



**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

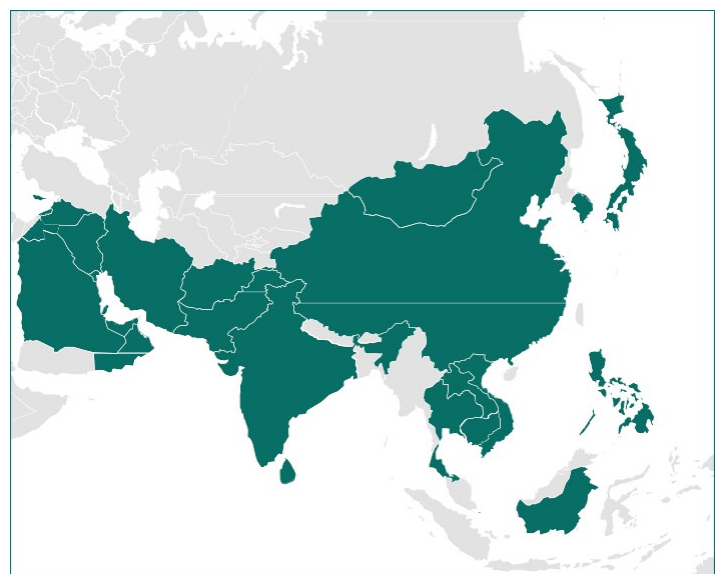
of mercury pollution and



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)

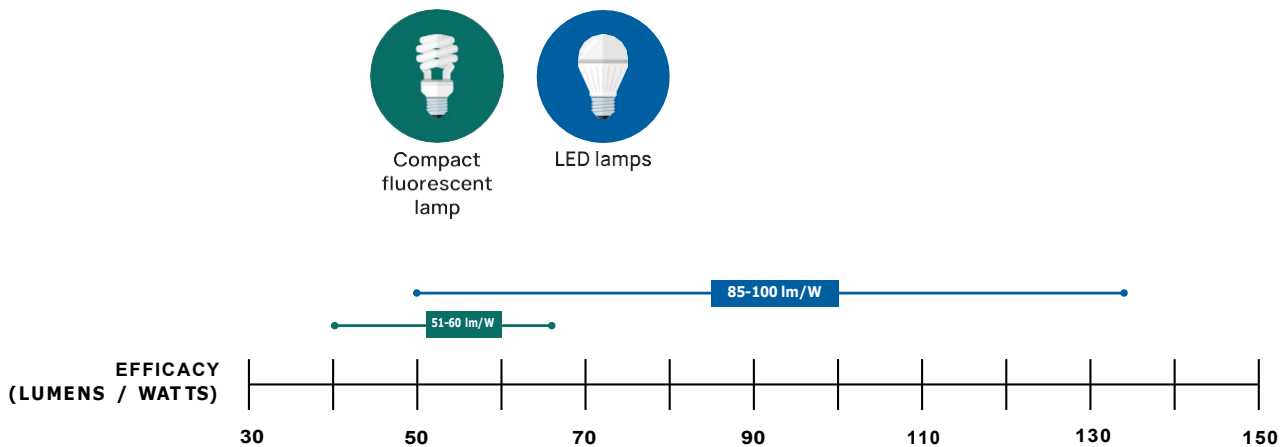
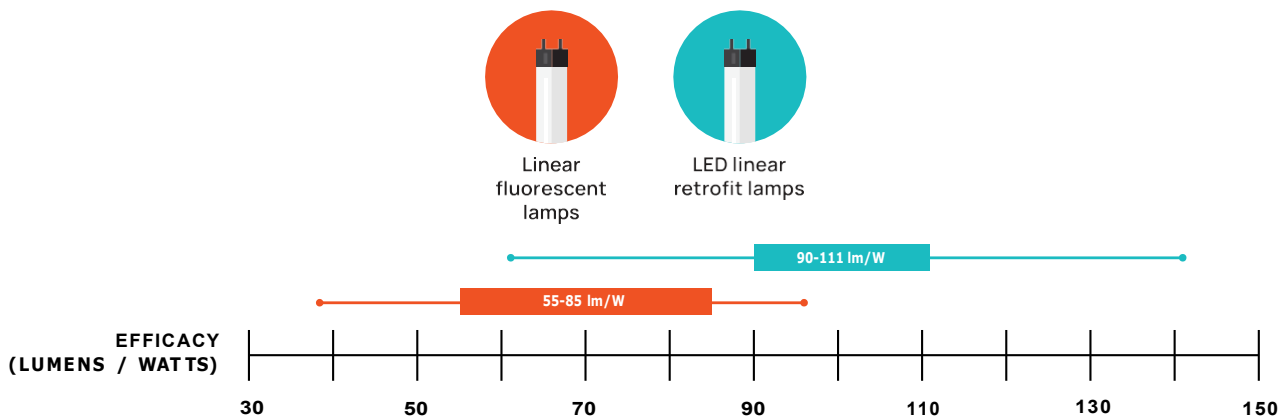
TABLE 3

THE TRUE COST OF LIGHT – LINEAR LAMPS

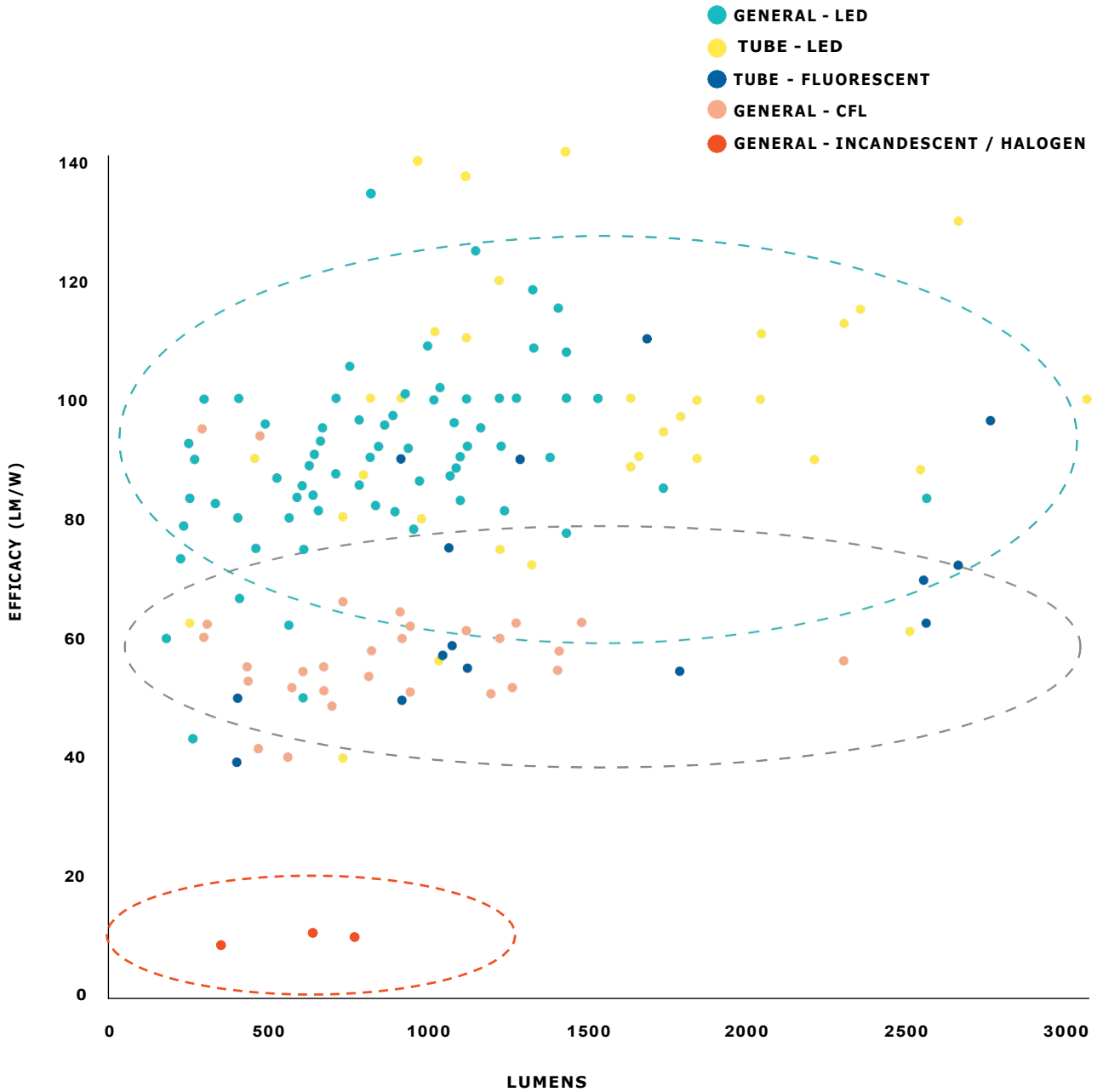
 COUNTRY	 LFL PRICE	 TLED PRICE	 PAYBACK PERIOD	 ENERGY SAVINGS WITH LED
Bangladesh	BDT 320 (US\$ 3.84)	BDT 580 (US\$ 6.96)	11.9 months	BDT 2340 (US\$ 28.08)
India	INR 58 (US\$ 0.75)	INR 346 (US\$ 4.50)	5.7 months	INR 2680 (US\$ 34.84)
Philippines	PHP 84 (US\$ 1.68)	PHP 170 (US\$ 3.40)	1.9 months	PHP 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



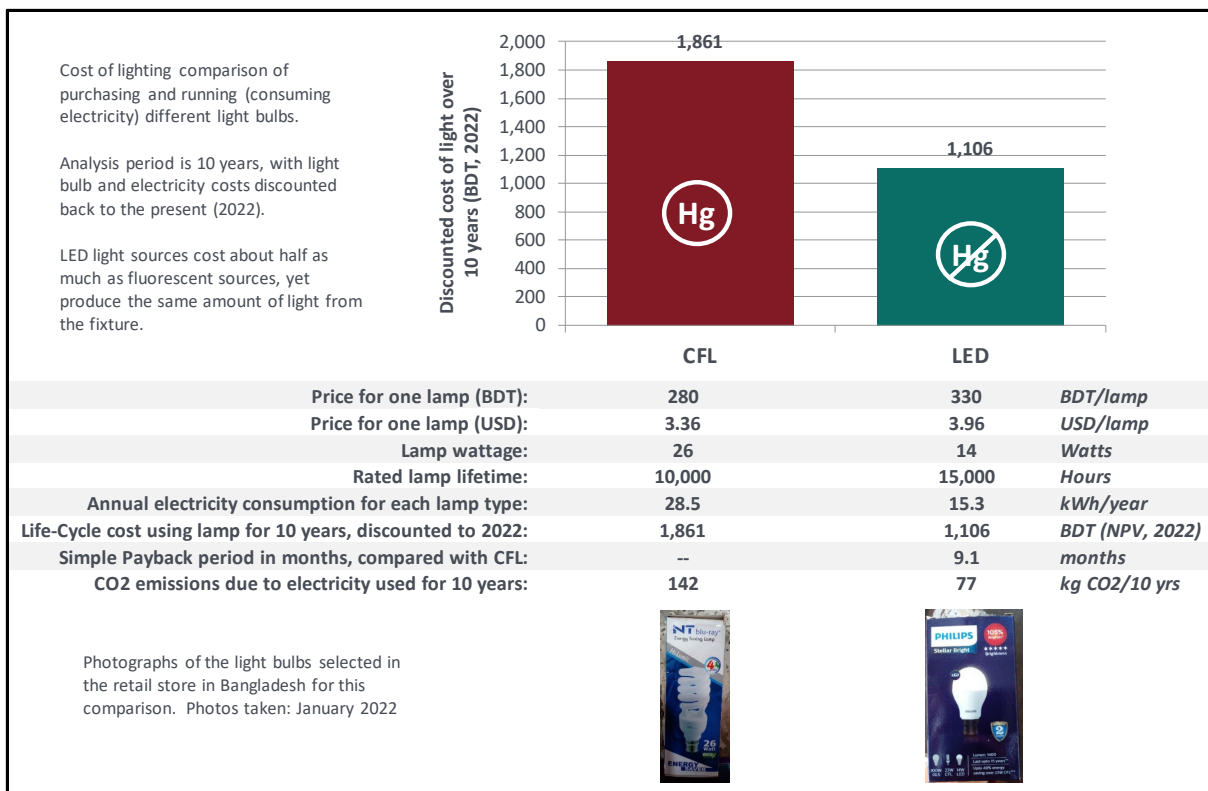
Table 1. Quantifying the Benefits of the African Lighting Amendment in Bangladesh

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

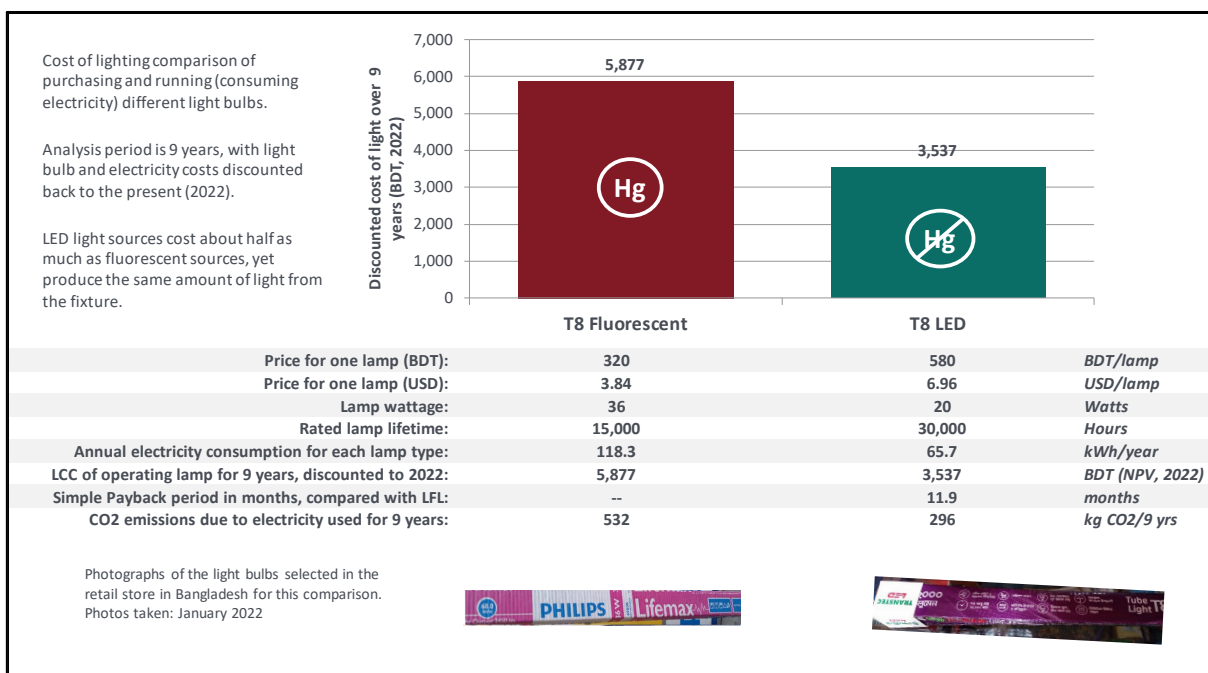
Important information about mercury and lighting in Bangladesh:

- 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



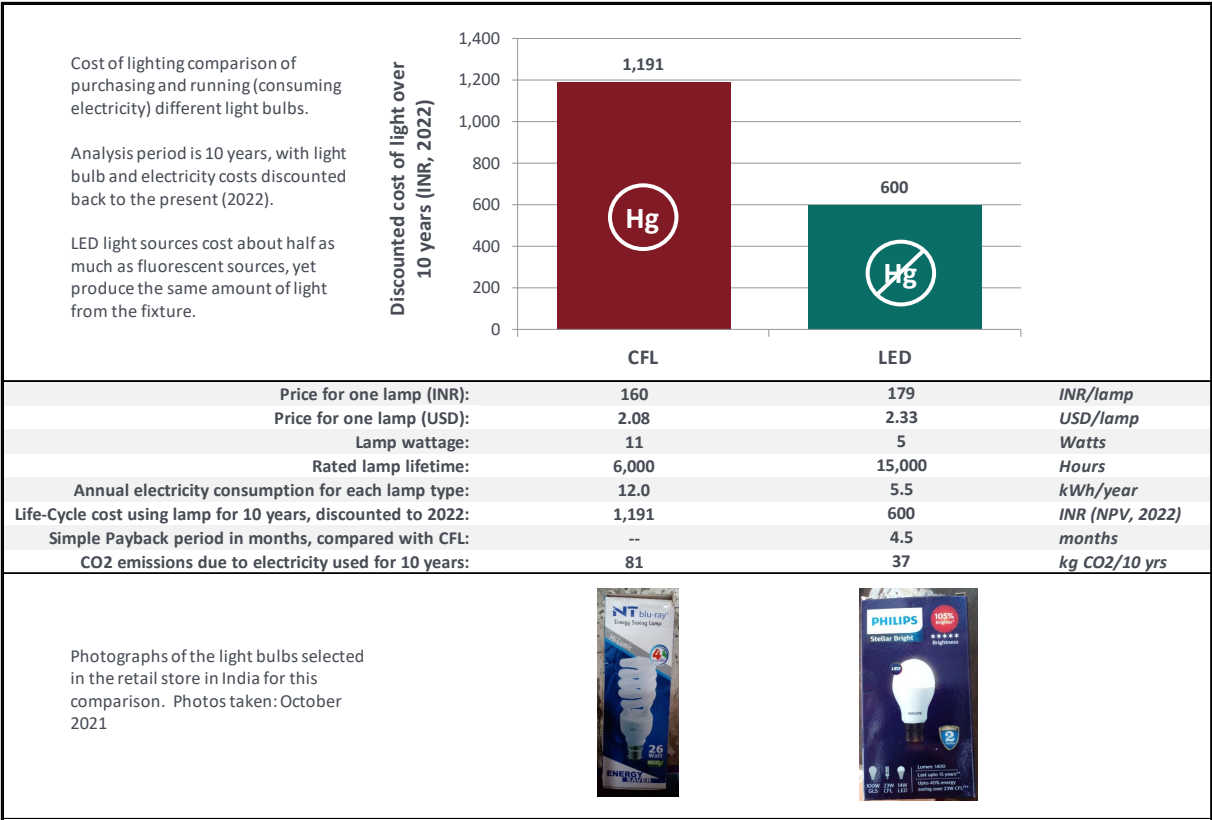
Table 2. Quantifying the Benefits of the African Lighting Amendment in India

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

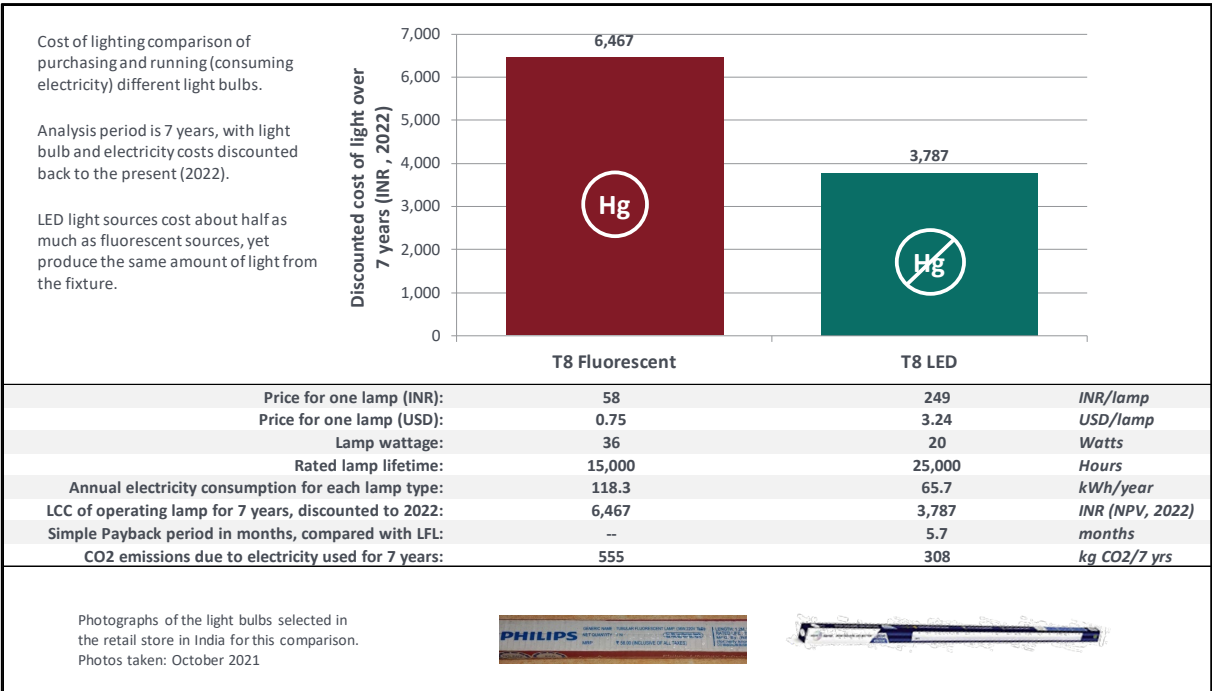
Important information about mercury and lighting in India:

- 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



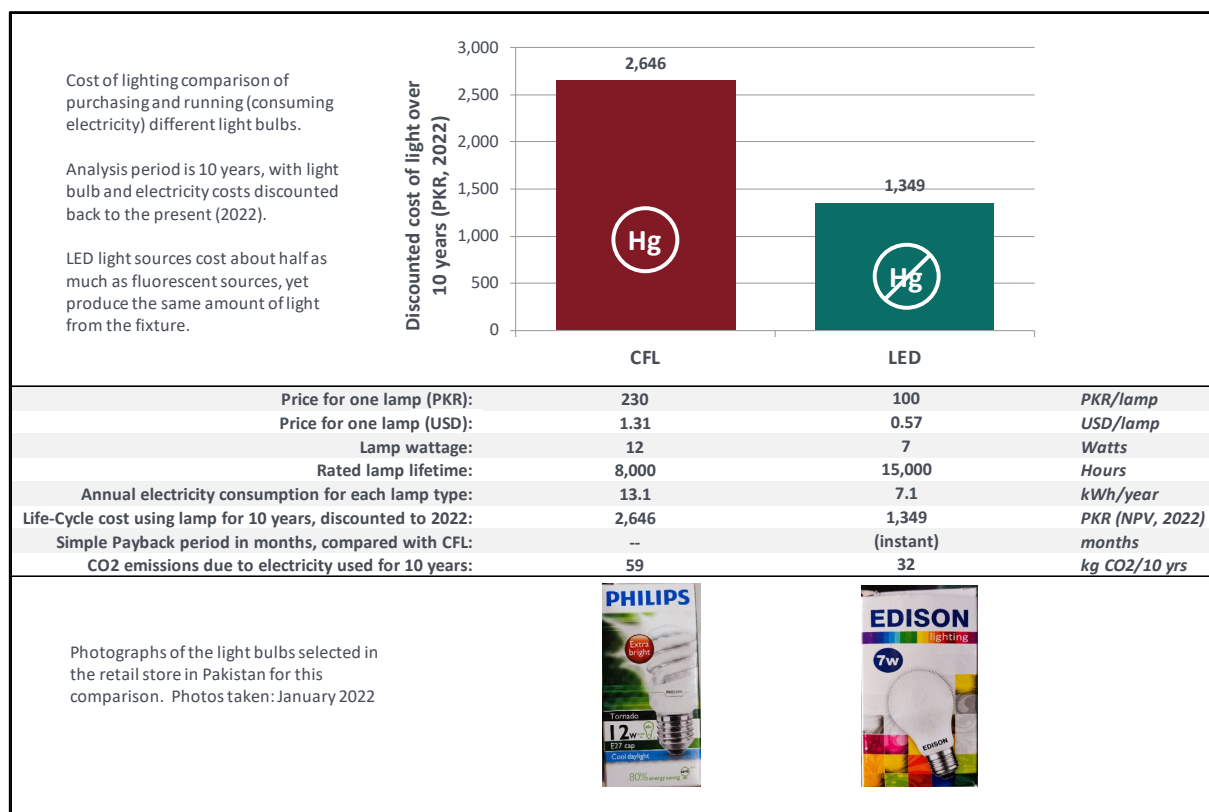
Table 3. Quantifying the Benefits of the African Lighting Amendment in Pakistan

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

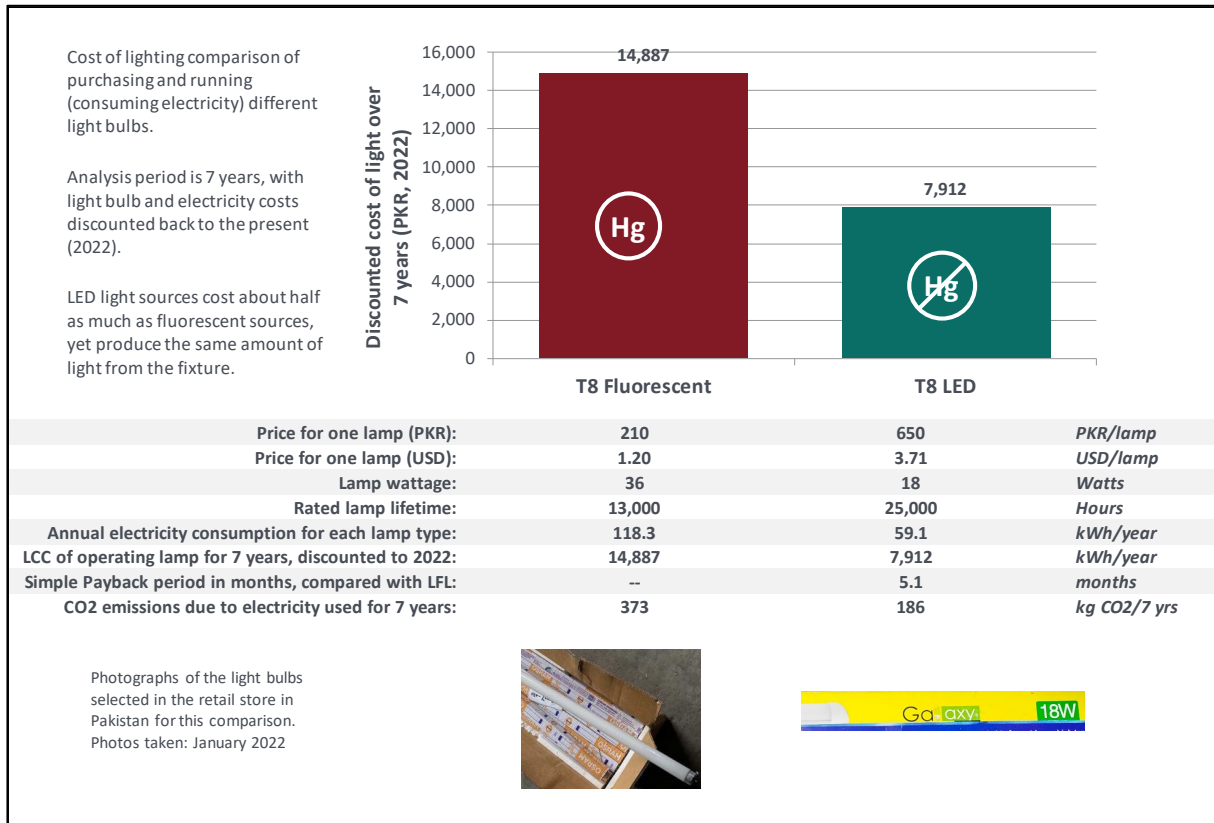
Important information about mercury and lighting in Pakistan:

- 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



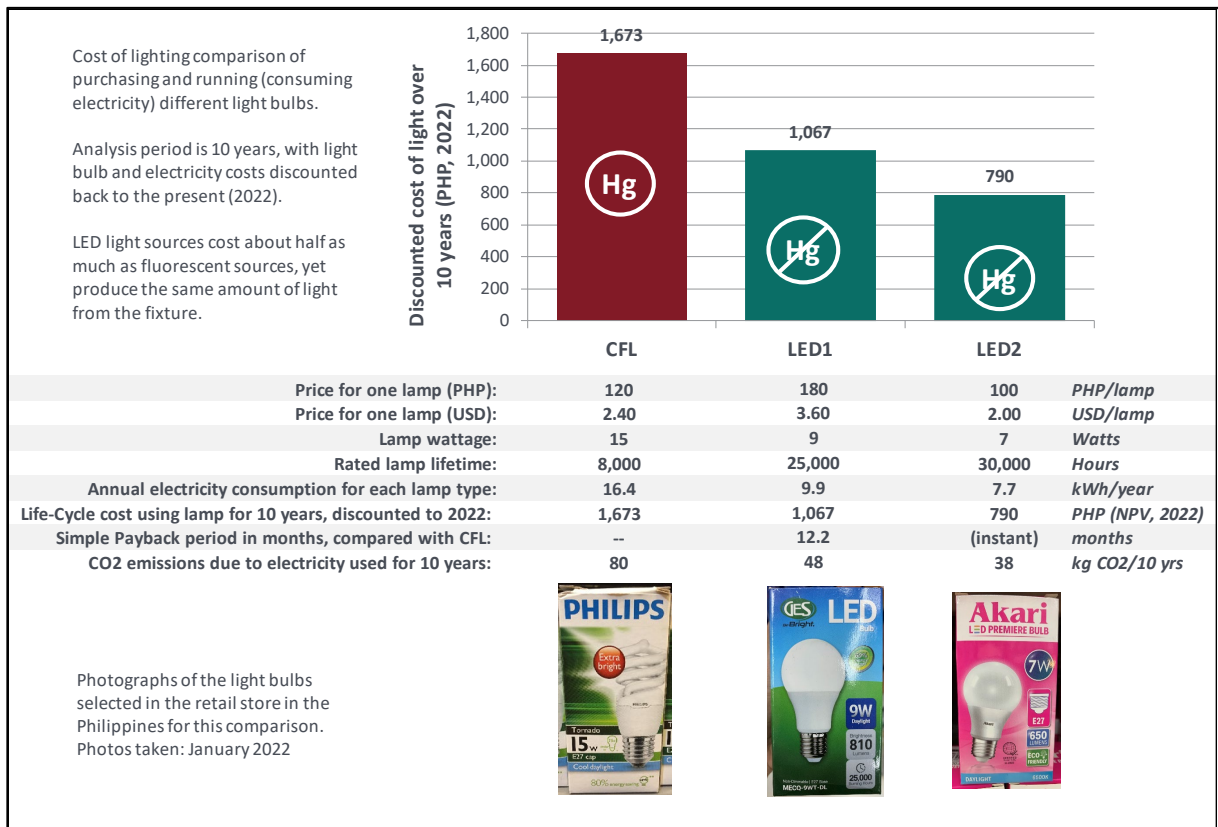
Table 4. Quantifying the Benefits of the African Lighting Amendment in the Philippines

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

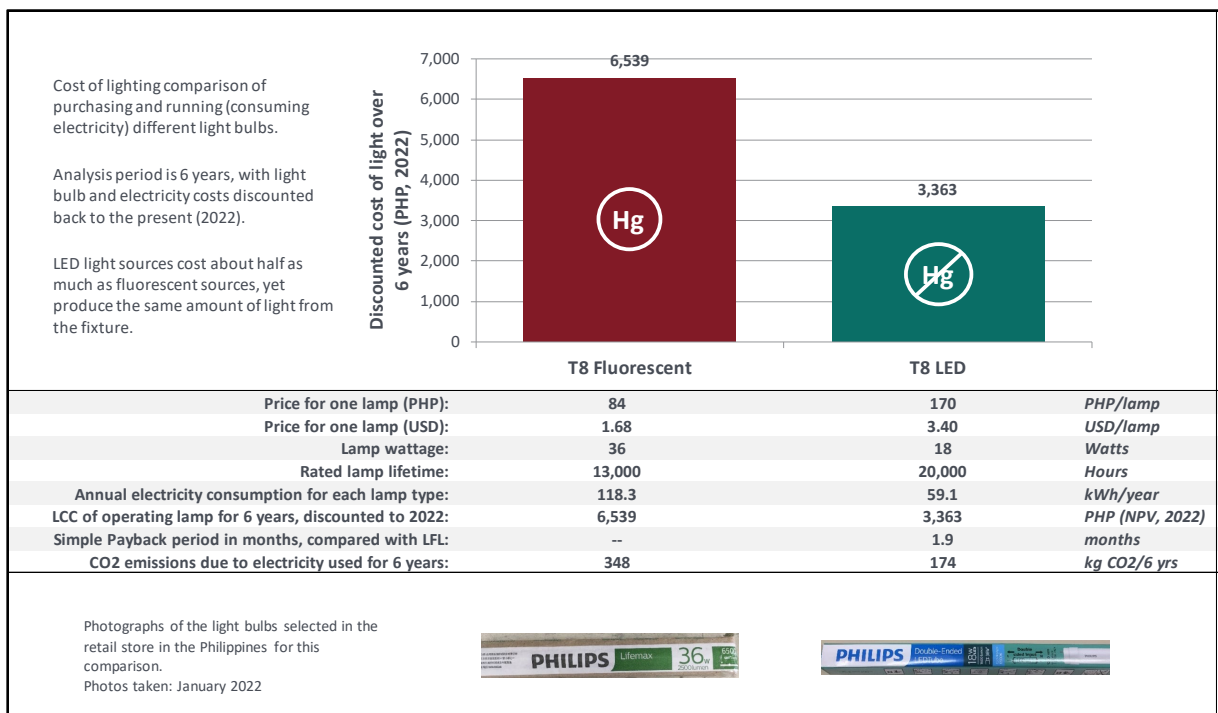
Important information about mercury and lighting in Philippines:

- 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:

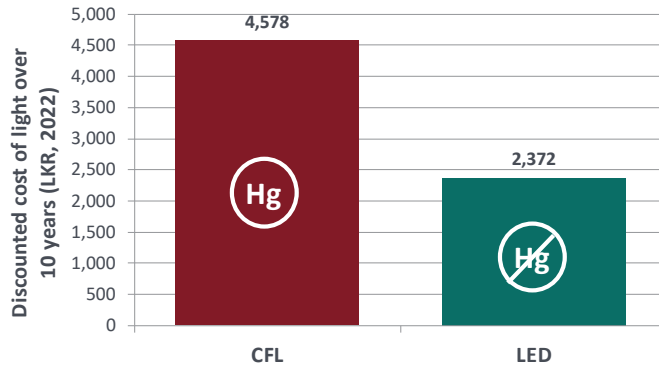
- Between 2013-2016, 99% of the mercury-containing lamps imported to Sri Lanka were fluorescent lamps, from which over 87% were comprised of CFL ([MIA 2019](#)).
- Orange Electric has a market share of 48% of CFLs. Orange Electric also owns the [only CFL recycling company in the country](#), which exports 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.

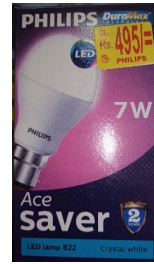
Analysis period is 10 years, with light bulb and electricity costs discounted back to the present (2022).

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



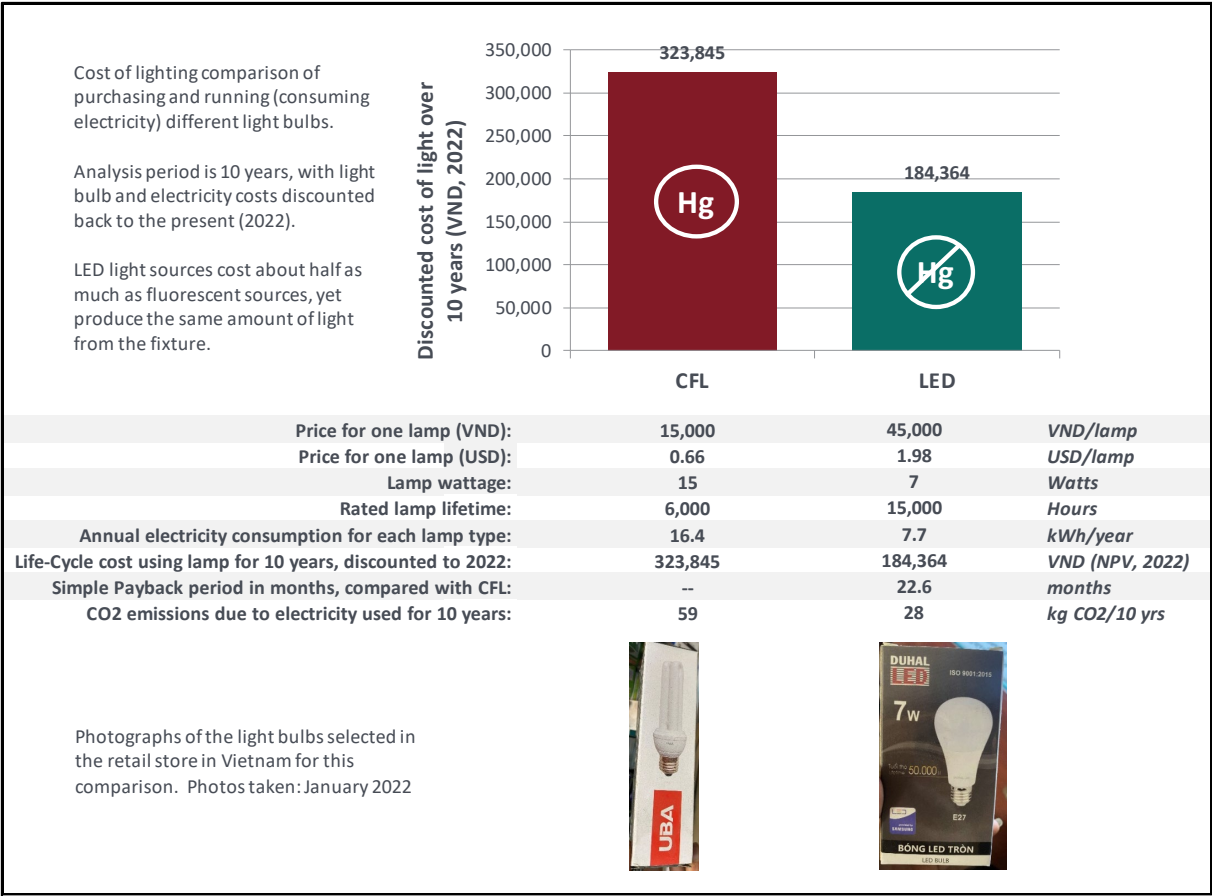
Table 7. Quantifying the Benefits of the African Lighting Amendment in Vietnam

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

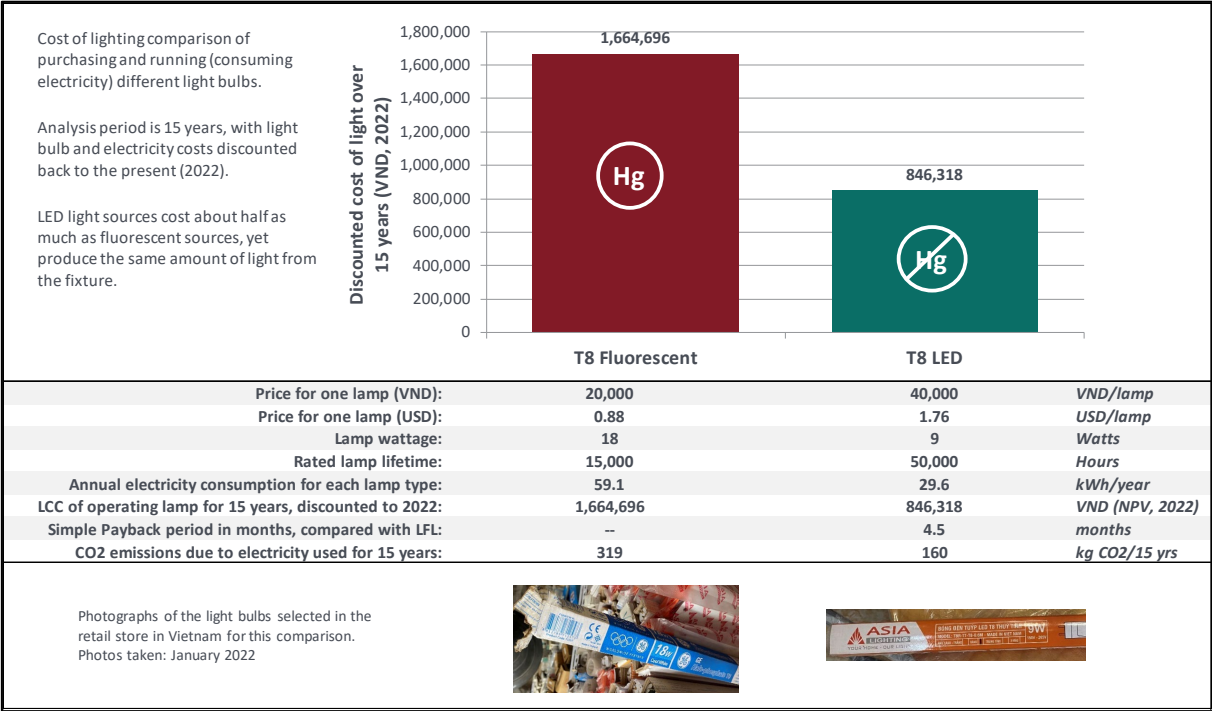
Important information about mercury and lighting in Vietnam:

- 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



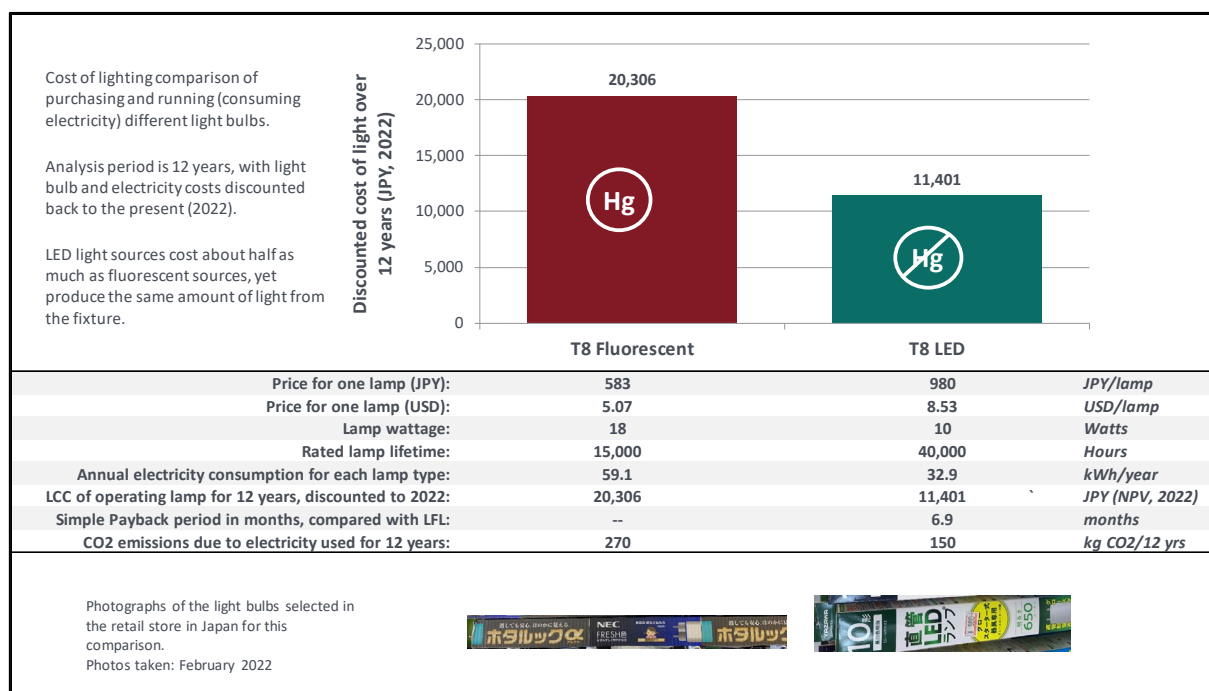
Table 8. Quantifying the Benefits of the African Lighting Amendment in Japan

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



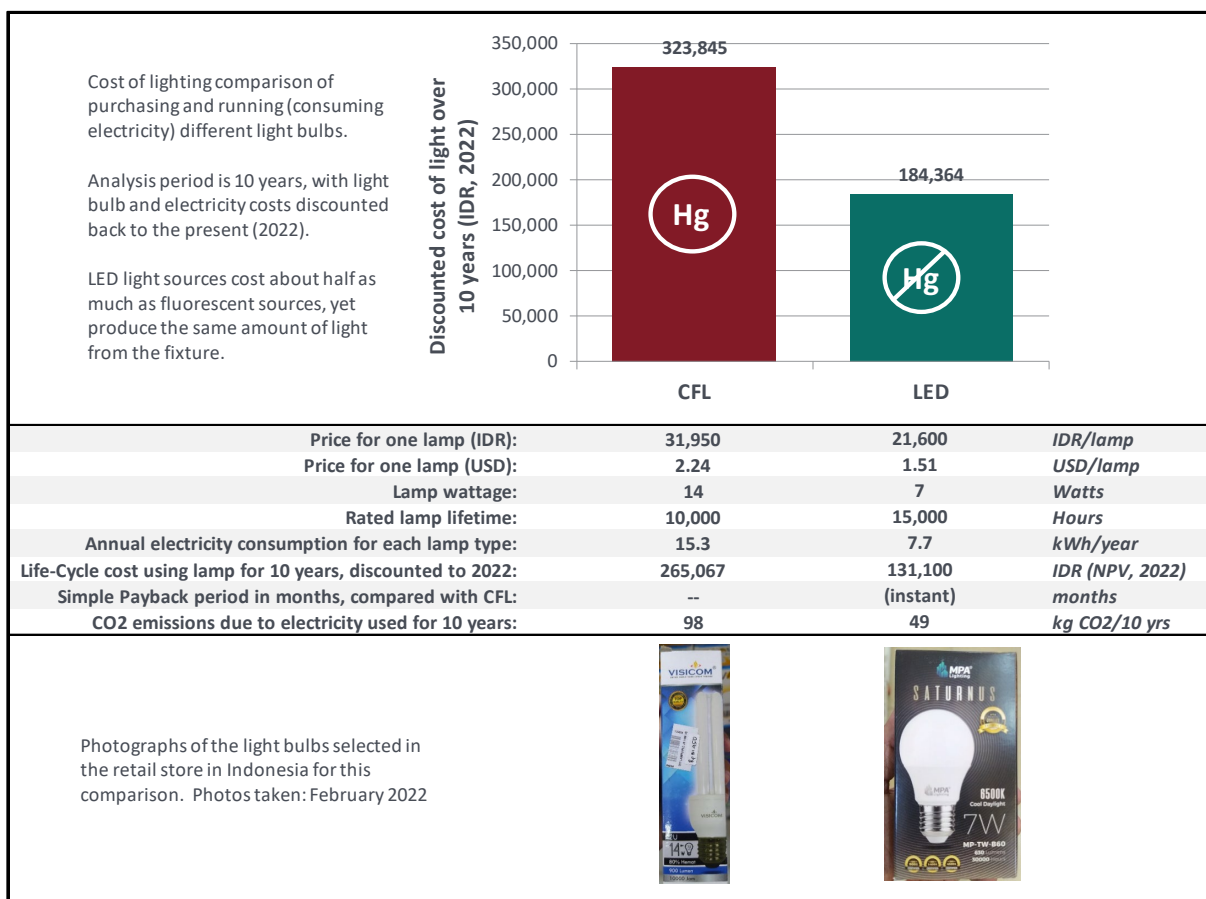
Table 9. Quantifying the Benefits of the African Lighting Amendment in Indonesia

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

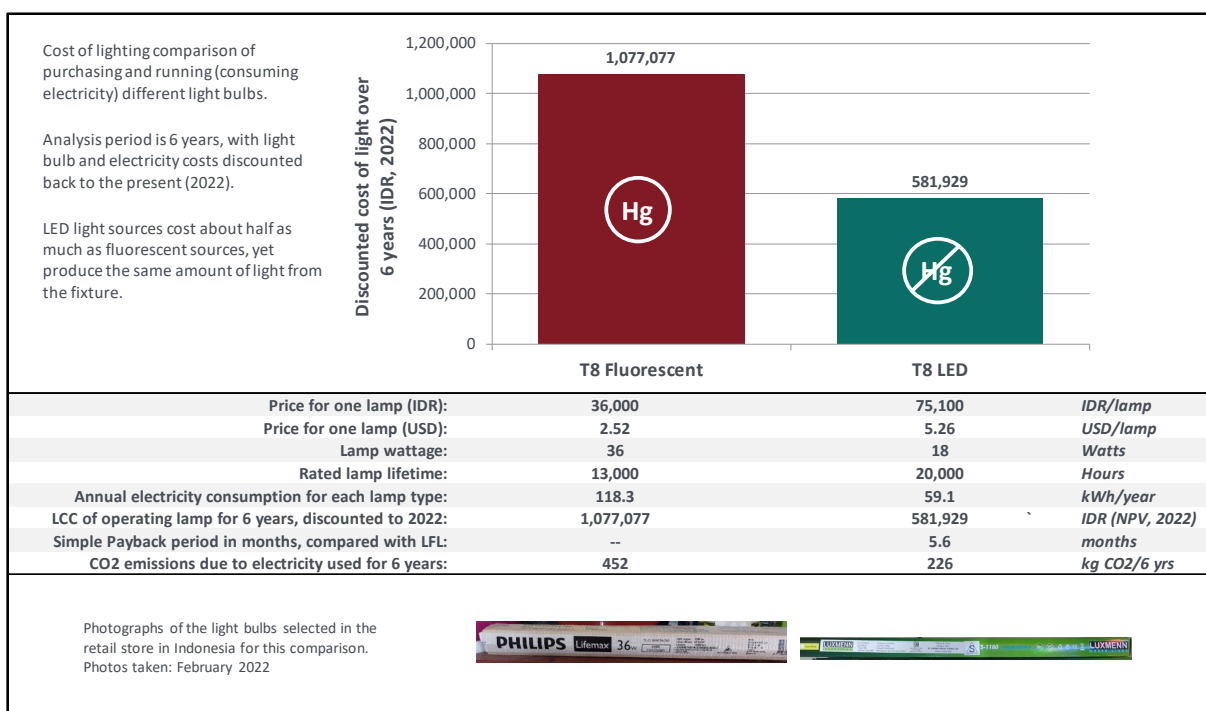
Important information about mercury and lighting in Indonesia:

- 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.



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