Clean Lighting Coalition

Technical & Economic Assessment of Mercury-Free Lighting: Africa Region

Africa Region

If a 2025 LFL phase out date is negotiated and adopted at Minamata COP5 – reflecting the position of the Clean Lighting Coalition – it would avoid the sale of 526 million linear fluorescent lamps in the Africa Region and result in the following cumulative benefits (2025-2050):

1. avoid **4 metric tons** of mercury pollution from leaking into the environment
2. avoid **189 million tons of CO2** emissions
3. save approximately **500 TWh of the region's total electricity consumption** and
4. save **$51 billion USD**

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 and based on CLASP's MEPSy model[1]

Lighting Market Overview

The African region is a net importer of lighting products. There is no local manufacture of fluorescent lighting on the continent – all are imported from other regions. However, there are several LED assembly companies, providing local jobs and stimulating national economies. CLiC found 21 assembly companies across nine countries as listed below:

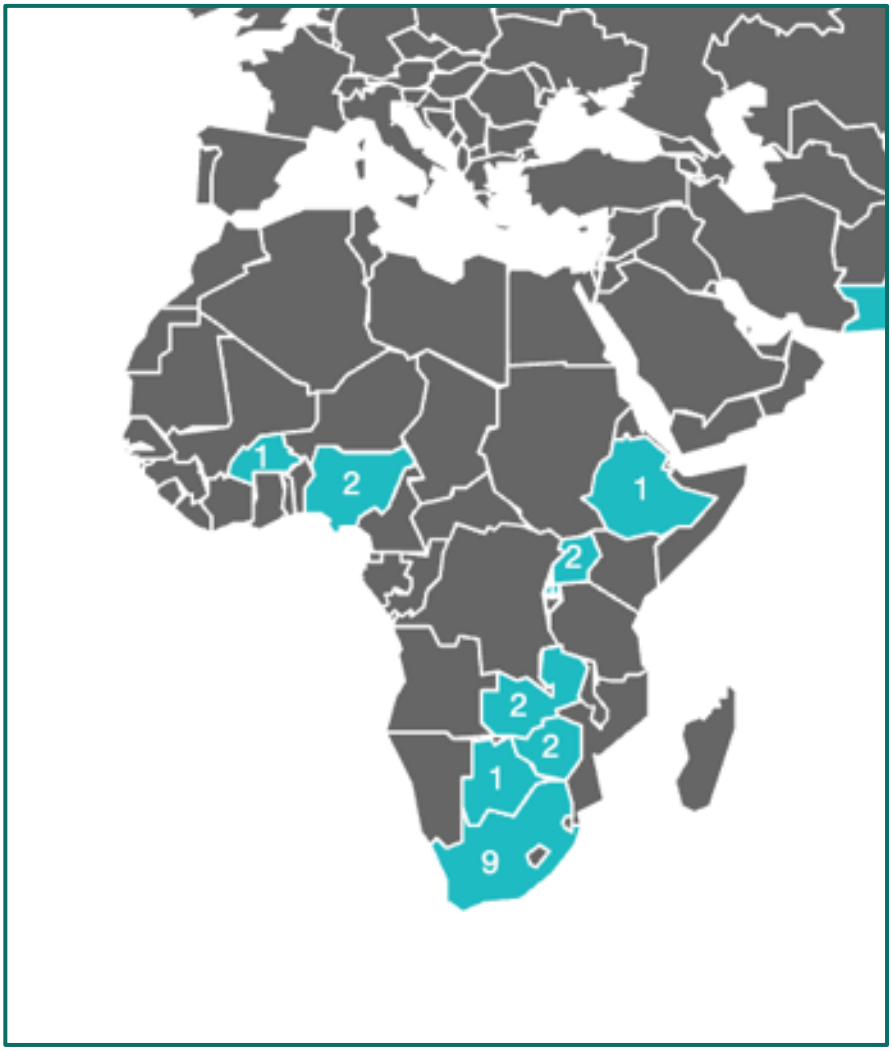
1. **Botswana** - The Bulb World focuses entirely on LED production.
2. **Burkina Faso-** Lagazel Kalo, focus on solar LED lamps
3. **Ethiopia-** Damatrade focuses on LED lamps and fixtures
4. **Nigeria** – Oretronics technology and Quadloop Technologies
5. **Rwanda** - Sahasra
6. **South Africa** - LEDwise Lighting and Beka Schreder focus on luminaires
7. **Uganda** – Pearl Light Technologies and Lumens Manufacturing Industries (U) Ltd.
8. **Zambia** – Savenda Electricals and Electrical Maintenance Lusaka
9. **Zimbabwe** – Muruwe and AE Electrical

[1] https://clasp.shinyapps.io/mepsy/

Phasing-out fluorescents would encourage local assembly of LEDs, aligning with regional efforts to accelerate economic growth, generate employment opportunities, and reduce reliance on lighting product importation.

The figure below shows the current LED assembly across Africa.[2]

Global LED Manufacturer Map



[2]The interactive map is available here

Comparing Costs: LEDs vs LFL

On average, LED lamps are more expensive than the fluorescent lamp on a first-cost basis, but pay for themselves quickly, 2.9 months and 0.9 months respectively for T8s and T12s. Figure 1 provides an inventory of the average payback periods across different countries in the region for T8s.

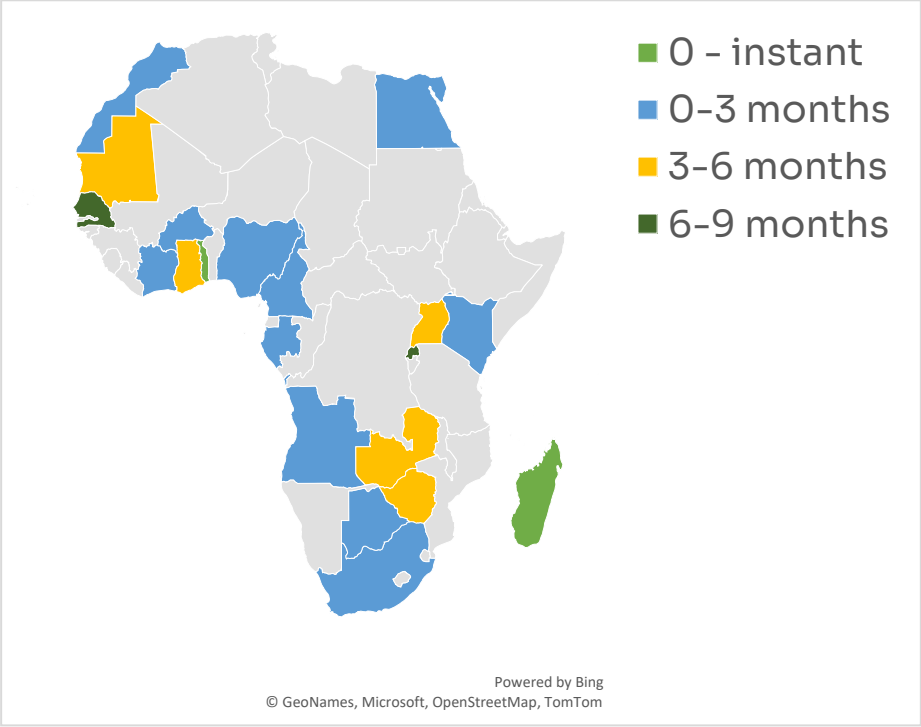


Figure 1 T8 Payback Periods in Assessed Countries

LED lamps consume half as much power as fluorescents – so electricity bills are halved over the lamp lifetime. On average, Africa consumers save 52% of lifecycle costs when they replace LFLs with LEDs. Figure 2 provides summarizes the cost savings for LED T8s.

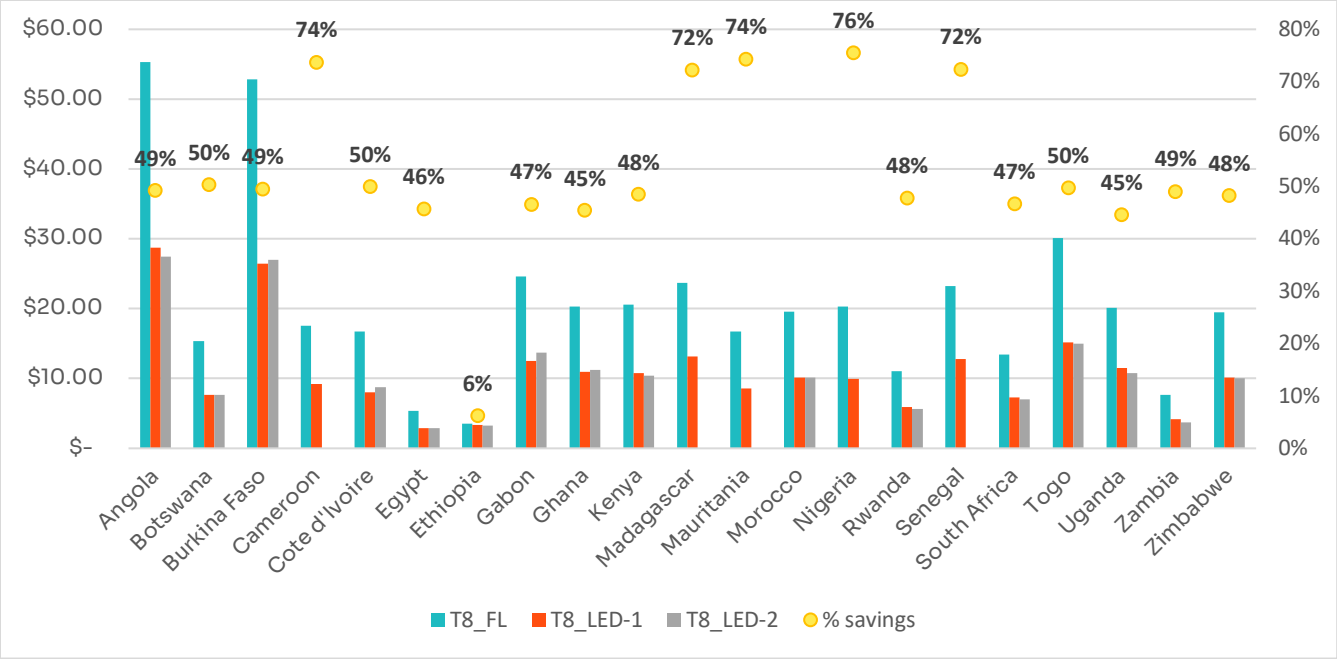


Figure 2 Life Cycle Savings of LEDS over Fluorescents

Tables 1 and 2 provides comparative information about the true costs of lighting with LFL vs LED lamps across countries in the region.

T8 linear lighting products were the most common in the selected countries in Africa. Suppliers and retailers were reported to recommend T8's to customers replacing their T12 fluorescent lamps. T12s and T8s products belong to the same family with the G13 base type and therefore direct replacement is possible. In Africa, the average payback period for T8 products was 2.9 months. The life cycle costs of LED T8s are half that of the fluorescent counterparts. In some countries, such as Ethiopia, the payback was substantially higher. This is a result of the subsidized cost of electricity in the country, 0.022 USD/kWh for commercial entities.

Table 1 True Cost of Light: T8 Lamps

	LFL PRICE	LED PRICE	PAYBACK PERIOD	ANNUAL ENERGY SAVINGS WITH LED
Angola	AOA 1519.9 (US$3.3)	AOA 1828.5 (US$3.97)	0.3 months	AOA 12476.43 (US$27.09)
Botswana	BWP 30.5 (US$2.47)	BWP 48.35 (US$3.91)	2.4 months	BWP 89.05 (US$7.2)
Burkina Faso	XOF 2200 (US$3.53)	XOF 4000 (US$6.41)	1.3 months	XOF 16118.84 (US$25.84)
Cameroon	XAF 374 (US$0.6)	XAF 1495 (US$2.4)	2.5 months	XAF 5380.83 (US$8.63)
Cote d'Ivoire	XOF 750 (US$1.2)	XOF 2000 (US$3.21)	2.9 months	XOF 5121.84 (US$8.21)
Egypt	EGP 45 (US$1.46)	EGP 95 (US$3.07)	7 months	EGP 86 (US$2.78)
Gabon	XAF 1150 (US$1.84)	XAF 2000 (US$3.21)	1.4 months	XAF 7487.63 (US$12)
Ghana	GHS 15 (US$1.81)	GHS 40 (US$4.84)	3.7 months	GHS 80.42 (US$9.72)
Kenya	KES 150 (US$1.27)	KES 250 (US$2.12)	1 months	KES 1193.24 (US$10.12)
Madagascar	MGA 50000 (US$12.21)	MGA 18200 (US$4.44)	instantaneous	MGA 36069.3 (US$8.81)
Mauritania	MRU 50 (US$1.18)	MRU 150 (US$3.53)	3.4 months	MRU 348.87 (US$8.2)
Morocco	MAD 10.9 (US$1.07)	MAD 25 (US$2.46)	1.7 months	MAD 97.65 (US$9.61)
Nigeria	NGN 1500 (US$3.54)	NGN 2190 (US$5.17)	1.8 months	NGN 4572.72 (US$10.79)
Rwanda	RWF 1500 (US$1.46)	RWF 5500 (US$5.34)	8.6 months	RWF 5558.22 (US$5.39)
Senegal	XOF 1000 (US$1.6)	XOF 5500 (US$8.82)	7.6 months	XOF 7087.32 (US$11.36)
South Africa	ZAR 43 (US$2.63)	ZAR 58 (US$3.55)	1.7 months	ZAR 104.07 (US$6.36)
Togo	XOF 1248 (US$2)	XOF 1248 (US$2)	instantaneous	XOF 9165.15 (US$14.69)
Uganda	UGX 7000 (US$1.9)	UGX 25000 (US$6.78)	6 months	UGX 36175.73 (US$9.8)
Zambia	ZMW 45 (US$2.66)	ZMW 60 (US$3.54)	3 months	ZMW 59.13 (US$3.49)

	LFL PRICE	LED PRICE	PAYBACK PERIOD	ANNUAL ENERGY SAVINGS WITH LED
Zimbabwe	ZWL 986.12 (US$2.63)	ZWL 1919.8 (US$5.12)	3.2 months	ZWL 3547.8 (US$9.46)

The average payback period for T12's in the selected countries in Africa was about 1.3 months. The product type was available in 7 out of the 18 countries with countries. Zimbabwe for example banned T12 products in 2017. It was reported that retailers recommend a switch to T8 to customers replacing their T12 fluorescents.

Table 2 True cost of Light: T12 Lamps

	LFL PRICE	LED PRICE	PAYBACK PERIOD	ANNUAL ENERGY SAVINGS WITH LED
Cameroon	XAF 960 (US$1.54)	XAF 1300 (US$2.08)	0.8 months	XAF 5380.83 (US$8.63)
Kenya	KES 150 (US$1.27)	KES 170 (US$1.44)	0.2 months	KES 1458.41 (US$12.37)
Madagascar	MGA 46700 (US$11.4)	MGA 12000 (US$2.93)	instantaneous	MGA 36069.3 (US$8.81)
Nigeria	NGN 4000 (US$9.44)	NGN 2190 (US$5.17)	instantaneous	NGN 5487.26 (US$12.95)
Rwanda	RWF 8500 (US$8.25)	RWF 4500 (US$4.37)	instantaneous	RWF 6793.38 (US$6.59)
Senegal		XOF 800 (US$1.28)		XOF -15749.6 (US$-25.25)
South Africa	ZAR 52 (US$3.18)	ZAR 72 (US$4.4)	1.9 months	ZAR 127.2 (US$7.77)
Zambia	ZMW 65 (US$3.84)	ZMW 35 (US$2.07)	instantaneous	ZMW 72.27 (US$4.27)

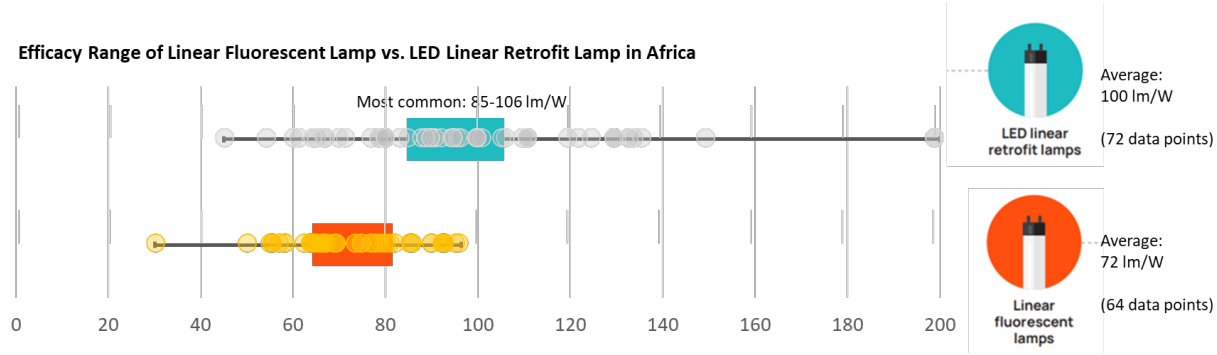
The displayed prices in columns 1-2 were recorded from commercial entities, wholesale shops, and suppliers in each country. Columns 3-4 illustrate the benefits associated with switching to mercury-free LED technology. The Payback Period column shows the amount of time needed for the energy savings from the LED lamp to pay for its higher cost. If the LED 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$.

Energy Efficiency Comparison

The energy efficiency of a light bulb is measured in lumens/watt. The graphic below depicts the ranges of energy efficiency of different types of bulbs available across African markets based on the collected data. 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 average efficacy of the LED lamps in the region is markedly higher than that of the fluorescent pairs: 100lm/W against 72lm/W

Table 3 Efficacy Comparison Between LED and Fluorescent Lamps



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:

1. **Southern Africa Development Community**: 16 countries adopted a harmonised standard SADC HT 109:2021 in Q2 2021 that is shifting markets to LEDs. In May 2023 South Africa formally adopted VC9109 and VC 9110 which will phase out inefficient and environmentally harmful lighting products. Other countries that have adopted the regional MEPS include Namibia, Eswatini and Mozambique.
2. **East African Community**: 6 countries adopted a harmonized standard EAS 1064 in Q2 2022 which shifts the markets to LED. Kenya, Uganda, and Rwanda have nationalized the regional MEPS.

3. **Ivory Coast:** After signing the Minamata Convention and developing the Decree of E-waste Management (adopted in 2017), the government has been supplying LED lamps for public lighting in all the country's major cities since 2019. The government is further promoting LED lamps by reducing taxes on these types of lamps.
4. **Nigeria:** Draft National Lighting MEPS, FDNIS 1209. Finalization is expected in Q3/Q4 2023, which will shift the market to LED.
5. **Burkina Faso:** 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 3,000 LED streetlamps.
6. Many countries including **Angola, Cameroon, Ghana**, amongst others have adopted green public procurement practices for public lighting services. These efforts have enabled the countries to realize immediate energy savings and greenhouse gas (GHG) emissions reductions.
7. With an increasing focus on sustainable/ clean energy to meet SDG 7, the widespread adoption of solar LED lighting technologies in many African countries is inherently transitioning the markets to LED.

Compatibility/Retrofits for LED lamps

In all the studied African markets, LED retrofits were easily available for fluorescent lamps. LED retrofit lamps were designed as a retrofit product for fluorescent fixtures; therefore, no rewiring is required for installation.

Additionally, the economic cooperation between regions such as EAC and SADC is an indicator of the availability of retrofits in the other African countries, given that regions typically have harmonized standards for lighting products and source through the same import channels. In the few cases (6 - 9%) where the LED lamps 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

Rates of collected and properly recycled e-waste (not just lighting products) are extremely low across Africa - 4% in Southern Africa, 1.3% in Eastern Africa and 0% in other regions. However, major e-waste recyclers across the continent are already sustainably disposing LED lighting products, including Enviroserve in Rwanda, WEEE Centre in Kenya, Hinckley Recycling in Nigeria, among others. While LED lamps are considered e-waste, they do not need to be treated as hazardous waste.

Accelerating the transition to LEDs would turn off the mercury tap – eliminating hazardous waste and mercury contents from new lighting products imported to Africa Region. The proposed African Lighting Amendment would therefore mitigate further environmental pollution and public health safety concerns.

ANNEX OF COUNTRY LEVEL DATA

Angola

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Angola

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	9,160,000	8,390,000	7,660,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	69	63	57	kg of mercury
National electricity savings	8.57	7.93	7.30	TWh of electricity
National financial savings from avoided electricity use	0.61	0.56	0.52	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	2.81	2.58	2.34	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Angola became a signatory to the Minamata Convention on 11 October 2013.
- The country has rolled out several solar LED street lighting projects in recent years.
- The transition to mercury-free lighting is expected to have both energy and cost-saving benefits to Angola.

Map of LED Companies in Angola

Angola does not have local assembly or manufacturing of LED lighting products[1]. Lighting products are imported from different countries including India, China, the UAE, and Germany.

[1] One mention of a company called Best was found, but the company did not have any digital presence.

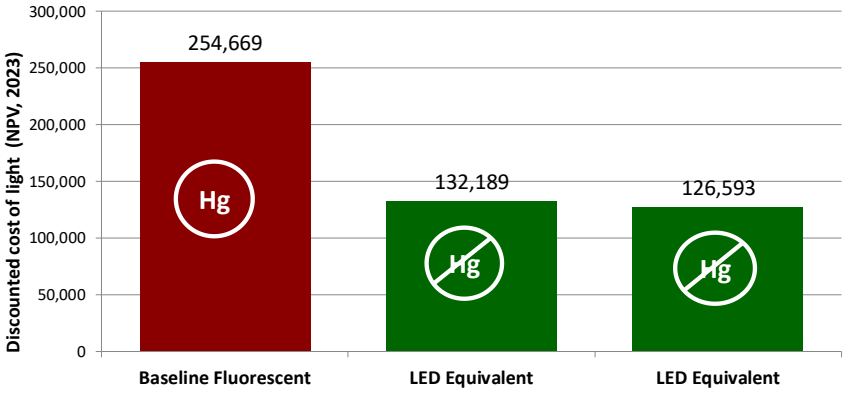
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Angola.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (AOA):	**1,520**	**4,219**	**1,829**	**AOA**
Price for one lamp (USD):	**3.30**	**9.16**	**3.97**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**10,000**	**25,000**	**50,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**254,669**	**132,189**	**126,593**	**AOA (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**2.6**	**0.3**	**months**
CO2 emissions due to electricity used for 15 years:	**503**	**252**	**252**	**kg CO2/10 yrs**

Burkina Faso

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Burkina Faso

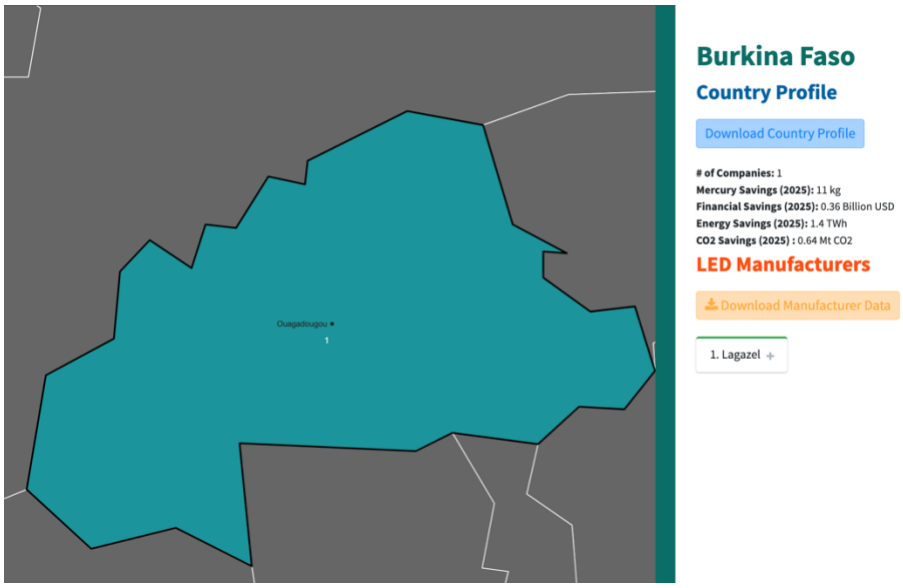
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	1,500,000	1,390,000	1,280,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	11	10	10	kg of mercury
National electricity savings	1.41	1.32	1.23	TWh of electricity
National financial savings from avoided electricity use	0.36	0.34	0.31	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.64	0.59	0.55	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- The Burkinabe government is in the process of developing Minimum Energy Performance Standards (MEPS) for lighting products. These MEPS are expected to be aligned with those adopted by other African countries, including Nigeria, countries in the East African Community (EAC), and those in the Southern African Development Community (SADC).
- As a member of Economic Community of West African States (ECOWAS), Burkina Faso subscribes to ECOWAS' energy-efficiency plan to phase out incandescent lamps and replace them with high-efficiency alternatives.
- 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 installing 3,000 LED streetlamps.
- According to Burkina Faso's Mercury Impact Assessment (MIA), mercury light sources contribute 26 kg Hg/year – resulting in air and soil pollution. It is estimated that around 573,000 (rough estimate) lamps are imported into the country annually. However, the lamp's low cost and improved efficiency, together with the country's porous borders, could mean that a greater number of mercury-containing lights are making their way onto Burkina Faso's market.

Map of LED Companies in Burkina Faso

Lagazel was established in Burkina Faso in 2015 and assembles solar LED lighting products in Dédougou. Apart from this local assembly company, other lighting products in Burkina Faso are imported from countries such as China.



The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Burkina Faso.

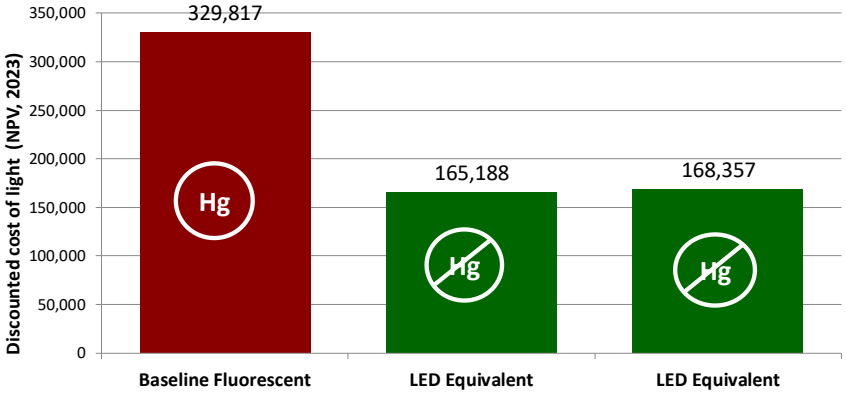
T12 lamps are a rare find on the market in Burkina Faso. Field visits and exchanges with traders revealed that this type of lamp is almost non-existent on the local market. The most used lamps are the T8s. Non-integrally ballasted lamps were also not commonly available on the Burkinabe market.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XOF):	2,200	4,000	4,073	XOF
Price for one lamp (USD):	3.53	6.41	6.53	US dollars
Lamp wattage:	36	18	18	Watts
Lamp is on for hours/day:	9	9	9	hours/day
Annual electricity consumption for each lamp type:	118	59	59	kWh/year
Rated lamp lifetime:	10,000	40,000	25,000	Hours
Analysis period for life-cycle assessment:	10	10	10	years
Life-cycle cost for analysis period, discounted to 2023	329,817	165,188	168,357	XOF (NPV, 2023)
Simple Payback period in months, compared with LFL:	-	1.3	1.4	months
CO2 emissions due to electricity used for 12 years:	752	376	376	kg CO2/10 yrs

Botswana

Table 1. Benefits of LFL Phase Out in 2025, 2026 & 2027 in Botswana

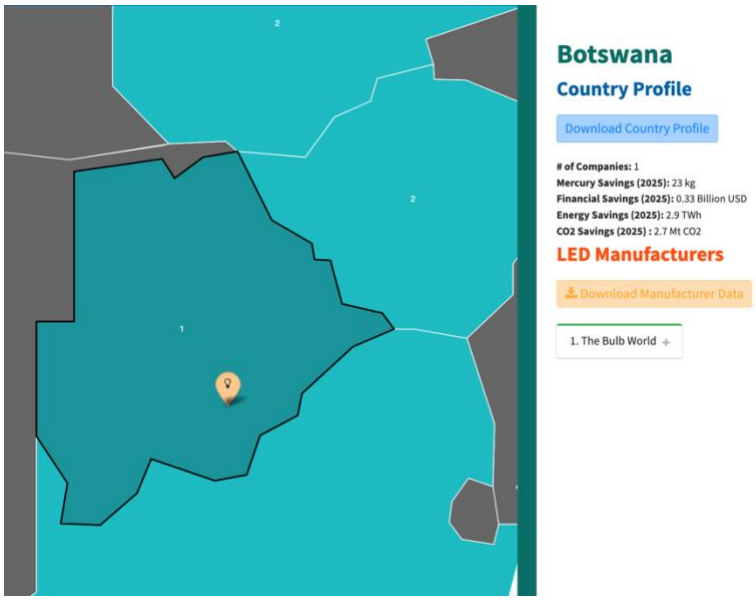
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	3,080,000	2,840,000	2,620,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	23	21	20	kg of mercury
National electricity savings	2.89	2.70	2.51	TWh of electricity
National financial savings from avoided electricity use	0.33	0.31	0.28	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	2.74	2.54	2.34	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Botswana became a signatory to the Minamata Convention on 3 June 2016.
- The government has rolled out several solar LED street lighting projects in recent years. In 2022, Bulb World, a local LED manufacturer, collaborated with the government to install solar lighting in several councils.
- Botswana and Burkina Faso, on behalf of the African Region, submitted a proposal to amend Part 1 of Annex A to the Minamata Convention to eliminate fluorescent lighting.
- The transition to mercury-free lighting will have both energy and cost-saving benefits for Botswana.

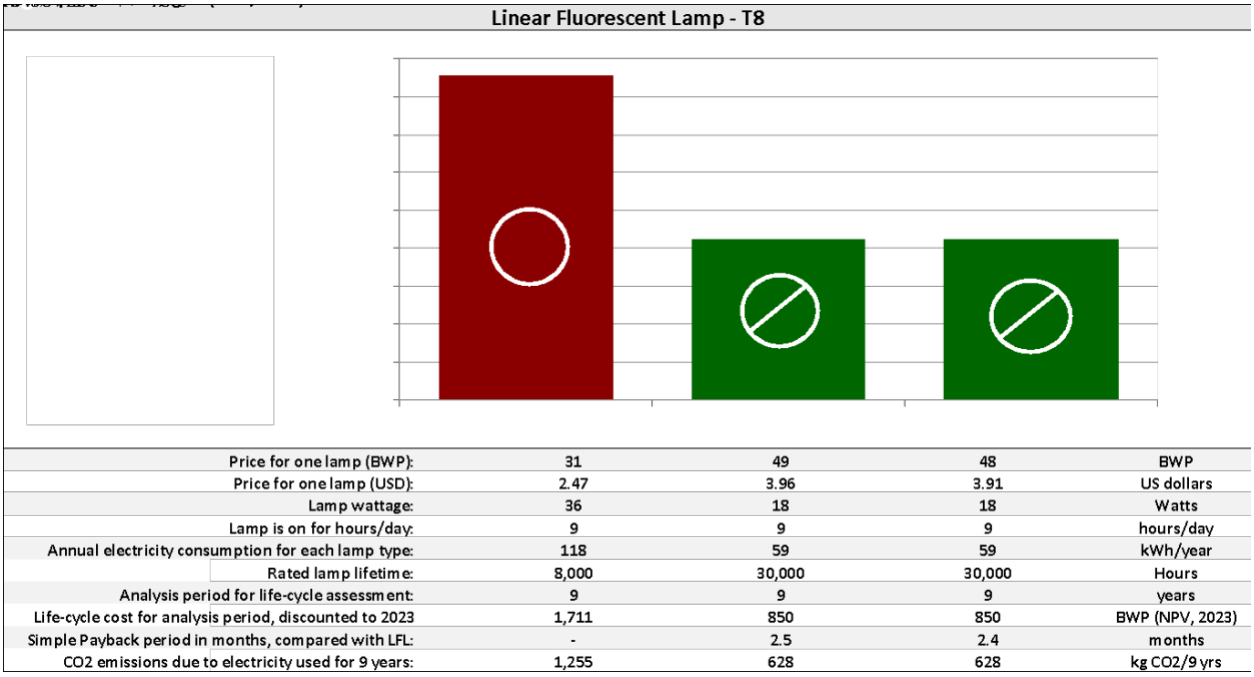
Map of LED Companies in Botswana

In Botswana, there is one company assembling LED lighting products, as shown in the map below.



The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Botswana.

T8s are the most common lighting product in Botswana.



Price for one lamp (BWP):	31	49	48	BWP
Price for one lamp (USD):	2.47	3.96	3.91	US dollars
Lamp wattage:	36	18	18	Watts
Lamp is on for hours/day:	9	9	9	hours/day
Annual electricity consumption for each lamp type:	118	59	59	kWh/year
Rated lamp lifetime:	8,000	30,000	30,000	Hours
Analysis period for life-cycle assessment:	9	9	9	years
Life-cycle cost for analysis period, discounted to 2023	1,711	850	850	BWP (NPV, 2023)
Simple Payback period in months, compared with LFL:	-	2.5	2.4	months
CO2 emissions due to electricity used for 9 years:	1,255	628	628	kg CO2/9 yrs

Ivory Coast

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Ivory Coast

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	7,940,000	7,310,000	6,680,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	60	55	50	kg of mercury
National electricity savings	7.48	7.00	6.51	TWh of electricity
National financial savings from avoided electricity use	0.84	0.79	0.74	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	3.00	2.79	2.57	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Ivory Coast has banned the sale of incandescent lamps since January 2019.
- Ivory Coast has a Strategy for the Transformation of the Lighting Market, which is integrated into its National Development Plan. Additionally, as part of ECOWAS, the country is in alignment with the West African Economic and Monetary Union (*Union Economique et Monétaire Ouest Africaine* or UEMOA in French) labeling systems, which also cover lighting products.
- Ivory Coast has an Ecological Sound Management of e-waste regulation, which prohibits the design, manufacture, and sale of products containing mercury.
- The government has rolled out several market transformation activities, including the distribution of CFLs and supplying LED lamps for public lighting in the country's major cities since 2019. Additionally, LED lamps now enjoy reduced taxes.

Map of LED Companies in Ivory Coast

Ivory Coast does not have local assembly or manufacturing of LED lighting products.

The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Ivory Coast.

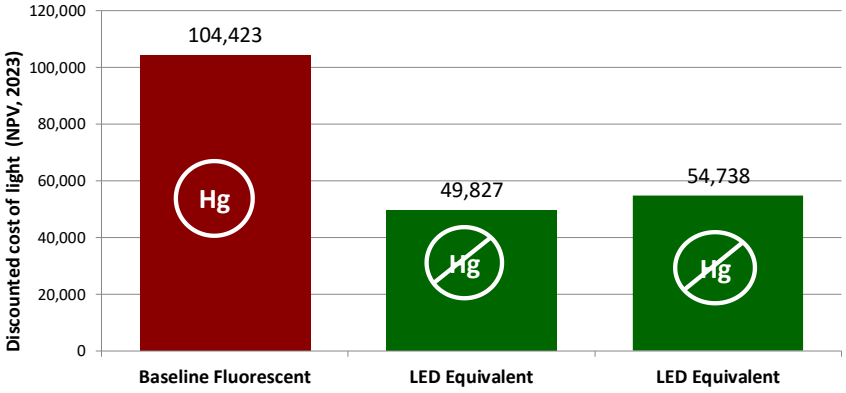
T12 tubes and non-integrated lamps are not available in the market. T8s and T5s, on the other hand, were found to be widely available.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XOF):	**750**	**4,300**	**2,000**	**XOF**
Price for one lamp (USD):	**1.20**	**6.89**	**3.21**	**US dollars**
Lamp wattage:	**36**	**16**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**53**	**59**	**kWh/year**
Rated lamp lifetime:	**12,000**	**50,000**	**25,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**104,423**	**49,827**	**54,738**	**XOF (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**7.5**	**2.9**	**months**
CO2 emissions due to electricity used for 15 years:	**515**	**229**	**258**	**kg CO2/10 yrs**

Cameroon

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Cameroon

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	6,080,000	5,510,000	4,940,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	46	41	37	kg of mercury
National electricity savings	5.86	5.37	4.88	TWh of electricity
National financial savings from avoided electricity use	1.16	1.07	0.96	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	1.41	1.29	1.15	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Cameroon has an emerging green technology business called Cameroon Energies that is looking to produce LED technologies in the future.
- Over 20% of the electricity used in Cameroon's residential sector goes toward lighting. Mercury-free LED retrofit bulbs result in energy- and cost-savings for Cameroon.
- The public lighting bill accounts for 55% of the State's total electricity expenditure. The government of Cameroon, in collaboration with other partners, has carried out training on the expansion and improvement of the energy efficiency of existing public lighting systems. Additionally, some municipalities have installed solar street lighting to reduce public lighting costs.
- There are currently no lighting policies, regulations, or standards implemented in Cameroon.

Map of LED Companies in Cameroon

Cameroon does not have any local manufacturing or assembly of lightbulbs or luminaires (light fixtures). All required stock is imported from China.

The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Cameroon.

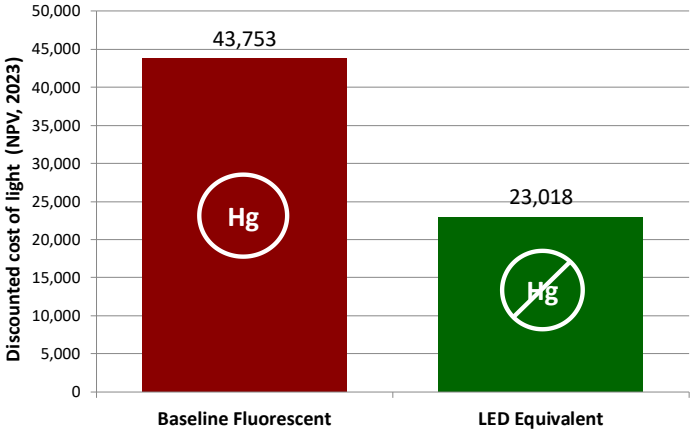
Tube fluorescent and LED lamps represent a very small portion of the lighting consumption in Cameroon. Customers mostly use LED bulbs. The more commonly available product was the T8.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



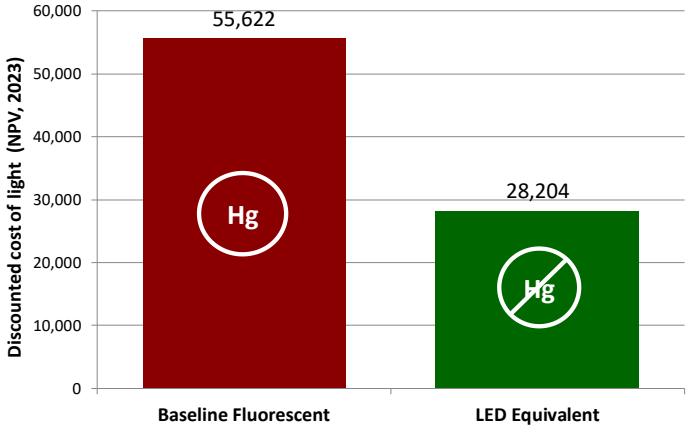
Price for one lamp (XAF):	**374**	**1,495**	***XAF***
Price for one lamp (USD):	**0.60**	**2.40**	***US dollars***
Lamp wattage:	**36**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**118**	**59**	***kWh/year***
Rated lamp lifetime:	**13,000**	**15,000**	***Hours***
Analysis period for life-cycle assessment:	**4**	**4**	***years***
Life-cycle cost for analysis period, discounted to 2023	**43,753**	**23,018**	***XAF (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**2.5**	***months***
CO2 emissions due to electricity used for 4 years:	**130**	**65**	***kg CO2/4 yrs***

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XAF):	**960**	**1,300**	***XAF***
Price for one lamp (USD):	**1.54**	**2.08**	***US dollars***
Lamp wattage:	**36**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**118**	**59**	***kWh/year***
Rated lamp lifetime:	**13,000**	**17,000**	***Hours***
Analysis period for life-cycle assessment:	**5**	**5**	***years***
Life-cycle cost for analysis period, discounted to 2023	**55,622**	**28,204**	***XAF (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**0.8**	***months***
CO2 emissions due to electricity used for 5 years:	**163**	**81**	***kg CO2/5 yrs***

Ethiopia

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Ethiopia

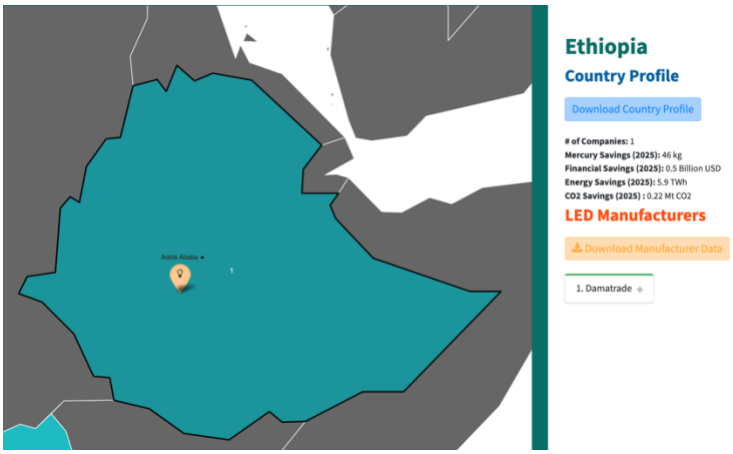
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	6,200,000	5,680,000	5,160,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	47	43	39	kg of mercury
National electricity savings	5.90	5.46	5.02	TWh of electricity
National financial savings from avoided electricity use	0.50	0.47	0.43	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.22	0.21	0.19	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Mercury-free LED retrofit bulbs are highly cost-effective in Ethiopia.
- Ethiopia currently has standards stipulating the performance and safety requirements for several lighting products, including self-ballasted lamps and double-capped fluorescents. It is, however, yet to adopt Minimum Energy Performance Standards (MEPS) for lighting products.
- Solar LED lighting is a growing market for serving communities that are yet to be connected to the grid.
- Electricity is heavily subsidized in Ethiopia, with businesses paying USD0.022/ kWh. A transition to LED lighting which is more efficient would reduce the subsidy burden on the government.

Map of LED Companies in Ethiopia

There are several local companies that assemble lighting technologies and accessories, including LEDs. However, Ethiopia still imports most of its LED lighting products from China, India, and Germany.



The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Ethiopia.

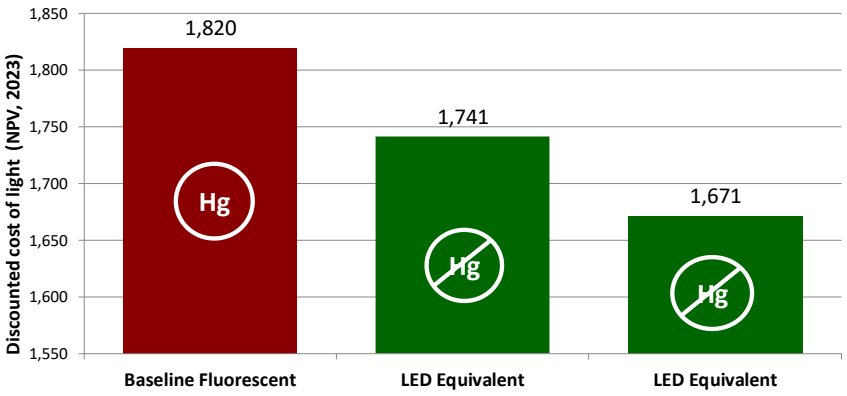
Despite the existence of T12 fluorescent lighting products in the market, retailers recommend the switch to T8 LEDS which are directly retrofitted. Additionally, non-integrated lamps are not widely available in the Ethiopian market, as there is no demand from customers. Customers tend to go for pin-less (screw-type) heads.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



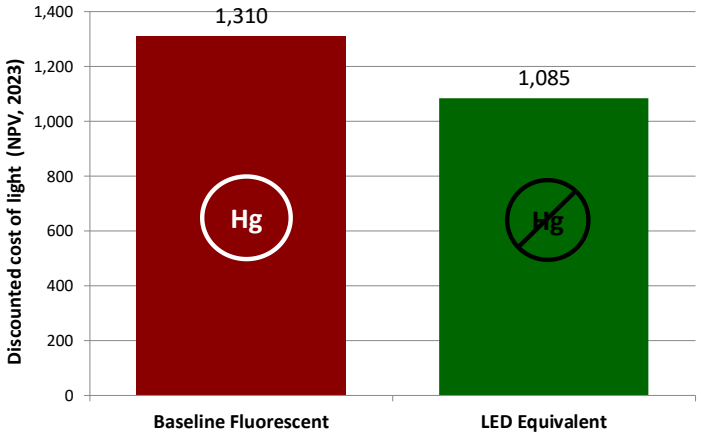
Price for one lamp (ETB):	**300**	**580**	**950**	**ETB**
Price for one lamp (USD):	**5.78**	**11.16**	**18.29**	**US dollars**
Lamp wattage:	**32**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**105**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**20,000**	**25,000**	**35,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**1,820**	**1,741**	**1,671**	**ETB (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**59.8**	**139.0**	**months**
CO2 emissions due to electricity used for 10 years:	**46**	**26**	**26**	**kg CO2/10 yrs**

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (ETB):	**300**	**580**	***ETB***
Price for one lamp (USD):	**5.78**	**11.16**	***US dollars***
Lamp wattage:	**36**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**118**	**59**	***kWh/year***
Rated lamp lifetime:	**24,000**	**25,000**	***Hours***
Analysis period for life-cycle assessment:	**7**	**7**	***years***
Life-cycle cost for analysis period, discounted to 2023	**1,310**	**1,085**	***ETB (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**46.5**	***months***
CO2 emissions due to electricity used for 7 years:	**36**	**18**	***kg CO2/7 yrs***

Gabon

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Gabon

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	2,940,000	2,700,000	2,480,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	22	20	19	kg of mercury
National electricity savings	2.76	2.57	2.38	TWh of electricity
National financial savings from avoided electricity use	0.74	0.69	0.64	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	1.01	0.93	0.86	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- In 2019, the Gabon government rolled out a nationwide solar LED street lighting activity, installing nearly 5,000 solar streetlights.
- In February 2023, Gabon, alongside Jamaica and Sri Lanka, launched a multi-million-dollar project to eliminate the use of mercury in skin lightening products.
- Eliminating mercury lighting products has both cost- and energy-saving benefits.

Map of LED Companies in Gabon

Although Gabon's industrial sector is undergoing significant development, the local manufacturing and/or assembly of light bulbs is nonexistent.

Currently, lighting products are imported from countries such as Morocco, Tunisia, Turkey, Portugal, Spain, Italy, China, India, Taiwan, France, Belgium, etc.

The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Gabon.

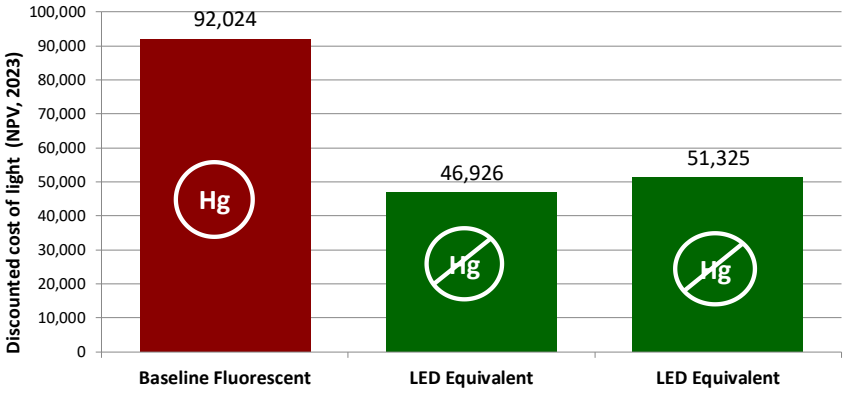
T12 fluorescent and retrofit LED tubes are not available in Gabon. Almost no public or private institutions, stores, buildings, or household dwellings use them – instead they use T8s.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XAF):	**1,150**	**2,000**	**3,450**	**XAF**
Price for one lamp (USD):	**1.84**	**3.21**	**5.53**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**12,000**	**20,000**	**15,000**	**Hours**
Analysis period for life-cycle assessment:	**6**	**6**	**6**	**years**
Life-cycle cost for analysis period, discounted to 2023	**92,024**	**46,926**	**51,325**	**XAF (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**1.4**	**3.7**	**months**
CO2 emissions due to electricity used for 6 years:	**312**	**156**	**156**	**kg CO2/6 yrs**

Ghana

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Ghana

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	9,210,000	8,240,000	7,300,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	69	62	55	kg of mercury
National electricity savings	8.90	8.07	7.24	TWh of electricity
National financial savings from avoided electricity use	3.64	3.32	2.97	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	2.91	2.62	2.33	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- In 2017, Ghana adopted efficiency standards and labeling for LEDs and self-ballasted FLs. It is now mandatory for labels to indicate the energy efficiency of lighting products.
- Additionally, in 2022, Ghana adopted regulations to prohibit the manufacture, import, and sale of incandescent filament lamps.
- Import duty and VAT were waived on the importation of LED lamps in 2010.
- The government has implemented several retrofit programs replacing fluorescent lighting with LEDs in different government institutions, including hospitals and ministry buildings.

Map of LED Companies in Ghana

Ghana does not have local lighting manufacturing and assembly companies. It currently imports lighting products from China and India.

The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Ghana.

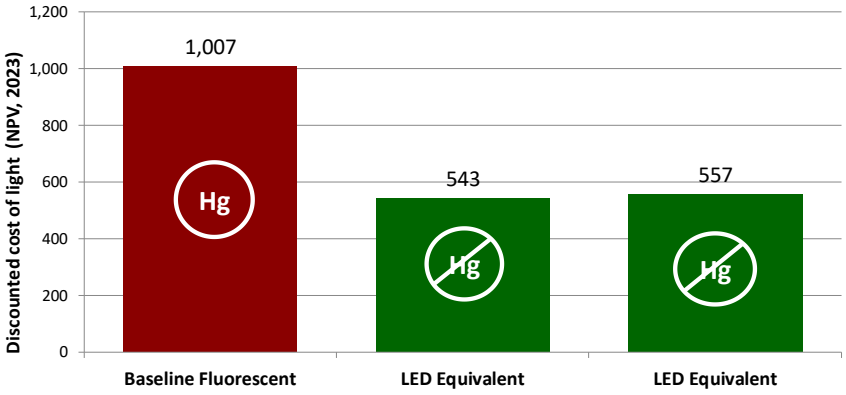
The T12 fluorescent tube has virtually been phased out in Ghana. The lighting market has recently adopted the T5 and T8 fluorescent tubes.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (GHS):	**15**	**60**	**40**	**GHS**
Price for one lamp (USD):	**1.81**	**7.25**	**4.84**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**8,000**	**20,000**	**15,000**	**Hours**
Analysis period for life-cycle assessment:	**6**	**6**	**6**	**years**
Life-cycle cost for analysis period, discounted to 2023	**1,007**	**543**	**557**	**GHS (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**6.7**	**3.7**	**months**
CO2 emissions due to electricity used for 6 years:	**255**	**128**	**128**	**kg CO2/6 yrs**

Kenya

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Kenya

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	7,560,000	6,870,000	6,220,000	units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	57	52	47	kg of mercury
National electricity savings	7.15	6.57	6.01	TWh of electricity
National financial savings from avoided electricity use	1.21	1.12	1.02	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	1.99	1.81	1.64	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Kenya has mandatory MEPS for general service lighting (GSL), directional and non-directional lamps, and LEDs, subsequently phasing out fluorescent lighting.
- Kenya also has mandatory labeling requirements for lighting and carries out compliance activities including conformity assessment and market surveillance.

Map of LED Companies in Kenya

No information was found on the local assembly or manufacturing of lighting products. The lighting market in Kenya is import-based with the majority of imports coming from India and China.

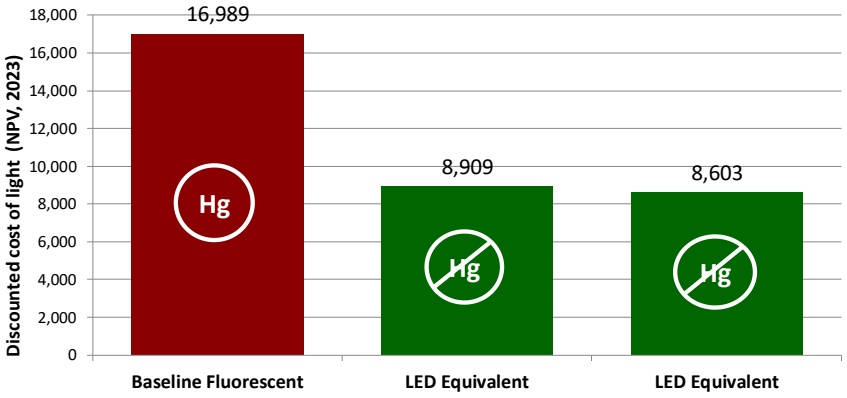
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Kenya.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



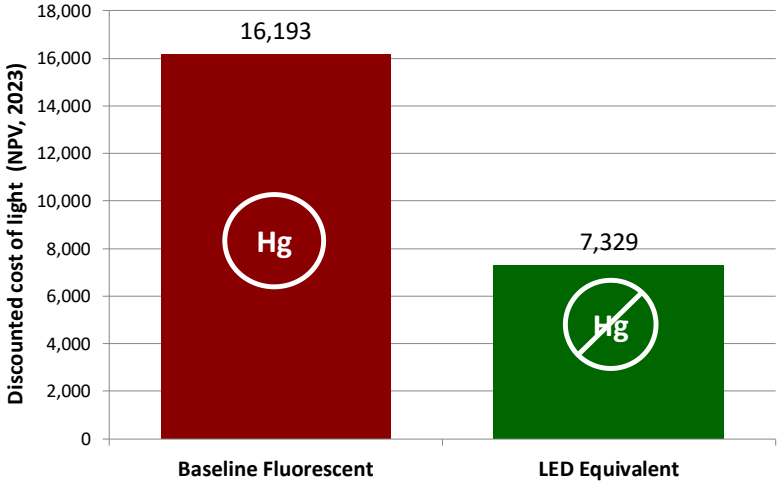
Price for one lamp (KES):	**150**	**300**	**250**	**KES**
Price for one lamp (USD):	**1.27**	**2.55**	**2.12**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**13,000**	**15,000**	**25,000**	**Hours**
Analysis period for life-cycle assessment:	**7**	**7**	**7**	**years**
Life-cycle cost for analysis period, discounted to 2023	**16,989**	**8,909**	**8,603**	**KES (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**1.5**	**1.0**	**months**
CO2 emissions due to electricity used for 7 years:	**262**	**131**	**131**	**kg CO2/7 yrs**

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (KES):	**150**	**170**	***KES***
Price for one lamp (USD):	**1.27**	**1.44**	***US dollars***
Lamp wattage:	**40**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**131**	**59**	***kWh/year***
Rated lamp lifetime:	**13,000**	**20,000**	***Hours***
Analysis period for life-cycle assessment:	**6**	**6**	***years***
Life-cycle cost for analysis period, discounted to 2023	**16,193**	**7,329**	***KES (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**0.2**	***months***
CO2 emissions due to electricity used for 6 years:	**250**	**112**	***kg CO2/6 yrs***

Madagascar

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Madagascar

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	1,020,000	947,000	873,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	8	7	7	kg of mercury
National electricity savings	0.95	0.89	0.82	TWh of electricity
National financial savings from avoided electricity use	0.31	0.29	0.27	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.26	0.24	0.22	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Madagascar ratified the Minamata Convention in May 2015.
- Madagascar's electrification levels are currently at 33.7%. A key electrification strategy includes off-grid solutions, which are expected to increase the market share of off-grid solar LED lighting within the local market.
- Mercury-containing lighting products still make up a large portion of Madagascar's market. According to a 2013 assessment, these products ranked second only to mercury-containing batteries in annual consumer consumption.

Map of LED Companies in Madagascar

Madagascar does not have any local assembly or manufacturing of LED lighting products. The country imports most of its lighting products from India, Vietnam, and France.

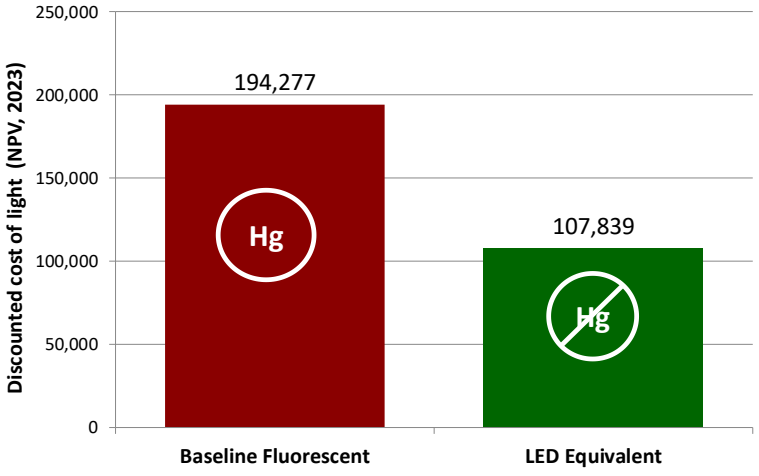
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Madagascar.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



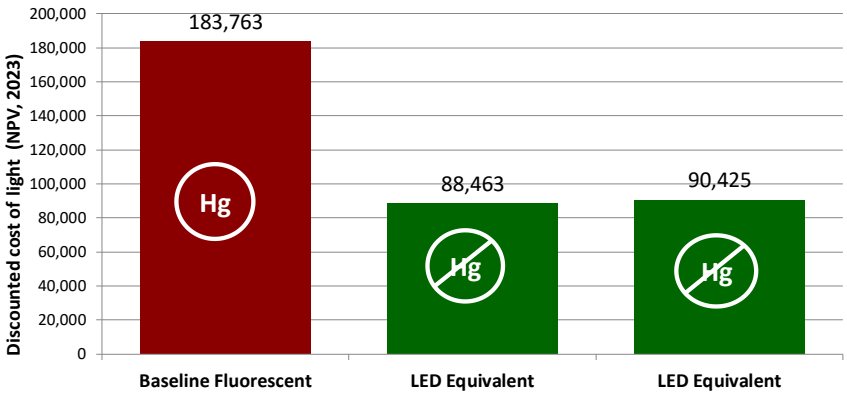
Price for one lamp (MGA):	**50,000**	**18,200**	***MGA***
Price for one lamp (USD):	**12.21**	**4.44**	***US dollars***
Lamp wattage:	**40**	**20**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**131**	**66**	***kWh/year***
Rated lamp lifetime:	**8,000**	**6,000**	***Hours***
Analysis period for life-cycle assessment:	**2**	**2**	***years***
Life-cycle cost for analysis period, discounted to 2023	**194,277**	**107,839**	***MGA (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**instant**	***months***
CO2 emissions due to electricity used for 2 years:	**99**	**50**	***kg CO2/2 yrs***

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (MGA):	**46,700**	**12,000**	**13,000**	**MGA**
Price for one lamp (USD):	**11.40**	**2.93**	**3.17**	**US dollars**
Lamp wattage:	**38**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**125**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**7,500**	**5,000**	**6,000**	**Hours**
Analysis period for life-cycle assessment:	**2**	**2**	**2**	**years**
Life-cycle cost for analysis period, discounted to 2023	**183,763**	**88,463**	**90,425**	**MGA (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**instant**	**instant**	**months**
CO2 emissions due to electricity used for 2 years:	**94**	**45**	**45**	**kg CO2/2 yrs**

Nigeria

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Nigeria

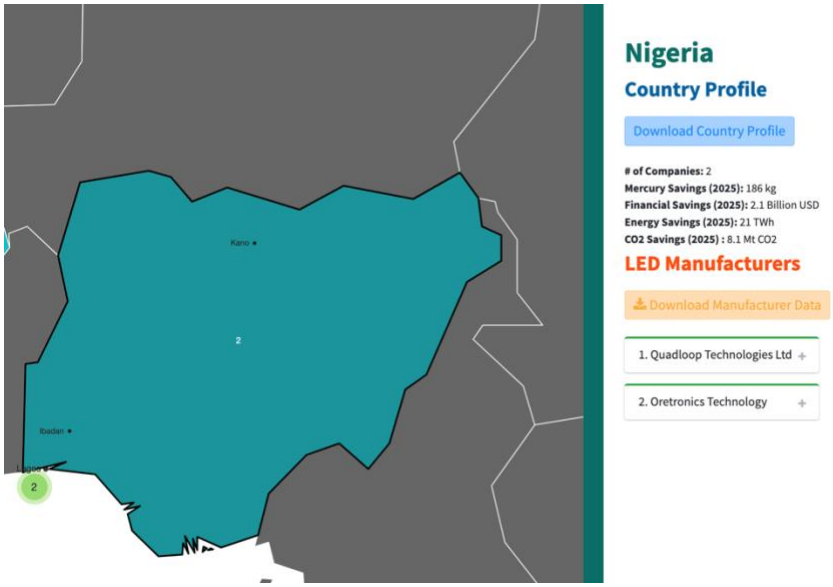
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	31,100,000	28,800,000	26,600,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	186	169	153	kg of mercury
National electricity savings	19	17	16	TWh of electricity
National financial savings from avoided electricity use	1.9	1.7	1.6	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	7.4	6.9	6.4	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Nigeria is currently in the process of adopting Minimum Energy Performance Standards (MEPS) for lighting products. Adoption of these MEPS will have extensive energy- and cost-saving benefits for the users and the country.
- Nigeria's Energy Policy prioritizes replacing all incandescent light bulbs in every home, industry, institution, and establishment in the country with LEDs and other energy-saving lamps by the year 2025. The Nigerian National Energy Efficiency Action Plan (NEEAP) also prioritizes the use of Energy Efficient lighting. Its 2020 target was for 40% of households to be using EE lighting, up to 100% by 2030.
- The Nigerian Clean Energy Access Program (NCEAP) plans to distribute 150 million energy efficient bulbs over the next five years under the Clean Development Mechanism (CDM).
- Several solar LED street lighting projects have been rolled out in major Nigerian cities. There are also multiple large projects to extend energy access to communities living off the grid through solar home systems and solar energy kits.
- In 2022, a successful LED retrofit program was carried out at the Folarin Coker Hospital in Lagos. This retrofit halved electricity bills for the hospital.

Map of LED Companies in Nigeria

Nigeria has several local LED assembly companies as shown in the map below[1]. Additionally, Nigeria imports lighting products from India, China, and Germany



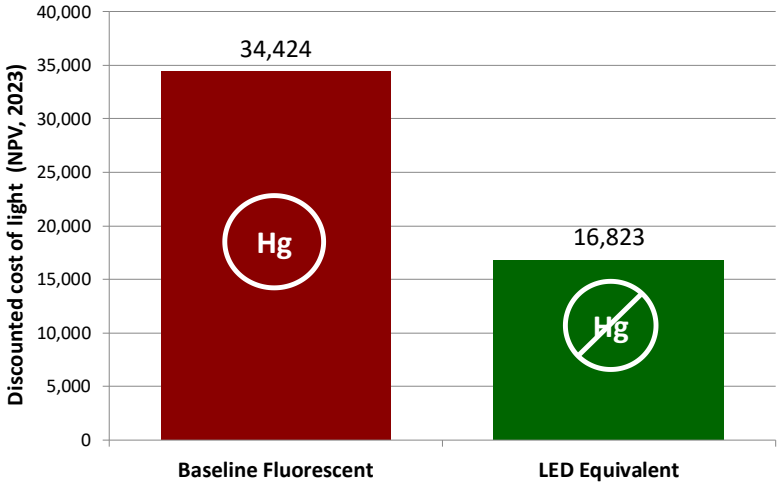
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Nigeria.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (NGN):	**1,500**	**2,190**	***NGN***
Price for one lamp (USD):	**3.54**	**5.17**	***US dollars***
Lamp wattage:	**36**	**16**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**118**	**53**	***kWh/year***
Rated lamp lifetime:	**15,000**	**15,000**	***Hours***
Analysis period for life-cycle assessment:	**4**	**4**	***years***
Life-cycle cost for analysis period, discounted to 2023	**34,424**	**16,823**	***NGN (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**1.8**	***months***
CO2 emissions due to electricity used for 4 years:	**187**	**83**	***kg CO2/4 yrs***

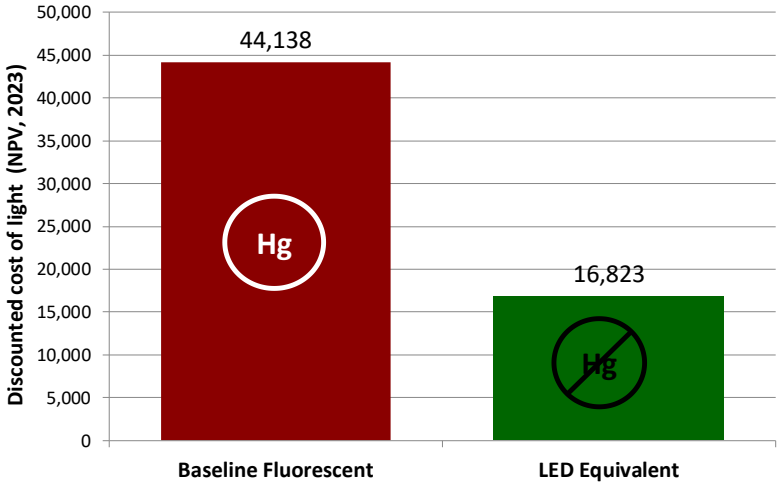
[1] Mega Benjamin & Eric Nigeria Limited and Chug Hang Inter-Continental Industrial Co. LTD were named as assemblers of lighting products but they do not have any digital presence (website, Facebook, etc.)

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (NGN):	**4,000**	**2,190**	***NGN***
Price for one lamp (USD):	**9.44**	**5.17**	***US dollars***
Lamp wattage:	**40**	**16**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**131**	**53**	***kWh/year***
Rated lamp lifetime:	**10,000**	**15,000**	***Hours***
Analysis period for life-cycle assessment:	**4**	**4**	***years***
Life-cycle cost for analysis period, discounted to 2023	**44,138**	**16,823**	***NGN (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**instant**	***months***
CO2 emissions due to electricity used for 4 years:	**208**	**83**	***kg CO2/4 yrs***

Rwanda

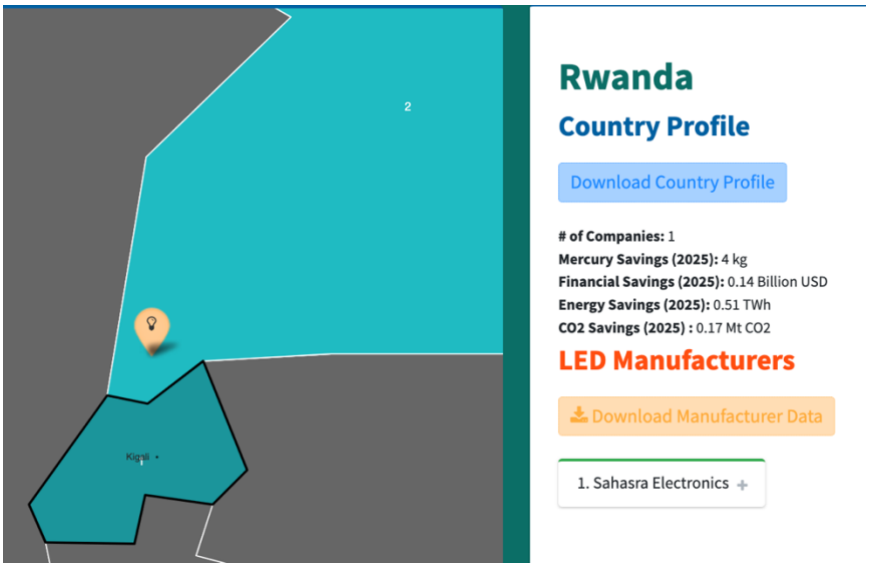
Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Rwanda

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	530,000	476,000	425,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	4	4	3	kg of mercury
National electricity savings	0.51	0.46	0.42	TWh of electricity
National financial savings from avoided electricity use	0.14	0.13	0.12	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.17	0.15	0.14	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- As part of the East Africa Community, Rwanda has adopted the EAS 1064 Minimum Energy Performance Standards for lighting products.
- In a bid to meet green investment goals, the government has also rolled out solar LED street lighting projects across different parts of the country.
- In 2014, the government of Rwanda rolled out a bulk procurement scheme of 200,000 compact fluorescent lamps across the country to reduce power demand.
- A transition to mercury-free lighting products will result in both energy- and cost-savings for the country.

Map of LED Companies in Rwanda
Rwanda has a company assembling LED lighting products as shown in the map below.



The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Rwanda.

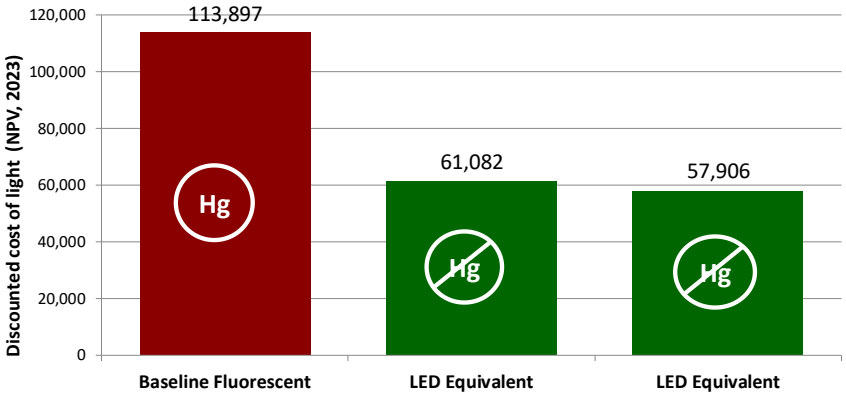
Non-integrated lamps are not available in the Rwandan market.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



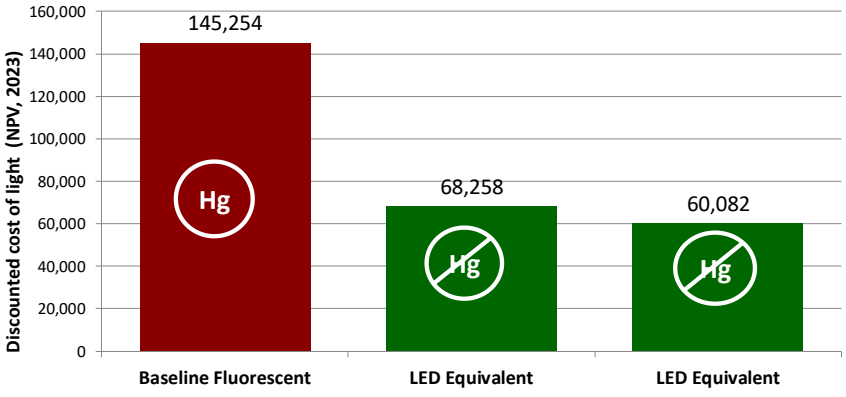
Price for one lamp (RWF):	**1,500**	**5,500**	**8,500**	**RWF**
Price for one lamp (USD):	**1.46**	**5.34**	**8.25**	**US dollars**
Lamp wattage:	**36**	**18**	**16**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**53**	**kWh/year**
Rated lamp lifetime:	**18,000**	**42,000**	**46,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**113,897**	**61,082**	**57,906**	**RWF (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**8.6**	**13.6**	**months**
CO2 emissions due to electricity used for 14 years:	**545**	**273**	**242**	**kg CO2/10 yrs**

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (RWF):	**8,500**	**6,500**	**4,500**	**RWF**
Price for one lamp (USD):	**8.25**	**6.31**	**4.37**	**US dollars**
Lamp wattage:	**40**	**20**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**131**	**66**	**59**	**kWh/year**
Rated lamp lifetime:	**15,000**	**45,000**	**45,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**145,254**	**68,258**	**60,082**	**RWF (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**instant**	**instant**	**months**
CO2 emissions due to electricity used for 13 years:	**606**	**303**	**273**	**kg CO2/10 yrs**

Senegal

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Senegal

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	2,500,000	2,280,000	2,060,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	19	17	16	kg of mercury
National electricity savings	2.38	2.19	2.01	TWh of electricity
National financial savings from avoided electricity use	0.61	0.56	0.51	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	1.11	1.02	0.92	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- The government of Senegal has rolled out extensive solar LED street lighting projects across nearly 400 locations in the country.
- In 2021, the government launched a project to deploy 4.4 million LED bulbs to households, administrations, and small businesses.

Map of LED Companies in Senegal

Senegal does not have any local assembly or manufacturing of LED lighting products. The country imports most of its lighting from India, France, and Belgium.

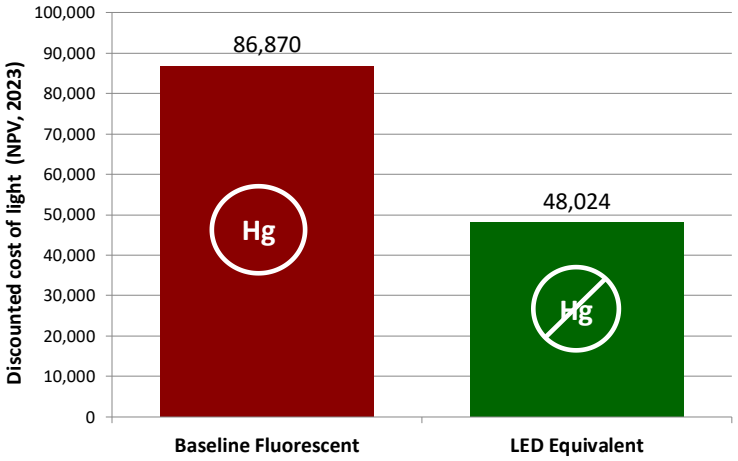
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Senegal.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



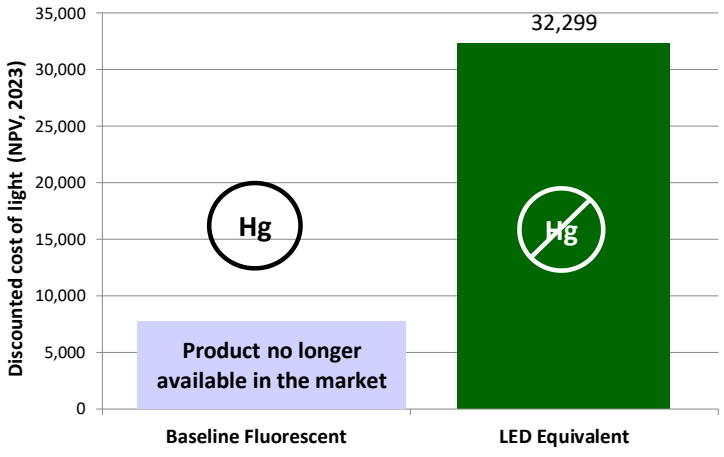
Price for one lamp (XOF):	**1,000**	**5,500**	***XOF***
Price for one lamp (USD):	**1.60**	**8.82**	***US dollars***
Lamp wattage:	**36**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**118**	**59**	***kWh/year***
Rated lamp lifetime:	**18,000**	**20,000**	***Hours***
Analysis period for life-cycle assessment:	**6**	**6**	***years***
Life-cycle cost for analysis period, discounted to 2023	**86,870**	**48,024**	***XOF (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**7.6**	***months***
CO2 emissions due to electricity used for 6 years:	**403**	**201**	***kg CO2/6 yrs***

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XOF):		**800**	***XOF***
Price for one lamp (USD):		**1.28**	***US dollars***
Lamp wattage:		**40**	***Watts***
Lamp is on for hours/day:		**9**	***hours/day***
Annual electricity consumption for each lamp type:		**131**	***kWh/year***
Rated lamp lifetime:		**8,000**	***Hours***
Analysis period for life-cycle assessment:		**2**	***years***
Life-cycle cost for analysis period, discounted to 2023		**32,299**	***XOF (NPV, 2023)***
Simple Payback period in months, compared with LFL:			***months***
CO2 emissions due to electricity used for 2 years:		**149**	***kg CO2/2 yrs***

Togo

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Togo

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	495,000	454,000	415,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	4	3	3	kg of mercury
National electricity savings	0.46	0.43	0.40	TWh of electricity
National financial savings from avoided electricity use	0.12	0.11	0.10	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.12	0.11	0.10	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- In 2023, a project to electrify 12,100 households and install 1,858 solar LED streetlamps was launched by the World Bank in collaboration with the Togo government.
- In 2021, the Togo government rolled out a project to install 50,000 solar LED streetlamps across the country.
- In 2009, a bulk procurement scheme of 400,000 compact fluorescent light bulbs was launched to replace incandescent lamps.

Map of LED Companies in Togo

There is no local assembly or manufacturing of lighting products in Togo. Imports are mainly from India, France and Turkey.

The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Togo.

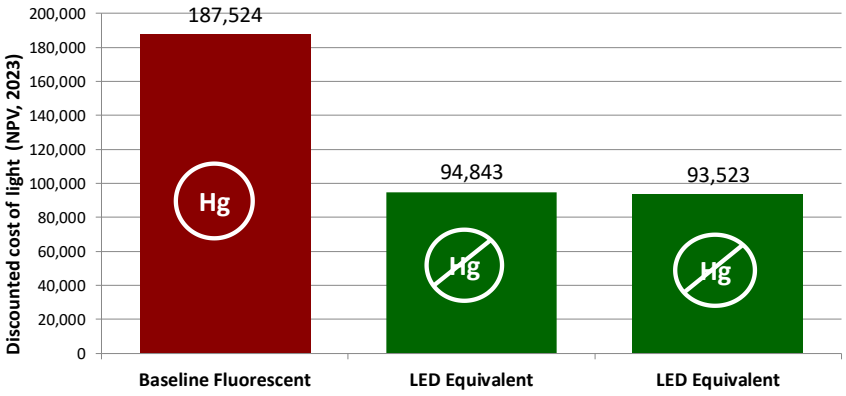
T12 and non-integrated lighting products are not commonly available in Togo. T8s and T5s, on the other hand, are widely available.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (XOF):	**1,248**	**1,248**	**1,871**	**XOF**
Price for one lamp (USD):	**2.00**	**2.00**	**3.00**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**10,000**	**15,000**	**40,000**	**Hours**
Analysis period for life-cycle assessment:	**10**	**10**	**10**	**years**
Life-cycle cost for analysis period, discounted to 2023	**187,524**	**94,843**	**93,523**	**XOF (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**instant**	**0.8**	**months**
CO2 emissions due to electricity used for 12 years:	**403**	**202**	**202**	**kg CO2/10 yrs**

Uganda

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Uganda

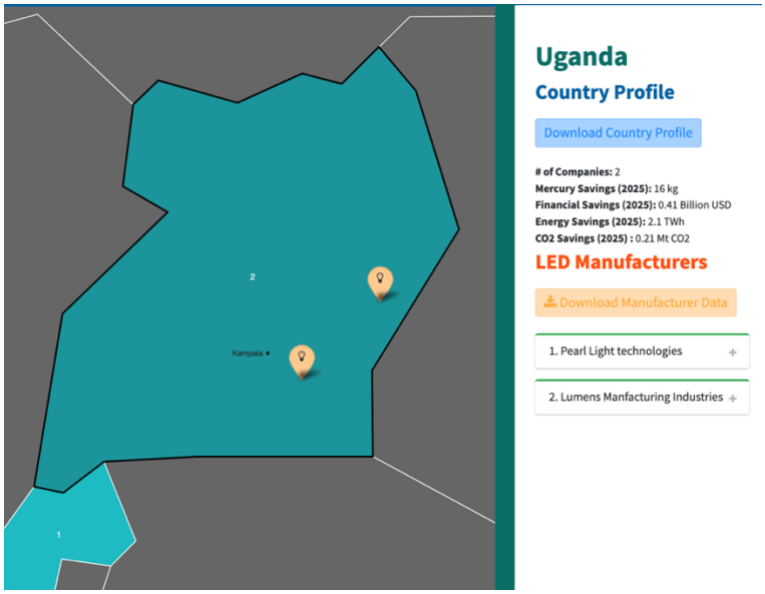
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	2,180,000	1,990,000	1,800,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	16	15	14	kg of mercury
National electricity savings	2.06	1.90	1.74	TWh of electricity
National financial savings from avoided electricity use	0.41	0.38	0.34	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.21	0.19	0.17	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Uganda has had mandatory Minimum Energy Performance Standards (MEPS) for tubular, fluorescent, and HID lighting products since 2011.
- Several major cities in Uganda, including Kampala and Jinja, have installed solar LED streetlights with immense energy- and cost-saving benefits.
- In 2015, the government of Uganda rolled out a bulk procurement and distribution scheme for 420,000 LED lamps to replace CFL (energy saving) lamps. The government had rolled out a similar program in 2007 to replace incandescent lamps with 800,000 CFL lamps.

Map of LED Companies in Uganda

Uganda has several companies locally assembling LED lighting products as shown below.



The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Uganda.

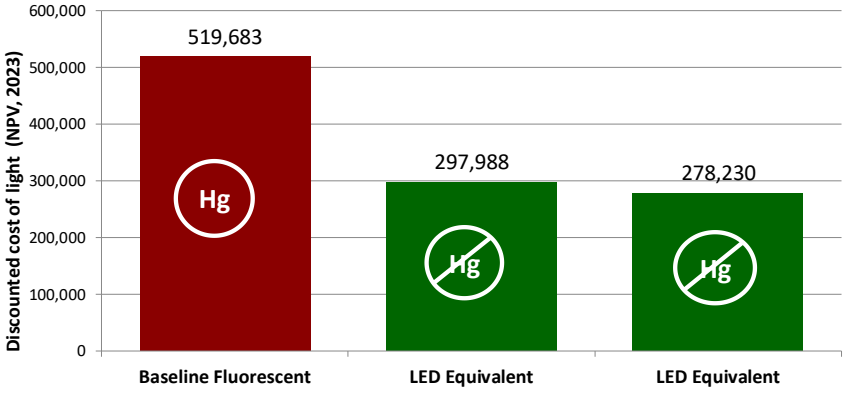
T12 lighting products are not available in the Ugandan market. Non-integrated lamps are also not commonly available.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (UGX):	**7,000**	**25,000**	**25,000**	**UGX**
Price for one lamp (USD):	**1.90**	**6.78**	**6.78**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**13,000**	**20,000**	**25,000**	**Hours**
Analysis period for life-cycle assessment:	**7**	**7**	**7**	**years**
Life-cycle cost for analysis period, discounted to 2023	**519,683**	**297,988**	**278,230**	**UGX (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**6.0**	**6.0**	**months**
CO2 emissions due to electricity used for 7 years:	**116**	**58**	**58**	**kg CO2/7 yrs**

South Africa

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in South Africa

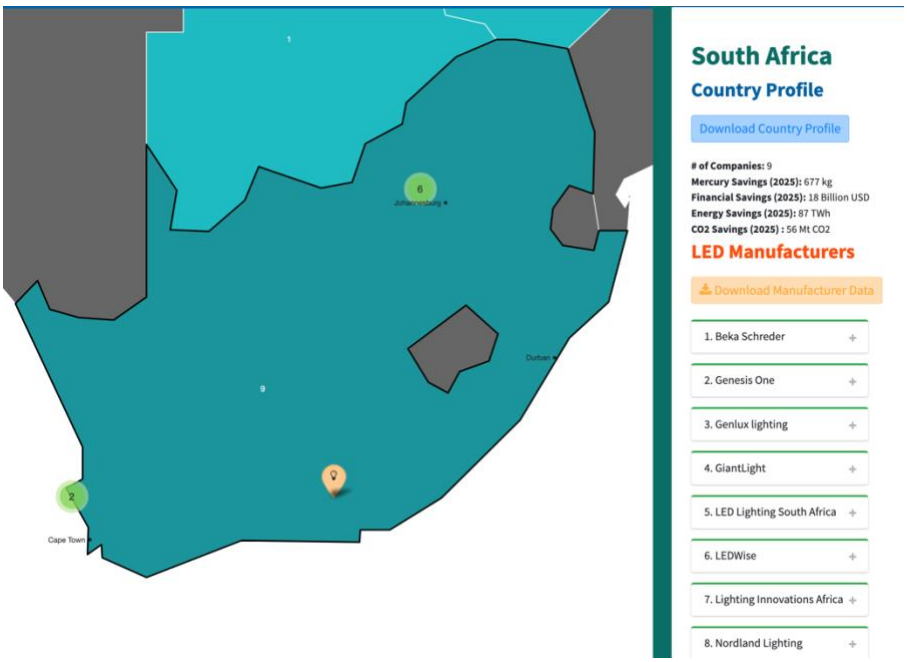
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	90,300,000	80,500,000	71,100,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	677	604	533	kg of mercury
National electricity savings	87.3	78.8	70.4	TWh of electricity
National financial savings from avoided electricity use	18.5	16.8	14.9	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	56.0	50.2	44.3	Mt CO_2

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- In June 2023, South Africa adopted a compulsory specification policy for General Service Lamps (GSLs). Adoption of these MEPS are expected to result in immense annual electricity and carbon savings.
- Several municipalities are rolling out solar LED street lighting projects in South Africa.
- In June 2023, Shoprite, one of South Africa's largest retailers, reduced its electricity consumption by 11.8% following the installation of 1,001,932 energy-efficient LED lightbulbs across 1,647 stores.
- There are strong industry voices, including LEDVANCE and Massmart, who support consumer education on the benefits and availability of new lighting technologies.

Map of LED Companies in South Africa

South Africa has many companies manufacturing and assembling lighting products as indicated on the map below.



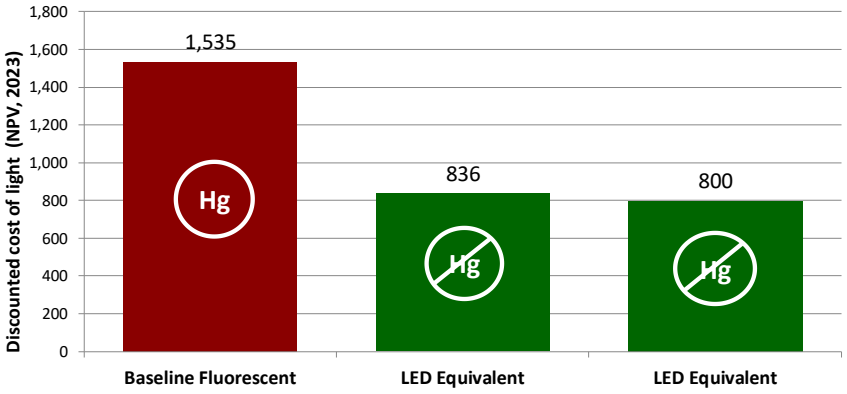
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in South Africa.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



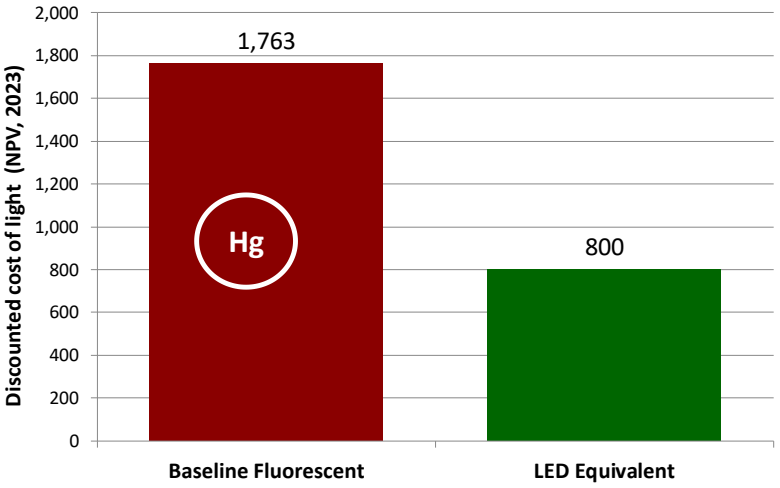
Price for one lamp (ZAR):	**43**	**58**	**72**	**ZAR**
Price for one lamp (USD):	**2.63**	**3.55**	**4.40**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**18,000**	**15,000**	**25,000**	**Hours**
Analysis period for life-cycle assessment:	**7**	**7**	**7**	**years**
Life-cycle cost for analysis period, discounted to 2023	**1,535**	**836**	**800**	**ZAR (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**1.7**	**3.3**	**months**
CO2 emissions due to electricity used for 7 years:	**688**	**344**	**344**	**kg CO2/7 yrs**

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (ZAR):	**52**	**72**	***ZAR***
Price for one lamp (USD):	**3.18**	**4.40**	***US dollars***
Lamp wattage:	**40**	**18**	***Watts***
Lamp is on for hours/day:	**9**	**9**	***hours/day***
Annual electricity consumption for each lamp type:	**131**	**59**	***kWh/year***
Rated lamp lifetime:	**8,000**	**25,000**	***Hours***
Analysis period for life-cycle assessment:	**7**	**7**	***years***
Life-cycle cost for analysis period, discounted to 2023	**1,763**	**800**	***ZAR (NPV, 2023)***
Simple Payback period in months, compared with LFL:	**-**	**1.9**	***months***
CO2 emissions due to electricity used for 7 years:	**764**	**344**	***kg CO2/7 yrs***

Zambia

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Zambia

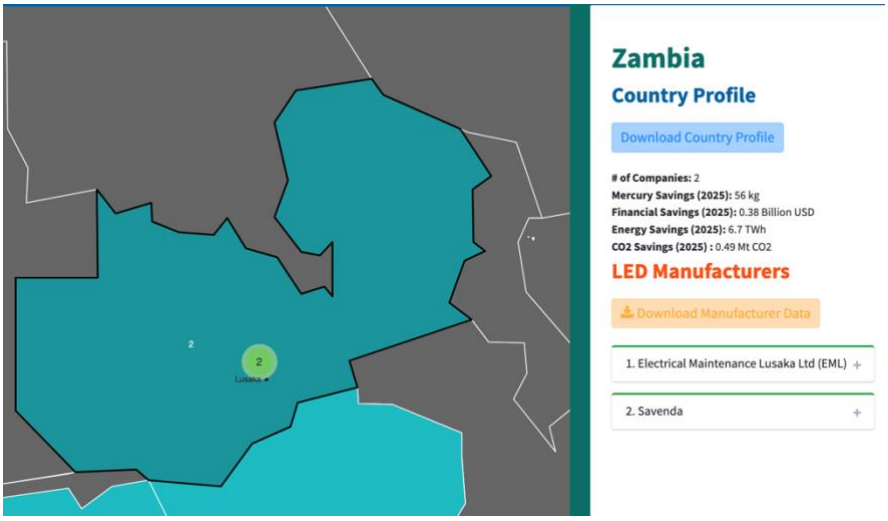
Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	7,470,000	7,020,000	6,570,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	56	53	49	kg of mercury
National electricity savings	6.73	6.37	6.01	TWh of electricity
National financial savings from avoided electricity use	0.38	0.36	0.34	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	0.49	0.46	0.43	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- As part of the SADC community, Zambia is in the process of adopting the region's lighting MEPS – SADC HT 109:202. Adopting these MEPS should result in energy, carbon, and financial savings for the country.
- Since 2019, several solar LED lighting programs have been rolled out by different government agencies and local authorities.
- In 2017, the national utility ZESCO rolled out a national LED distribution program that made 5 million LED lamps available to the population. It was estimated that this transition would achieve 30% electricity savings and potentially reduce power shortages that ravaged the country.
- In 2016, Zambia banned the importation of incandescent bulbs.
- Zambia ratified the Minamata Convention in 2016.

Map of LED Companies in Zambia

Zambia has two companies manufacturing and assembling LED lighting products as indicated in the map below.



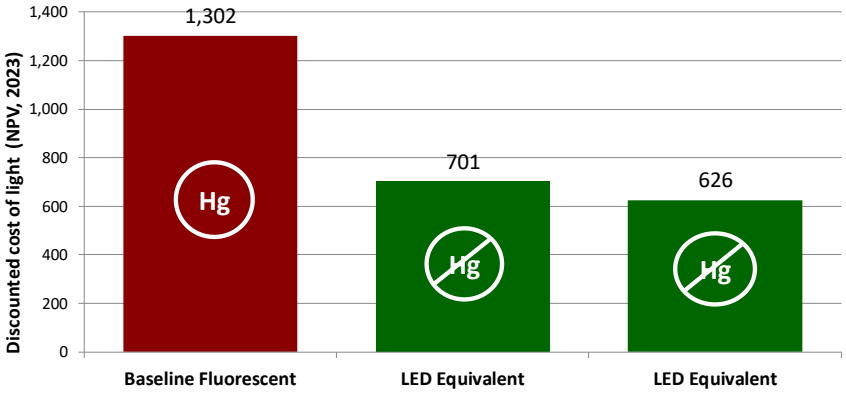
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Zambia.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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



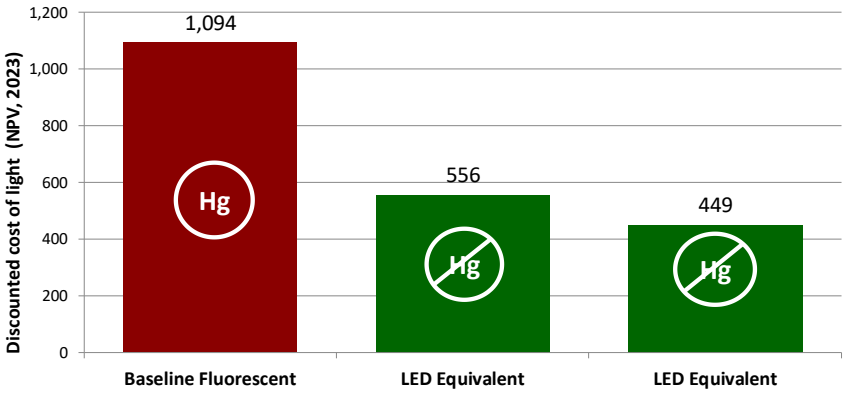
Price for one lamp (ZMW):	45	60	100	ZMW
Price for one lamp (USD):	2.66	3.54	5.90	US dollars
Lamp wattage:	36	18	16	Watts
Lamp is on for hours/day:	9	9	9	hours/day
Annual electricity consumption for each lamp type:	118	59	53	kWh/year
Rated lamp lifetime:	13,000	18,000	50,000	Hours
Analysis period for life-cycle assessment:	10	10	10	years
Life-cycle cost for analysis period, discounted to 2023	1,302	701	626	ZMW (NPV, 2023)
Simple Payback period in months, compared with LFL:	-	3.0	10.0	months
CO2 emissions due to electricity used for 15 years:	117	58	52	kg CO2/10 yrs

Linear Fluorescent Lamp - T12

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (ZMW):	**65**	**50**	**35**	**ZMW**
Price for one lamp (USD):	**3.84**	**2.95**	**2.07**	**US dollars**
Lamp wattage:	**40**	**22**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**131**	**72**	**59**	**kWh/year**
Rated lamp lifetime:	**10,000**	**25,000**	**25,000**	**Hours**
Analysis period for life-cycle assessment:	**7**	**7**	**7**	**years**
Life-cycle cost for analysis period, discounted to 2023	**1,094**	**556**	**449**	**ZMW (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**instant**	**instant**	**months**
CO2 emissions due to electricity used for 7 years:	**91**	**50**	**41**	**kg CO2/7 yrs**

Zimbabwe

Table 1. Benefits of LFL Phase Out in 2025, 2026, and 2027 in Zimbabwe

Benefits of Fluorescent Lighting Phase Out	LFL Phase Out in 2025	LFL Phase Out in 2026	LFL Phase Out in 2027	Unit
Avoided lamp sales	7,360,000	6,710,000	6,090,000	Units of lamps
Total avoided mercury uses in fluorescent lamp manufacturing	55	50	46	kg of mercury
National electricity savings	6.96	6.41	5.87	TWh of electricity
National financial savings from avoided electricity use	0.98	0.91	0.83	Billion USD
Total CO_2 emissions mitigated from avoided electricity use	5.15	4.70	4.26	$MTCO_2$

National Policies, Regulations, and Initiatives Around Mercury and Lighting

- Zimbabwe has a statutory instrument (SI2018-208) that bans inefficient incandescent lighting products. The country is also in the process of adopting the SADC regional lighting MEPS (SADC HT 109:2021). Nationalization of the SADC HT 109:2021 is expected to result in energy and financial savings for the country.
- In 2022, the government rolled out a solar LED street lighting project in Harare.
- In 2011, the national utility rolled out a $12 million USD campaign to distribute millions of free energy-efficient bulbs.

Map of LED Companies in Zimbabwe

Zimbabwe has two companies manufacturing and assembling LED lighting products as indicated in the map below.

T8's are the most widely available lighting product in Zimbabwe

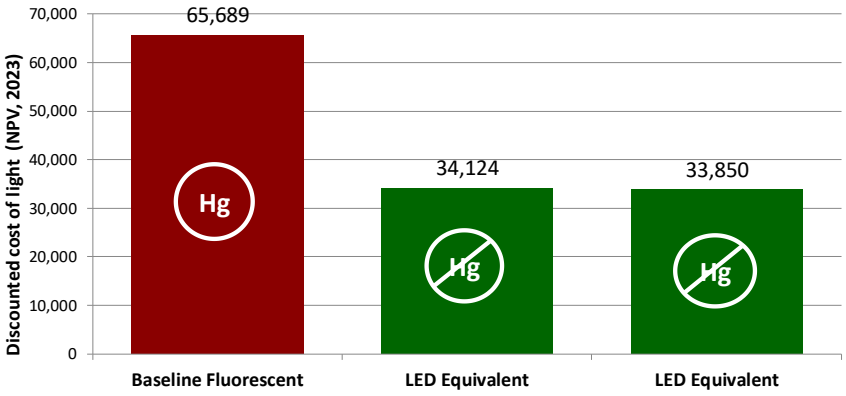
The following tables compare the costs and benefits of fluorescent and LED lighting technologies in Zimbabwe.

Linear Fluorescent Lamp - T8

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

Analysis period for life-cycle assesment is shown, with light bulb and electricity costs discounted back to the present (2023).

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 (ZWL):	**986**	**2,194**	**1,920**	**ZWL**
Price for one lamp (USD):	**2.63**	**5.85**	**5.12**	**US dollars**
Lamp wattage:	**36**	**18**	**18**	**Watts**
Lamp is on for hours/day:	**9**	**9**	**9**	**hours/day**
Annual electricity consumption for each lamp type:	**118**	**59**	**59**	**kWh/year**
Rated lamp lifetime:	**15,000**	**30,000**	**30,000**	**Hours**
Analysis period for life-cycle assessment:	**9**	**9**	**9**	**years**
Life-cycle cost for analysis period, discounted to 2023	**65,689**	**34,124**	**33,850**	**ZWL (NPV, 2023)**
Simple Payback period in months, compared with LFL:	**-**	**4.1**	**3.2**	**months**
CO2 emissions due to electricity used for 9 years:	**939**	**470**	**470**	**kg CO2/9 yrs**

CLiC

END TOXIC LIGHTING TOGETHER