Service, Energy and Public Utilities in collaboration with the electrical students of ITVET Stann Creek, carried out energy conservation measures by installing LED lights in public buildings. A total of 185 LED tubes were installed. Five years of operations of fluorescents tubes would cost a total of \$55,302.91. The LED replacements will cost \$27,651.46 for the same use within the same 5-year period. This reflects a combined savings of \$27,651.46, accumulated over the next 5 years, for replacing the fluorescent with LEDs.
- Findings of the market study carried out by our NGO partners show that LED lamps for general use are already more affordable than CFLs in Belize.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Belize. Switching to LED in Belize offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes roughly half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately BZD 37 over the lifetime of the LED retrofit lamp.

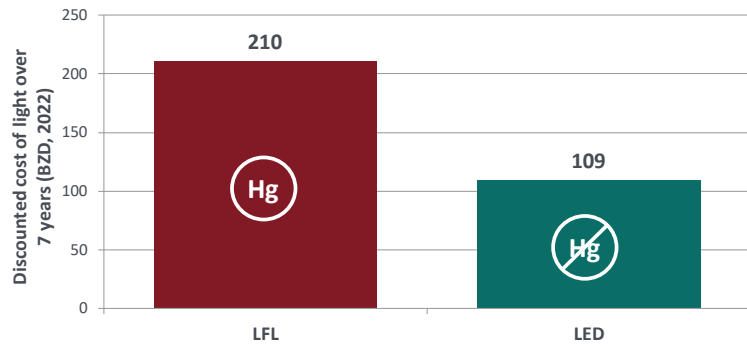


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Belize. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately BZD 100 over the lifetime of the LED lamp, yet the LED only costs BZD 13 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 7 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (BZD):	5	18	<i>BZD/lamp</i>
Price for one lamp (USD):	2.25	9.00	<i>USD/lamp</i>
Lamp wattage:	20	9	<i>Watts</i>
Rated lamp lifetime:	13,000	25,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	65.7	29.6	<i>kWh/year</i>
Life-Cycle cost using lamp for 7 years, discounted to 2022:	210	109	<i>BZD (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	10.2	<i>months</i>
CO2 emissions due to electricity used for 7 years:	138	62	<i>kg CO2/7 yrs</i>

Photographs of the light bulbs selected in the retail store in Belize for this comparison.
Photos taken: Q4 2021



Brazil

Table 4. Quantifying the Benefits of the African Lighting Amendment in Brazil

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	398,190,706 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	406,911,926 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	5,043 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	357.3 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 46.4 billion

Important information about mercury and lighting in Brazil:

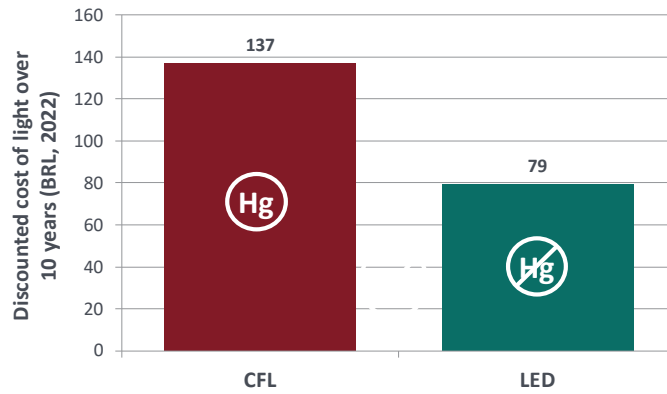
- [The 2050 National Energy Plan \(PNE 2050, in the Portuguese acronym\)](#) was launched by the Ministry of Mines and Energy (MME) and the Brazilian Energy Research Company (EPE). Energy policy making for the next 30 years will be supported by its analysis and projections of economic growth, demand for energy and output potential.
- Thirteen of the top 50 LED companies in the Latin American and Caribbean region are in Brazil, including Taschibra - 2nd in the region (after Signify) with a market share of 4.4% (131.6 million USD).
- The Brazilian Development Bank (BNDES) and the Ministry of Mines and Energy (MME) are offering financial instruments to transition public lighting to LED. Public-private partnership bids have already been selected for projects in Macapá, Petrolina, Teresina, Porto Alegre and Vila Velha, with upcoming projects in Curitiba, Canoas, Caruaru and Jaboatao dos Guararapes. These projects have already updated over 570 thousand fixtures to LED, benefitting over 7 million people. BNDES has also funded energy efficiency projects in small and medium enterprises which include transitioning to LED lighting.
- On March 13, 2015, INMETRO granted [Ordinance no. 144](#), which approves the Conformity Assessment Requirements for LED lamps intended to enter the Brazilian market. Then, on February 15, 2017, INMETRO approved the administrative [Rule No. 20, 2017](#), establishing the technical and conformity criteria for street lighting using discharge lamps and LED technology.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Brazil. Switching to LED in Brazil offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately BRL 58 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (BRL):	11	8	<i>BRL/lamp</i>
Price for one lamp (USD):	1.96	1.44	<i>USD/lamp</i>
Lamp wattage:	15	9	<i>Watts</i>
Rated lamp lifetime:	6,000	11,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	16.4	9.9	<i>kWh/year</i>
Life-Cycle cost using lamp for 10 years, discounted to 2022:	137	79	<i>BRL (NPV, 2022)</i>
Simple Payback period in months, compared with CFL:	--	(instant)	<i>months</i>
CO2 emissions due to electricity used for 10 years:	33	20	<i>kg CO2/10 yrs</i>

Photographs of the light bulbs selected in the retail store in Brazil for this comparison.
Photos taken: Q4 2021

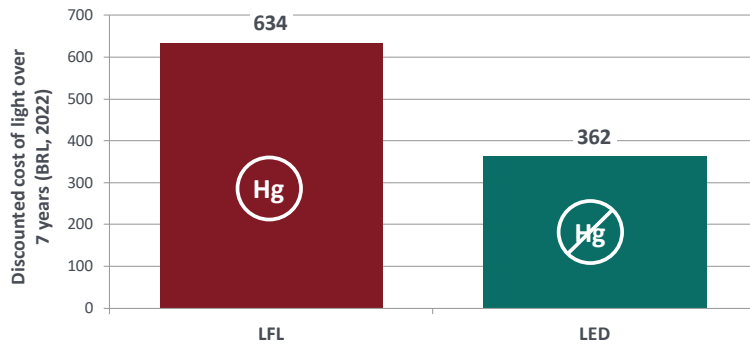


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Brazil. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately BRL 270 over the lifetime of the LED lamp, yet the LED only costs BRL 15 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 7 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (BRL):	15	30	<i>BRL/lamp</i>
Price for one lamp (USD):	2.68	5.40	<i>USD/lamp</i>
Lamp wattage:	36	20	<i>Watts</i>
Rated lamp lifetime:	10,000	25,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	118.3	65.7	<i>kWh/year</i>
Life-Cycle cost using lamp for 7 years, discounted to 2022:	634	362	<i>BRL (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	4.8	<i>months</i>
CO2 emissions due to electricity used for 7 years:	166	92	<i>kg CO2/7 yrs</i>

Photographs of the light bulbs selected in the retail store in Brazil for this comparison.
Photos taken: Q4 2021



Chile

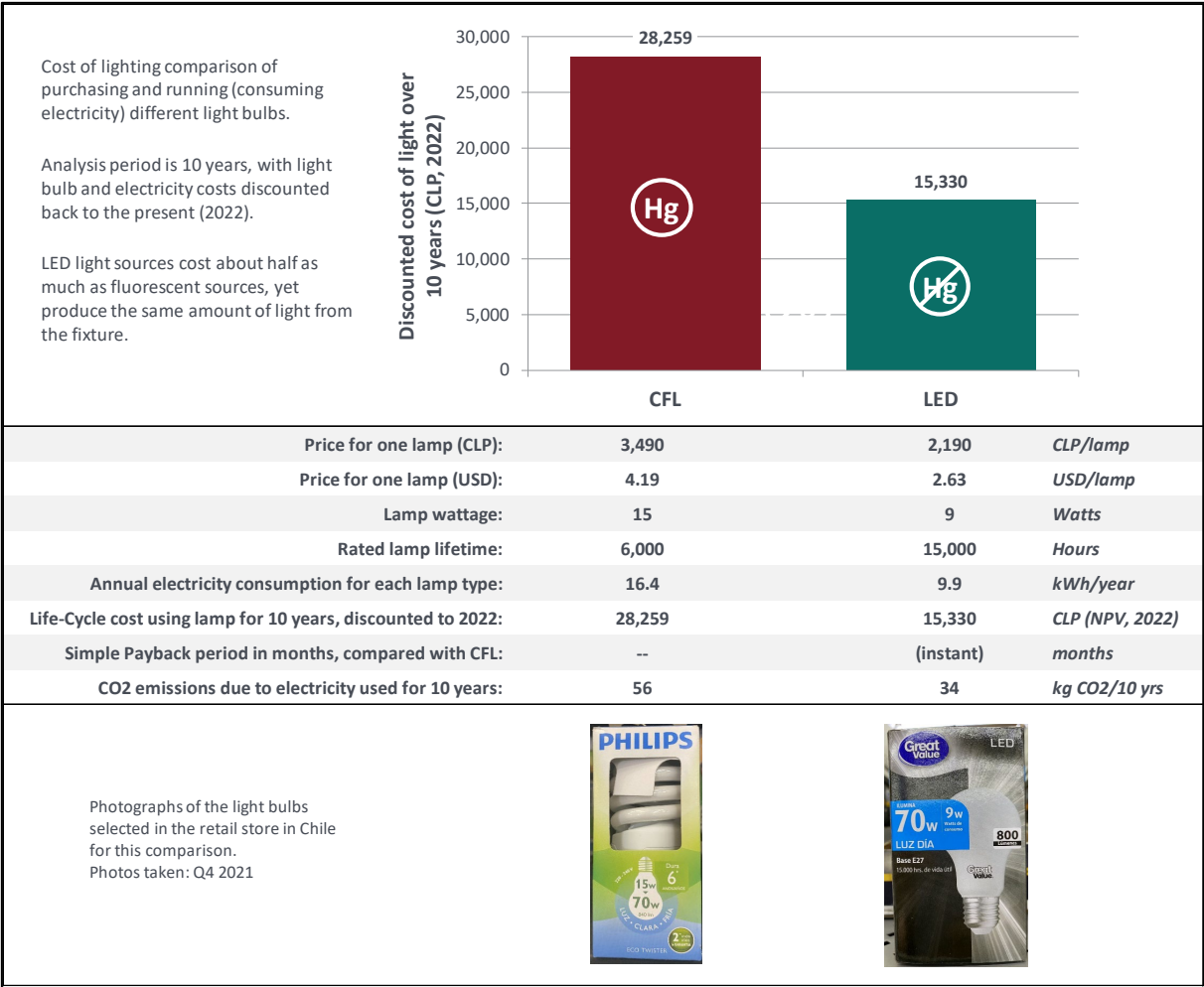
Table 5. Quantifying the Benefits of the African Lighting Amendment in Chile

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	41,440,676 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	49,100,400 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	575 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	42.4 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 6.8 billion

Important information about mercury and lighting in Chile:

- In 2013, the Ministry of Energy of Chile and Fundación Chile, with the support of the UNEP/GEF enlighten initiative (United for Efficiency), developed its National Efficient Lighting Strategy. This strategy established general minimum energy performance standards (MEPS) that phased out inefficient (incandescent) lamps, and proposed mercury labels and a sound end-of-life management system for mercury-containing lamps.
- Through Ministerial Resolution N. 10/2020, the Ministry of Energy updated MEPS for general lighting, to phase out inefficient lamps: 40 lm/W by 2021, 70 lm/W by 2023, 85 lm/W by 2025. This update effectively phases out fluorescent lamps as they do not currently reach those minimum energy performance standards, and makes the shift to LED lighting.
- In 2021, Chile published its first [Energy Efficiency Law \(No. 21,305\)](#) to promote the rational and efficient use of energy resources. According to the terms of this new law, the Ministry of Energy is required to prepare a National Energy Efficiency Plan and it must include, at least, the following matters:
 - residential energy efficiency
 - minimum standards and artifact labelling
 - energy efficiency in construction and transportation
 - energy efficiency and smart cities
 - energy efficiency in the productive sectors, and
 - education and training in energy efficiency
- In addition, the plan must establish short-, medium- and long-term goals, as well as the programs and actions necessary to achieve those goals. The 10% reduction in energy intensity targeted for 2030 should lead to cumulative savings of US\$15.2 billion and a reduction of 28.6Mt of CO2.
- Following Law 21,305, new homes will be required to have an energy efficiency label, like those found on electric appliances indicating their energy running costs. Large energy consumers will be required to implement an energy management system and to report annually on their consumption and other indicators. ...

The box below offers an economic analysis of a CFL and LED retrofit bulbs. Both of these lamps were selected and photographed in a retail store in Chile. Switching to LED in Chile offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately CLP 13,000 over the lifetime of the LED retrofit lamp.

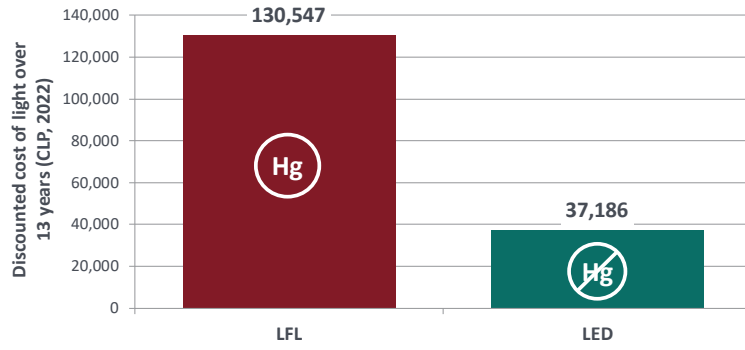


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Chile. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately CLP 93,000 over the lifetime of the LED lamp, yet the LED only costs CLP 900 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 13 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (CLP):	2,590	3,490	CLP/lamp
Price for one lamp (USD):	3.11	4.19	USD/lamp
Lamp wattage:	60	15	Watts
Rated lamp lifetime:	2,000	6,000	Hours
Annual electricity consumption for each lamp type:	65.7	16.4	kWh/year
Life-Cycle cost using lamp for 13 years, discounted to 2022:	130,547	37,186	CLP (NPV, 2022)
Simple Payback period in months, compared with LFL:	--	1.6	months
CO2 emissions due to electricity used for 13 years:	290	73	kg CO2/13 yrs

Photographs of the light bulbs selected in the retail store in Chile for this comparison.
Photos taken: Q4 2021



Colombia

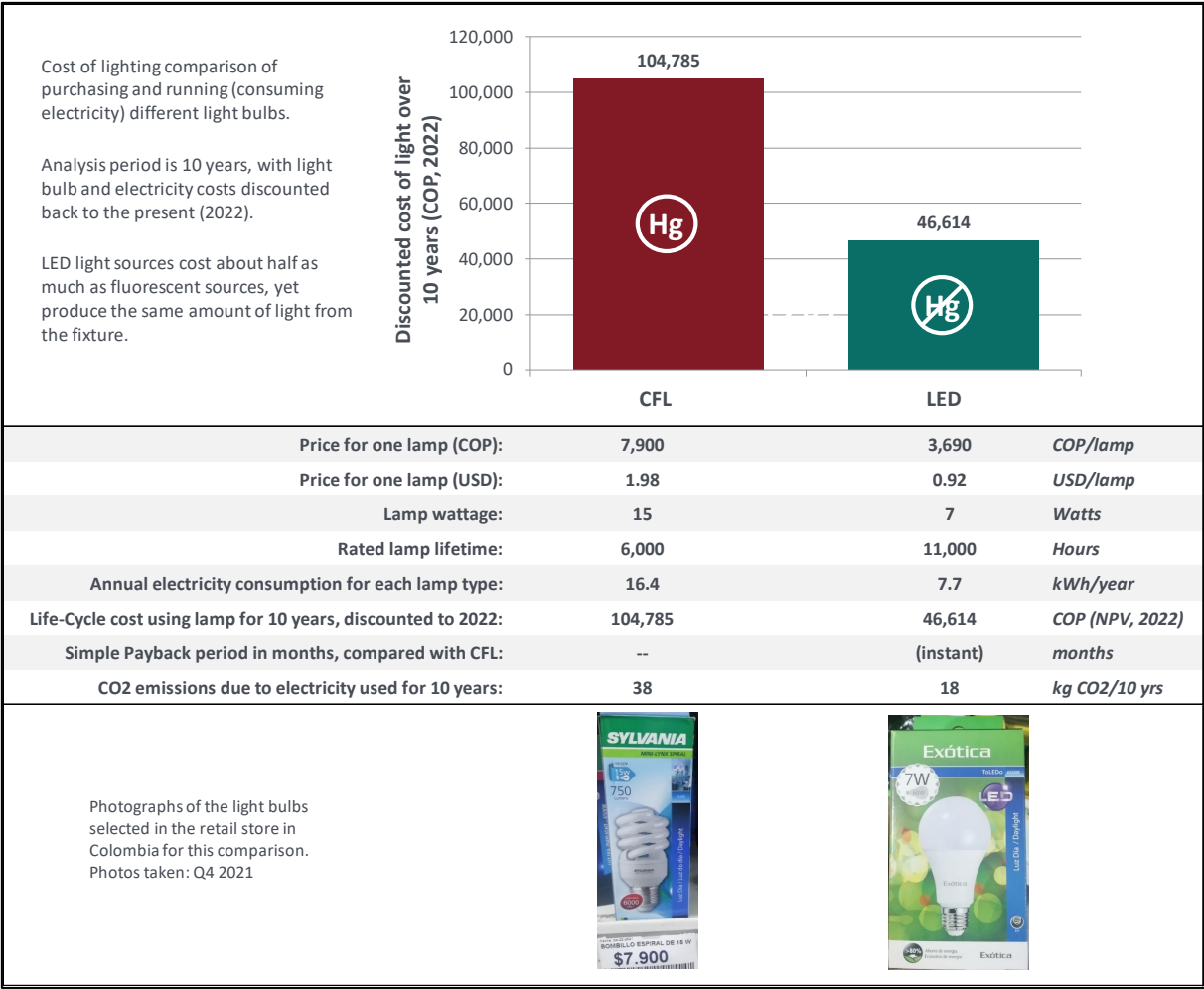
Table 7. Quantifying the Benefits of the African Lighting Amendment in Colombia

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	53,836,977 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	51,095,607 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	652 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	45.3 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 6.34 billion

Important information about mercury and lighting in Colombia:

- On April 23rd, 2021, the president of Colombia, Iván Duque, signed a decree that prohibits the manufacture, import and export of products containing added mercury.
- In 2010 the Ministry of Energy of Colombia issued the Technical Guidelines for General and Public Lighting (RETILAP). This document provides thorough minimum energy performance standards, testing parameters, and labelling requirements for all lighting appliances in Colombia. The document has been updated several times since its release.
- Findings of the market study carried out by our NGO partners show that LED lamps for general use are already more affordable than CFLs in Colombia.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Colombia. Switching to LED in Colombia offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately COP 57,000 over the lifetime of the LED retrofit lamp.

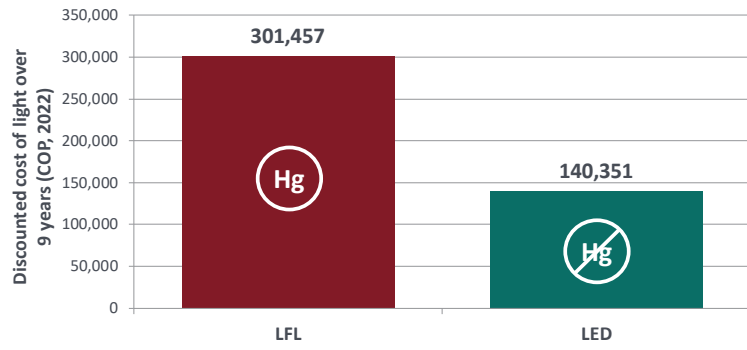


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Colombia. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately COP160,000 over the lifetime of the LED lamp, yet the LED only costs COP 5,700 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 9 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (COP):	2,200	7,900	<i>COP/lamp</i>
Price for one lamp (USD):	0.55	1.98	<i>USD/lamp</i>
Lamp wattage:	18	8	<i>Watts</i>
Rated lamp lifetime:	20,000	30,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	59.1	26.3	<i>kWh/year</i>
Life-Cycle cost using lamp for 9 years, discounted to 2022:	301,457	140,351	<i>COP (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	3.7	<i>months</i>
CO2 emissions due to electricity used for 9 years:	123	55	<i>kg CO2/9 yrs</i>

Photographs of the light bulbs selected in the retail store in Colombia for this comparison. Photos taken: Q4 2021



Guyana

Table 8. Quantifying the Benefits of the African Lighting Amendment in Guyana

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	1,092,383 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	978,623 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	13 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	1.0 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 238 million

Important information about mercury and lighting in Guyana:

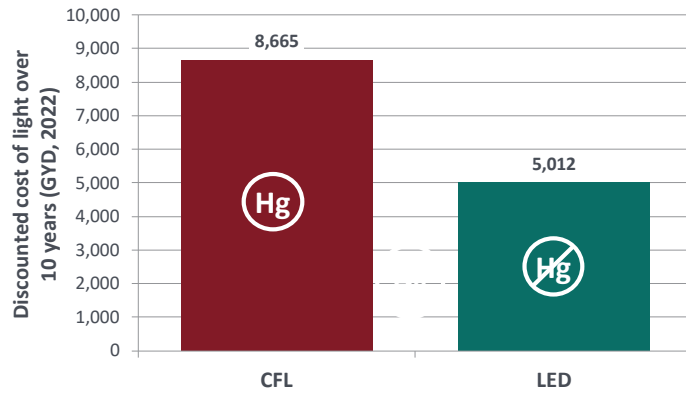
- The Guyana Energy Agency installed in excess of 602 Stand Alone Solar Powered LED Street Lights installed across all 10 Administrative Regions.
- Under the Hinterland LED Lighting Project the Guyana Energy Agency initiated an energy conservation initiative that will replace energy inefficient lights with energy efficient lights. Beneficiaries are customers of the 6 hinterland utilities.
- Findings of the market study carried out by our NGO partners show that LED lamps for general use are already more affordable than CFLs in Guyana. Moreover, Linear fluorescent lamps were not available for purchase in local stores, with TLEDs being the only available option.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Guyana. Switching to LED in Guyana offers a 9.7 month payback, meaning the LED lamp pays back the incrementally higher cost of the LED lamp through electricity savings. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately GYD 3,600 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (GYD):	400	700	<i>GYD/lamp</i>
Price for one lamp (USD):	1.92	3.36	<i>USD/lamp</i>
Lamp wattage:	13	7	<i>Watts</i>
Rated lamp lifetime:	10,000	25,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	14.2	7.7	<i>kWh/year</i>
Life-Cycle cost using lamp for 10 years, discounted to 2022:	8,665	5,012	<i>GYD (NPV, 2022)</i>
Simple Payback period in months, compared with CFL:	--	9.7	<i>months</i>
CO2 emissions due to electricity used for 10 years:	87	47	<i>kg CO2/10 yrs</i>

Photographs of the light bulbs selected in the retail store in Guyana for this comparison.
Photos taken: Q4 2021



Jamaica

Table 9. Quantifying the Benefits of the African Lighting Amendment in Jamaica

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	1,905,188 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	1,838,319 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	23 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	1.7 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 750 million

Important information about mercury and lighting in Jamaica:

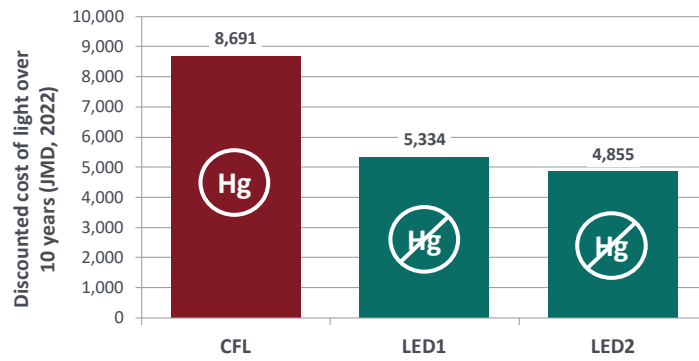
- The Jamaica Public Service Company Limited, with the support of USTDA, is implementing a project to transition 110,000 streetlights to LED, as well as installing intelligent controls and metering capabilities for revenue generation.
- As of 2020, two-thirds of the public lighting in Jamaica was LED.
- In 2017, Finance and the Public Service Minister, Hon. Audley Shaw, inaugurated the Energy Management and Efficiency Programme (EMEP), with the support from the Japan International Cooperation Agency and the Inter-American Development Bank. At the event, the Minister promoted and encouraged the population to transition to LED lights to reduce bills and electricity consumption.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Jamaica. Switching to LED in Jamaica offers 6-7 month payback compared with CFL, meaning the LED lamp pays for its incrementally higher price through electricity bill savings in 6-7 months. The LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately JMD 3,700 over the lifetime of the LED retrofit lamp.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (JMD):	395	560	612	<i>JMD/lamp</i>
Price for one lamp (USD):	2.53	3.58	3.92	<i>USD/lamp</i>
Lamp wattage:	15	9	8	<i>Watts</i>
Rated lamp lifetime:	6,000	11,000	11,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	16.4	9.9	8.8	<i>kWh/year</i>
Life-Cycle cost using lamp for 10 years, discounted to 2022:	8,691	5,334	4,855	<i>JMD (NPV, 2022)</i>
Simple Payback period in months, compared with CFL:	--	6.2	7.0	<i>months</i>
CO2 emissions due to electricity used for 10 years:	89	53	47	<i>kg CO2/10 yrs</i>

Photographs of the light bulbs selected in the retail store in Jamaica for this comparison. Photos taken: Q4 2021

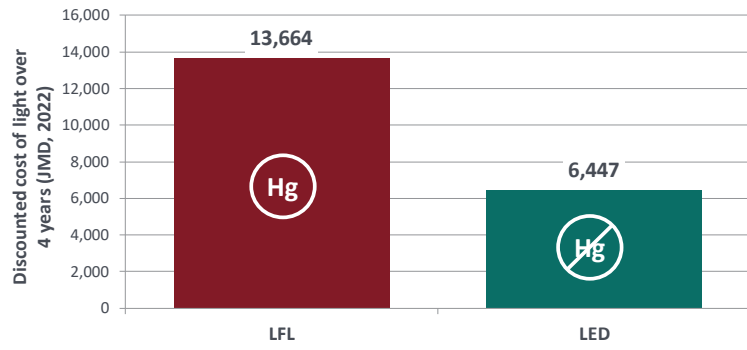


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Jamaica. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately JMD 7,000 over the lifetime of the LED lamp, yet the LED only costs JMD 250 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 4 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (JMD):	488	719	<i>JMD/lamp</i>
Price for one lamp (USD):	3.12	4.60	<i>USD/lamp</i>
Lamp wattage:	20	9	<i>Watts</i>
Rated lamp lifetime:	13,000	15,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	65.7	29.6	<i>kWh/year</i>
Life-Cycle cost using lamp for 4 years, discounted to 2022:	13,664	6,447	<i>JMD (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	5.5	<i>months</i>
CO2 emissions due to electricity used for 4 years:	142	64	<i>kg CO2/4 yrs</i>

Photographs of the light bulbs selected in the retail store in Jamaica for this comparison.
Photos taken: Q4 2021



Mexico

Table 10. Quantifying the Benefits of the African Lighting Amendment in Mexico

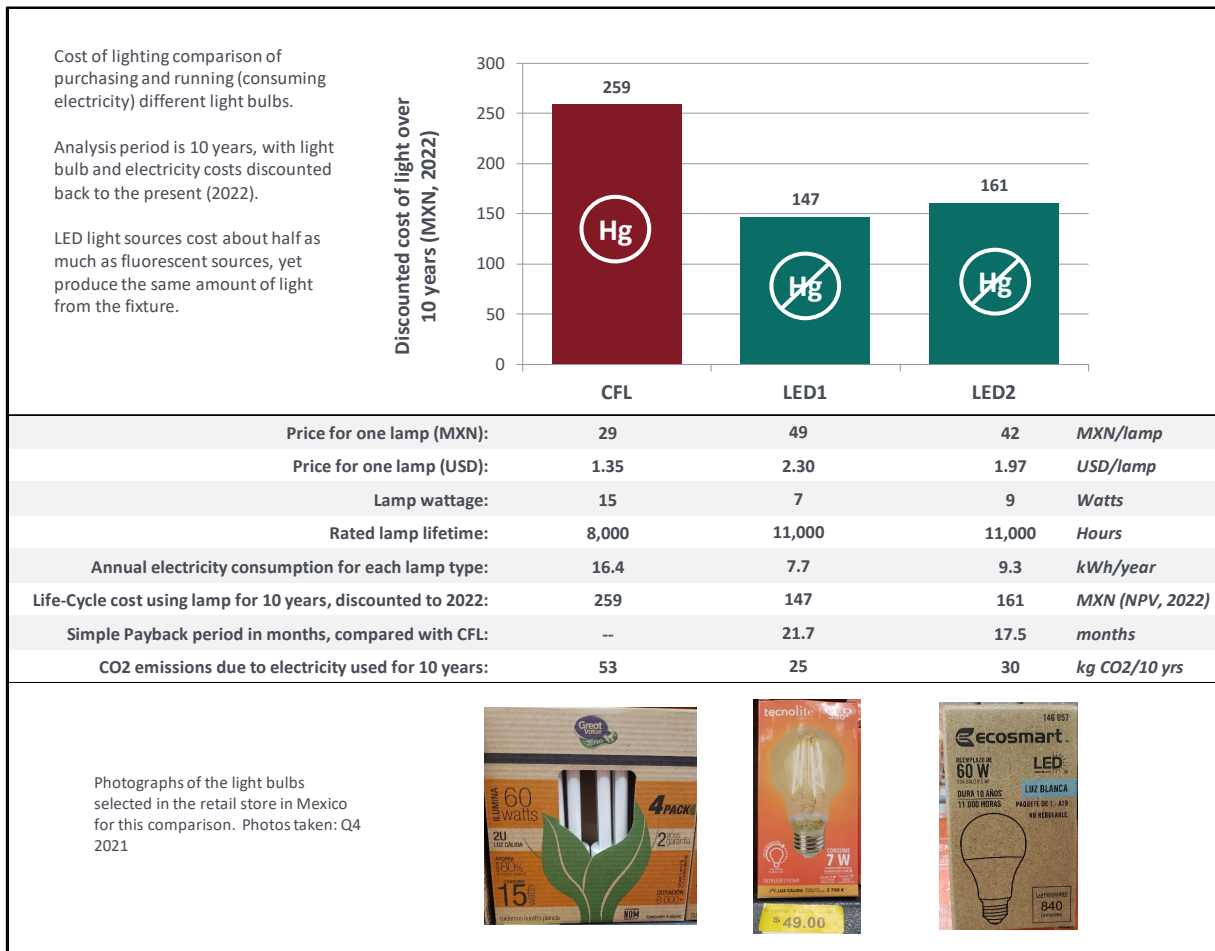
Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	167,831,511 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	182,491,073 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	2,208 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	161.3 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 9.7 billion

Important information about mercury and lighting in Mexico:

- The National Institute of Ecology and Climate Change (INECC) published a report on the Development of the initial assessment of the Minamata Convention in Mexico, to identify the readiness of the current legal framework of the country and propose modifications for the adoption of the Minamata Convention in the country.
- In Mexico, regulations for lighting products are based on 9 Official Mexican Standards (currently in force). The report mentioned above identified that the following norms must be revised and adapted to satisfy the Minamata Convention obligations:
 - NOM-017-ENER/SCFI-2012, Energy efficiency and safety requirements of self-ballasted compact fluorescent lamps. Limits and test methods.
 - NOM-028-ENER-2017, Energy efficiency of lamps for general use. Limits and test methods.
- Notably, Mexico also has NOM-030-ENER-2016 and NOM-031-ENER-2019, which define the minimum energy efficiency and safety standards for LED lamps for general use and for public lighting, respectively. These standards are an important step in protecting the national markets from low-quality lighting products.
- Mexico is an important actor in the global LED market, accounting for 4.6% of global exports of LED luminaires and 0.6% of LED packages/dies. A growing number of LED lamp manufacturers/assemblers are based in Mexico.
- There are several supporting policies, institutions and mechanisms in place that support the transition to more efficient and cleaner technologies, such as:
 - The Energy Efficiency Program promoted through the Trusts Instituted in Relation to Agriculture (FIRA).
 - The Energy Efficiency Program in the Federal Public Administration 2020-2024, which is promoted through the Ministry of Energy (SENER) and the National Commission for the Efficient Use of Energy (CONUEE). The Program establishes specific annual energy savings goals for participating buildings, vehicle fleets and industrial facilities.[2]
 - The FIDE Substantive Programs, which are promoted through the Trust for the Saving of Electric Energy. FIDE is a private, non-profit fund, created at the initiative of the Federal Electricity Commission (CFE) to contribute to the actions of saving and efficient use of electrical energy. These programs include the FIDE voluntary certification of energy-efficient products..

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Mexico. When switching from CFL to LED in Mexico, the payback in the domestic sector is 18-22 months. The LED lamp consumes approximately half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED

will save approximately MXN 100-110 over the lifetime of the LED retrofit lamp.



Panama

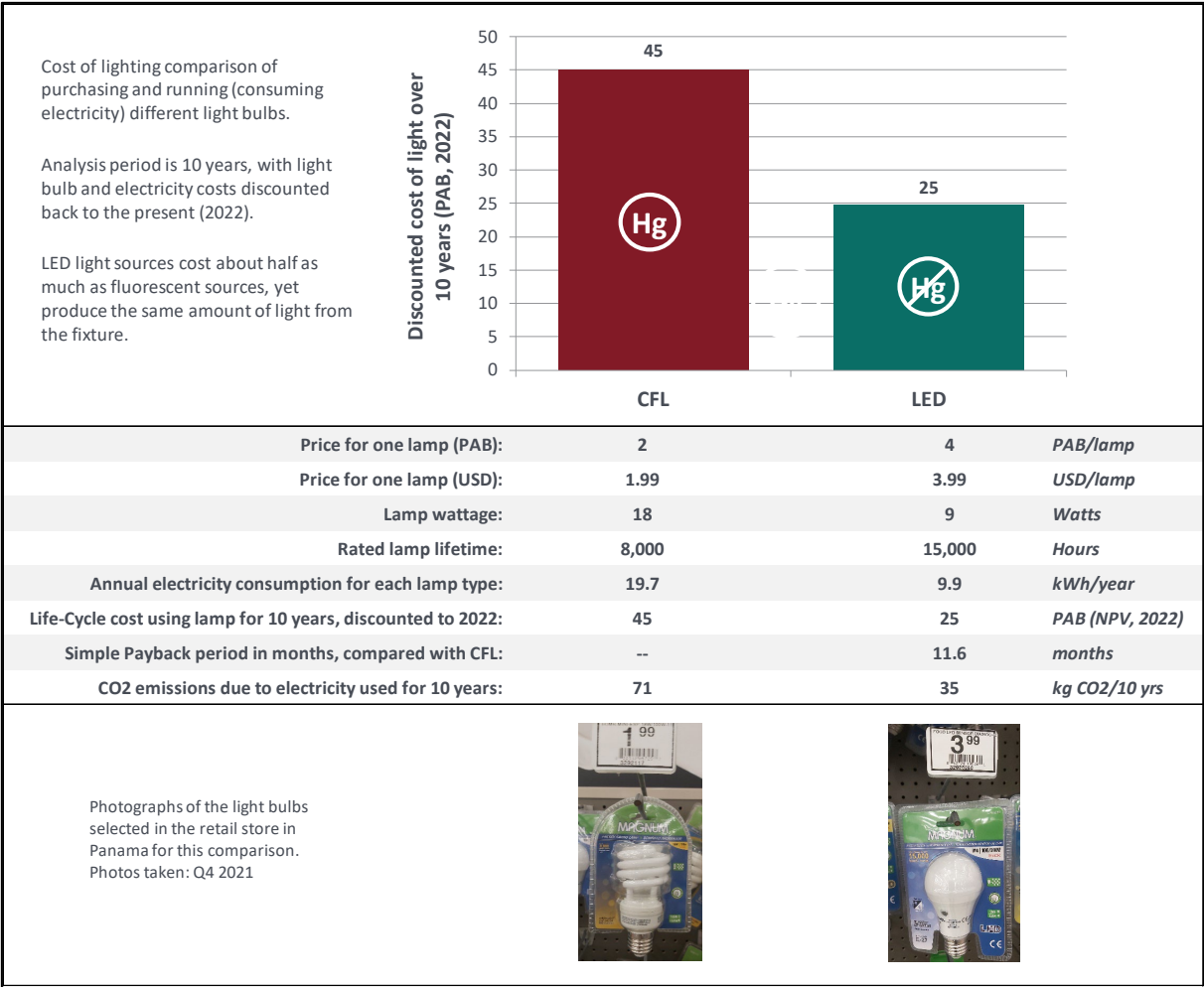
Table 11. Quantifying the Benefits of the African Lighting Amendment in Panama

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	6,176,854 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	5,846,221 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	75 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	5.3 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 1.1 billion

Important information about mercury and lighting in Panama:

- In 2013, Panama was one of the co-signatories of the Central American Regional Efficient Lighting Strategy, a document developed in the framework of Proyecto Mesoamerica with the support of the UNEP/GEF en.lighten initiative (United for Efficiency).
- In 2018, the [Government of Panama prohibited entry into the country of appliances](#) (i.e., air conditioners, lamps, and refrigerators) that do not meet certain minimum energy efficiency requirements. The promotion of efficient equipment is one of the aspects included in 'Law 69', of October 12, 2012, which establishes a policy for the rational use and efficiency of energy (UREE).
- 'Law 69' was [regulated by the Ministry of the Presidency of Panama through 'Executive Decree No. 398', of June 19, 2013](#). This regulation seeks to raise awareness among consumers to achieve a rational and efficient behavior of energy and promote the development of new energy technologies in the Central American country.
- At the end of 2020, the [Panamanian government approved a 10-year energy transition policy roadmap](#) in which it considers universal access to electricity as “priority one”. Although Panama has been working to expand rural electrification in recent years, it is estimated that approximately US\$350 million of new investment will be needed to achieve universal access by 2030.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Panama. When switching from CFL to LED in Panama, the payback in the domestic sector is 11.6 months. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately PAB 20 over the lifetime of the LED retrofit lamp.



The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Panama. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately PAB 38 over the lifetime of the LED lamp, yet the LED only costs PAB 2 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 4 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (PAB):	2	4	PAB/lamp
Price for one lamp (USD):	1.59	3.99	USD/lamp
Lamp wattage:	20	9	Watts
Rated lamp lifetime:	13,000	15,000	Hours
Annual electricity consumption for each lamp type:	65.7	29.6	kWh/year
Life-Cycle cost using lamp for 4 years, discounted to 2022:	58	29	PAB (NPV, 2022)
Simple Payback period in months, compared with LFL:	--	3.8	months
CO2 emissions due to electricity used for 4 years:	95	43	kg CO2/4 yrs

Photographs of the light bulbs selected in the retail store in Panama for this comparison. Photos taken: Q4 2021



Peru

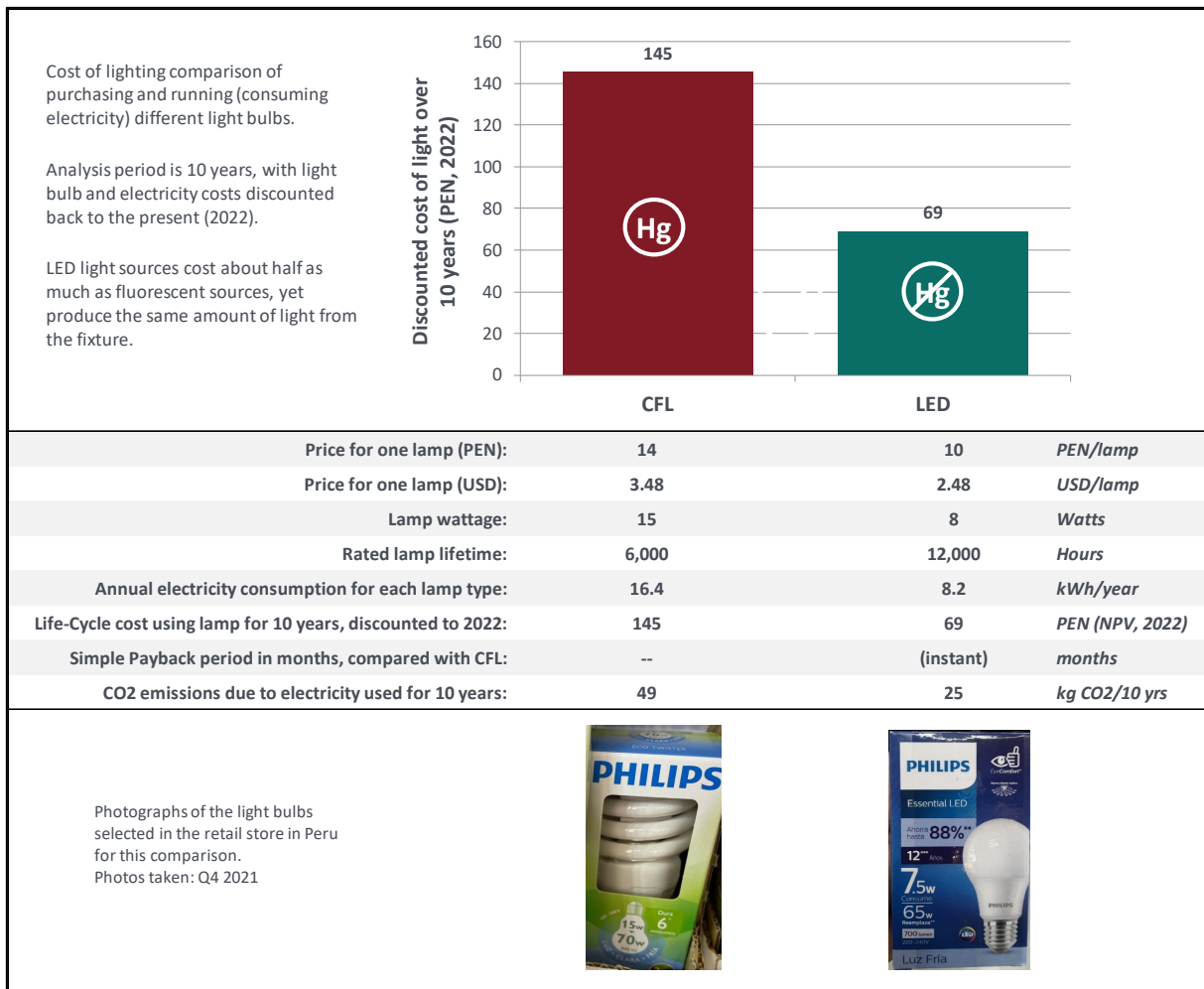
Table 12. Quantifying the Benefits of the African Lighting Amendment in Peru

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	32,993,184 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	27,743,925 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	373 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	25.6 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 4.6 billion

Important information about mercury and lighting in Peru:

- Peru approved in 2019 its National Plan for the Implementation of the Minamata Convention on Mercury, through Supreme Decree No. 004-2019
- According to a lighting market study developed by MINEM in 2015, it was projected that from the year 2021 the purchases of spotlights in the country would migrate massively towards the purchase of LED bulbs and that from the year 2024 the incandescent bulbs would disappear from the national market.
- Peru has a program of climate change mitigation measures, which includes the transformation of the lighting market in the residential sector with more efficient technology.
- Peru has a Technical Regulation on energy efficiency labeling for energy equipment, approved in 2017 by MINEM, through Supreme Decree No. 009-2017-EM. This Technical Regulation (RT) aims to establish the obligation of energy efficiency labelling, as well as the technical requirements and energy efficiency ranges for the classification of the same, in order to protect the environment and safeguard the right to information of consumers and users.
- In 2016, a Supreme Decree approving measures for the efficient use of energy (Supreme Decree No. 004-2016-EM) was promulgated. This regulation requires that entities and / or public companies that need to acquire or replace energy equipment, must do so with the most efficient technology that exists in the market, at the time of purchase.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Peru. Switching to LED in Peru offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately PEN 75 over the lifetime of the LED retrofit lamp.

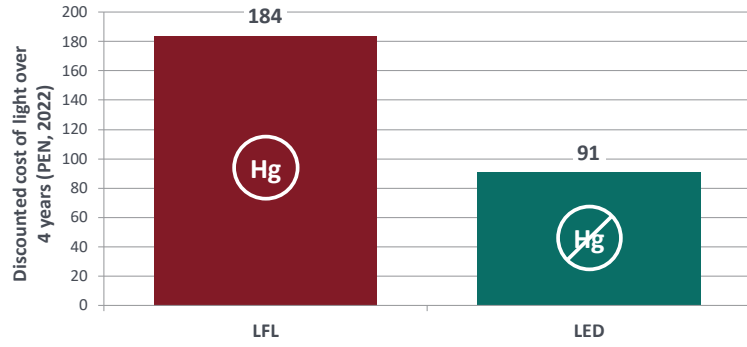


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Peru. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately PEN 93 over the lifetime of the LED lamp, yet the LED only costs PEN 8 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 4 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (PEN):	7	15	<i>PEN/lamp</i>
Price for one lamp (USD):	1.73	3.73	<i>USD/lamp</i>
Lamp wattage:	18	8	<i>Watts</i>
Rated lamp lifetime:	10,000	15,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	59.1	26.3	<i>kWh/year</i>
Life-Cycle cost using lamp for 4 years, discounted to 2022:	184	91	<i>PEN (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	4.1	<i>months</i>
CO2 emissions due to electricity used for 4 years:	71	32	<i>kg CO2/4 yrs</i>

Photographs of the light bulbs selected in the retail store in Peru for this comparison.
Photos taken: Q4 2021



Trinidad & Tobago

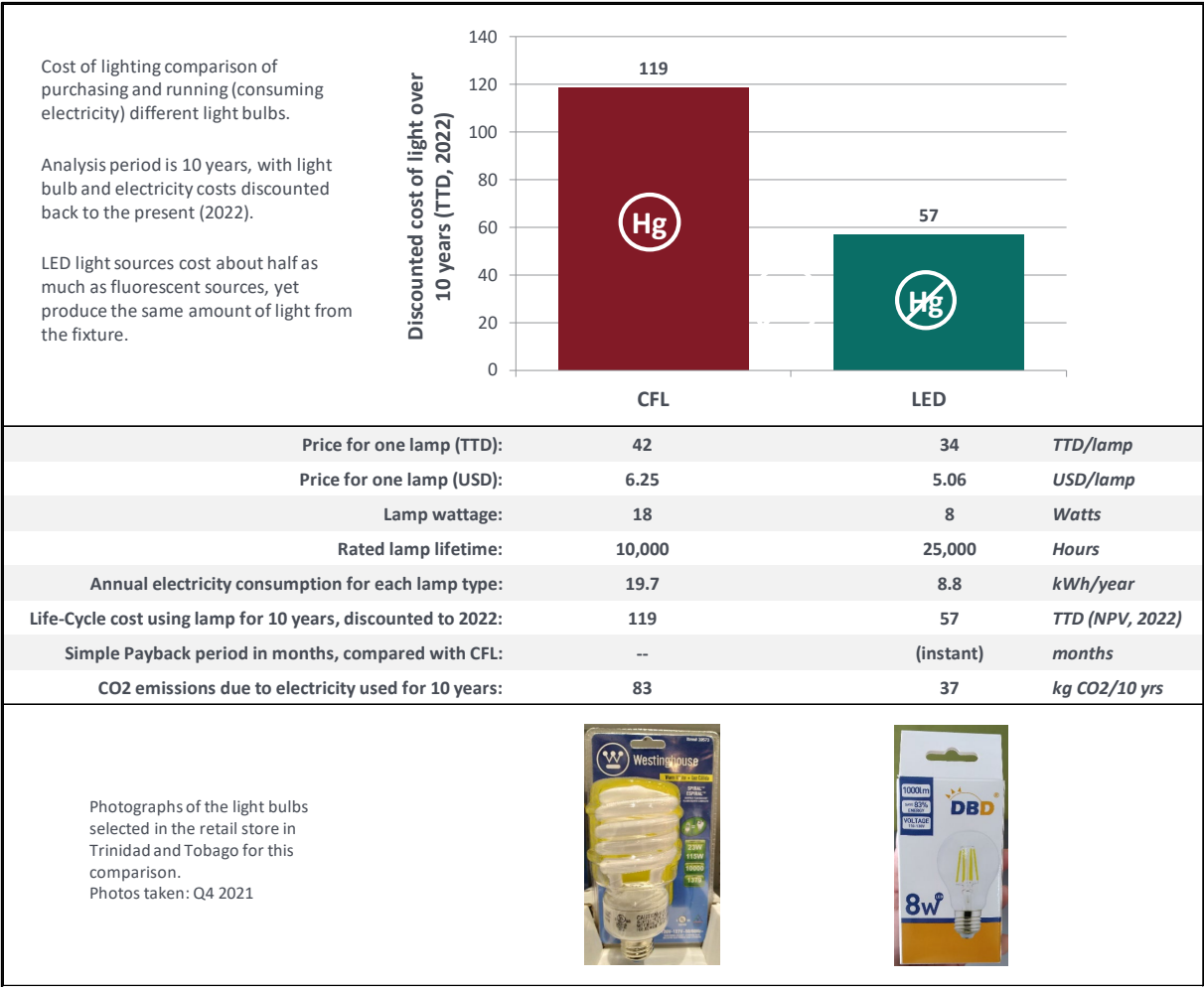
Table 12. Quantifying the Benefits of the African Lighting Amendment in Trinidad & Tobago

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	4,596,098 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	4,662,529 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	58 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	4.1 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 82 million

Important information about mercury and lighting in Trinidad & Tobago:

- The Government of Trinidad and Tobago launched a 2020-2024 Energy Conservation and Energy Efficiency Policy and Action Plan, which includes policies and initiatives to transition the country to LED lighting.
- As part of this Action Plan, in 2020, The Trinidad and Tobago Electricity Commission started its LED Light Bulb Distribution Program, giving away LED bulbs in efforts to reduce electricity consumption in the country, targeting over 400,000 households.
- Findings of the market study carried out by our NGO partners show that LED lamps for general use and tube LEDs are already more affordable than CFLs and LFLs in Trinidad and Tobago.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. All of these lamps were selected and photographed in a retail store in Trinidad & Tobago. Switching to LED in Trinidad & Tobago offers an instantaneous payback, because the LED lamp is less expensive than the CFL. Additionally, the LED lamp consumes half as much power as the CFL – so electricity bills are halved over the lamp lifetime – yet the LED lamp produces the same amount of light. Switching from CFL to LED will save approximately TTD 62 over the lifetime of the LED retrofit lamp.

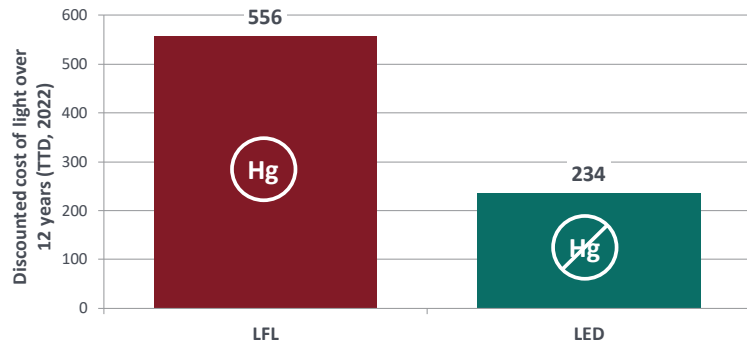


The box below offers an economic analysis of a linear fluorescent lamp and an LED retrofit tube, both of which were selected and photographed in a retail store in Trinidad & Tobago. The LED tube is more expensive than the fluorescent lamp on a first-cost basis, but the LED lamp consumes half as much power as the fluorescent tube – so electricity bills are halved over the lamp lifetime. Switching from fluorescent to an LED retrofit tube will save approximately TTD 320 over the lifetime of the LED lamp, yet the LED only costs TTD 25 more at the time of purchase.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

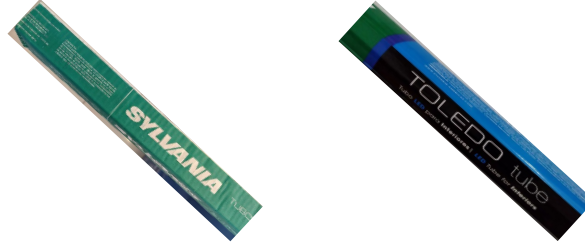
Analysis period is 12 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (TTD):	70	45	<i>TTD/lamp</i>
Price for one lamp (USD):	10.50	6.75	<i>USD/lamp</i>
Lamp wattage:	32	18	<i>Watts</i>
Rated lamp lifetime:	10,000	40,000	<i>Hours</i>
Annual electricity consumption for each lamp type:	105.1	59.1	<i>kWh/year</i>
Life-Cycle cost using lamp for 12 years, discounted to 2022:	556	234	<i>TTD (NPV, 2022)</i>
Simple Payback period in months, compared with LFL:	--	(instant)	<i>months</i>
CO2 emissions due to electricity used for 12 years:	530	298	<i>kg CO2/12 yrs</i>

Photographs of the light bulbs selected in the retail store in Trinidad and Tobago for this comparison.
Photos taken: Q4 2021



Uruguay

Table 12. Quantifying the Benefits of the African Lighting Amendment in Uruguay

Benefits of the African Lighting Amendment	Value
Avoided compact fluorescent lamp sales, CFL phase-out in 2024 (cumulative, 2024-2050)	8,120,819 lamps
Avoided linear fluorescent lamp sales, LFL phase-out in 2025 (cumulative, 2025-2050)	8,522,153 lamps
Total mercury in fluorescent lamps avoided (CFL in 2024, LFL in 2025, cumulative to 2050)	105 kilograms
National energy savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	7.5 TWh
National financial savings, fluorescent phase-out (CFL in 2024, LFL in 2025, cumulative to 2050)	US\$ 1.6 billion

Important information about mercury and lighting in Uruguay:

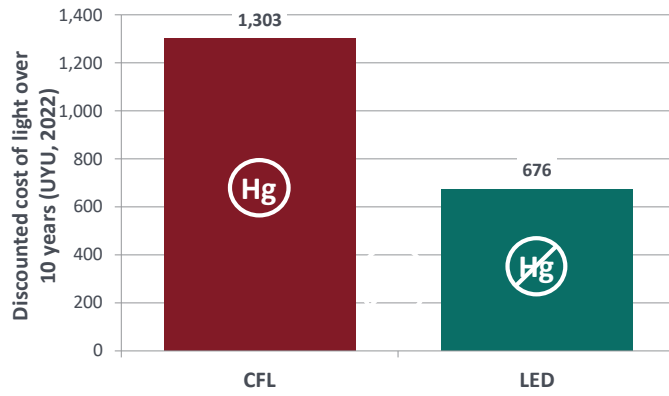
- Decree 15/2019 of the Ministry of Environment of Uruguay (MVOTMA) regulates and promotes the adequate management of mercury-containing products. Items reached by the decree include products covered in Annex A of the Minamata Convention (compact and linear fluorescent lamps, high pressure mercury vapor lamps, cold cathode fluorescent lamps, external electrode fluorescent lamps, high discharge lamps, thermometers and pressure measuring devices). Such products may not exceed the maximum mercury content established in the Minamata Convention.
- Decree 15/2019 also establishes the obligation of importers of mercury-containing products to design and implement a sound end-of-life management system including the reception, collection, storage, treatment, and destination of the mercury-containing waste.
- In 2013, the Ministry of Environment of Uruguay, with the support of the UNEP/GEF en.lighten initiative (United for Efficiency), developed its National Efficient Lighting Strategy. This strategy set the goals of phasing out inefficient lamps and certain mercury-containing lamps such as high-pressure mercury lamps used for public lighting. It also presented plans for the sound management of mercury in fluorescent lamps.

The box below offers an economic analysis of a CFL and LED retrofit bulbs. Both of these lamps were selected and photographed in a retail store in Uruguay. The LED lamp is slightly more expensive than the CFL on a first-cost basis, but the LED consumes half as much power as the CFL, so electricity bills are halved over the lamp lifetime. Switching from CFL to LED in Uruguay will save approximately UYU 600 over a ten year analysis period, yet the LED only costs UYU 7 more at the time of purchase. Thus, switching to LED in Uruguay offers a payback period of just 1.3 months and then goes on to save the user hundreds of UYU over its lifetime.

Cost of lighting comparison of purchasing and running (consuming electricity) different light bulbs.

Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

LED light sources cost about half as much as fluorescent sources, yet produce the same amount of light from the fixture.



Price for one lamp (UYU):	70	77	UYU/lamp
Price for one lamp (USD):	1.61	1.76	USD/lamp
Lamp wattage:	12	6	Watts
Rated lamp lifetime:	8,000	25,000	Hours
Annual electricity consumption for each lamp type:	13.1	6.6	kWh/year
Life-Cycle cost using lamp for 10 years, discounted to 2022:	1,303	676	UYU (NPV, 2022)
Simple Payback period in months, compared with CFL:	--	1.3	months
CO2 emissions due to electricity used for 10 years:	21	10	kg CO2/10 yrs

Photographs of the light bulbs selected in the retail store in Uruguay for this comparison.
Photos taken: Q4 2021



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