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关于汞的水俣公约

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关于汞的水俣公约缔约方大会
第四次会议
2021 年 11 月 1 日至 5 日，在线*
临时议程**项目 4 (a)（四）
供缔约方大会审议或采取行动的事项：
添汞产品以及使用汞或汞化合物的制造工艺：修正附件 A 和附件 B 的提案

关于修正《关于汞的水俣公约》附件 A 和附件 B 的提案

增编

非洲区域关于修正《关于汞的水俣公约》附件 A 第一部分和第二部分的提案

秘书处的说明

1. 如关于修正《关于汞的水俣公约》附件 A 和附件 B 的提案的秘书处说明（UNEP/MC/COP.4/26）所述，博茨瓦纳、布基纳法索和马达加斯加向秘书处提交了非洲区域关于修正《公约》附件 A 第一部分和第二部分的提案。

2. 该提案载于本说明附件一，解释性说明载于附件二。附件按收到的原文转载，未经正式编辑。

* 关于汞的水俣公约缔约方大会第四次会议续会将在印度尼西亚巴厘岛现场召开，会议暂定于 2022 年第一季度举行。

** UNEP/MC/COP.4/1。

附件一

非洲区域关于修正《关于汞的水俣公约》附件 A 第一部分的提案

非洲区域提议在附件 A“添汞产品”的第一部分中插入三个产品类别及其逐步淘汰日期。

第一部分：受第四条第一款管制的产品

添汞产品	开始禁止产品生产、进口或出口的时间（淘汰日期）
用于普通照明用途、不超过 30 瓦、带集成镇流器的紧凑型荧光灯	2024 年
用于普通照明用途的直管型荧光灯： (a) 三基色荧光粉，不超过 60 瓦； (b) 卤磷酸盐荧光粉，不超过 40 瓦	2025 年
用于电子显示器的各种长度的冷阴极荧光灯和外置电极荧光灯	2024 年

非洲区域关于修正《关于汞的水俣公约》附件 A 第二部分的提案

非洲区域建议删除附件 A 第二部分第二栏的标题和当前案文，并将案文替换如下：

第二部分：受第四条第三款管制的产品

添汞产品	缔约方逐步淘汰牙科汞合金行动路线图：2021-2029/缔约方为逐步减少使用牙科汞合金以便在 2029 年将其淘汰而将采取的措施
牙科汞合金	1. 到 2023 年 1 月 1 日，关于汞的水俣公约缔约方均应发布通报，建议儿童和育龄妇女只使用无汞牙科填充材料。 2. 到 2025 年 1 月 1 日，关于汞的水俣公约缔约方均应就其打算实施的逐步淘汰使用牙科汞合金的措施制定一项国家计划。缔约方应在互联网上公布其国家计划，并将其转交秘书处。 3. 到 2027 年 1 月 1 日，应停止制造和进口汞合金。为顾及例外情况并协助向无汞牙科的过渡，各缔约方可允许在本国国内再销售两年。 4. 到 2029 年 1 月 1 日，上文第 3 点规定的汞合金在各国国内的销售也应停止。

Annex II

Further explanatory note from the Africa region regarding the proposed amendment to Annex A: Part I: Eliminate Fluorescent Lighting*

This explanatory note provides details on each of the three categories of fluorescent lamps contained in the Minamata Convention's Annex A: Part 1, and evidence in support of phasing out fluorescent bulbs.

I. Compact fluorescent lamps (CFLs)

Summary of Key Points for CFLs:
• **Overview**: CFL is an outdated, inefficient, expensive technology which contains mercury • **Choice**: Mercury-free retrofits are available for all regular sockets and virtually all pin-base sockets; a wide selection of light output levels and white light colours • **Economic**: LED retrofits are highly cost-effective, payback in 6 weeks compared to halogen; LEDs cost 50% less than CFL to buy and use; LED is the least life-cycle cost option • **Technology**: LED continues to improve, getting cheaper and more efficient each year • **Waste**: most fluorescent bulbs are not disposed of safely at end of life, even in developed countries • **Business**: Africa has many new local manufacturing companies producing LED lamps, but there is no manufacturing of fluorescent on the continent • **Policy**: Some African countries are phasing out CFLs based on energy savings and cost • **Equity**: Risk that suppliers will dump more mercury lighting in Africa as fluorescent lamps are phased-out of the OECD

CFLs have been commonly used in both domestic and professional applications, most often indoors in table lamps and downlights, as well as in wall-washers and in some countries, streetlights. These products were developed in the late 1970's / early 1980's with the goal of reducing power consumption for lighting. All CFLs contain mercury. They can take up to five minutes to warm up to full brightness, they are fragile, and they have short lifetimes compared to LED.

CFLs come in two types – those which are integrally ballasted (CFL.i) and those which are not integrally ballasted (CFL.ni) – also called "pin-base CFLs".

Compact Fluorescent Lamp – integrally ballasted (CFL.i)	**Compact Fluorescent Lamp – non-integrally ballasted (CFL.ni)**
A fluorescent lamp designed to replace an incandescent lamp. Consists of a fluorescent tube that is curved, twisted or folded to fit into the space of an incandescent lamp, and incorporates an electronic ballast in the base of the lamp. Each lamp contains 3-10 milligrams of mercury.	A fluorescent lamp where the ballast operating the lamp is contained inside the fixture into which the pin-base CFL.ni lamp is inserted. The "ni" stands for non-integrated, meaning the ballast is not integrated within the lamp. Each lamp contains 3-10 milligrams of mercury.
	

* The submitters provided English and French versions of the explanatory note.

Based on the ready availability, economic feasibility, and environmental and public health benefits of eliminating mercury-added CFLs, these products should be banned for manufacture, import and export as soon as possible and preferably by the end of 2024[1]. CFLs are rapidly declining in sales around the world and for example in Europe, CFL.i lamps will be banned by the Ecodesign Directive from 1 September 2021.

Availability of mercury-free alternatives: In the past, CFLs were commonly used in households, offices, schools and elsewhere, but they are increasingly being replaced now by LED. Mercury-free LED replacements for CFL.i and CFL.ni lamps are widely available in lighting markets everywhere. These alternatives are available in thousands of different shapes and sizes, levels of light output, color renderings and color temperatures. LED retrofit lamps are available to operate both in a regular light bulb socket (mains voltage) and on the pins of a fixture that takes CFL.ni. Research on the availability of CFL.ni pin bases has shown that of the 19 types of CFL.ni base types (e.g., 2G7, 2GX-7, 2G11, etc.), LED retrofits are available today for 16 of them. For the three which LED replacements were not immediately available, the reason given was the low volume of sales for these base types. However, suppliers in China said there are no technical impediments for manufacturing LED retrofit lamps for these base types and manufacturers confirm they can be produced within a few months on request.[2]

Economic feasibility of alternatives: Retrofitting CFLs with LED alternatives is highly cost-effective. The payback period associated with LED replacement of a CFL is short: in most cases, less than a year. In fact, in many parts of the world, LED replacements for CFLs are already on price-parity. That is the case in the United States[3] and in South Africa. Analysis in these markets has shown that LEDs are approximately 50% less expensive to own and operate than a CFL.

The examples below show the cost-effectiveness of LEDs compared with other lighting in South Africa and Uganda. Assuming the bulbs operate for 4 hours per day, the payback periods for LED lamps are only a matter of weeks – yet the lamps operate for years.



Item	Halogen	CFL	LED
Life	2000 hrs (2 yrs)	6000 hrs (6 yrs)	15000 hrs (15 yrs)
Price each*	R 21.99	R 29.99	R 29.99
Power	60 W	15 W	8 W
Use (3hr/day)*	65.7 kWh/yr	16.4 kWh/yr	8.8 kWh/yr
Elec cost.*	Rand 82.1/yr	Rand 20.5/yr	Rand 11.0/yr
10-year cost	Rand 953.2	Rand 265.3	Rand 139.5
Payback period		7 weeks	6 weeks

Figure 1. Payback Period for a General Service LED Lamp in South Africa

[1] The year selected should be the earliest date that would still allow countries to operationalise/domesticate the law necessary for this ban

[2] *Green Electrical Supply https://www.greenelectricalsupply.com/*

[3] *Electrical Engineering (EE) Times https://www.eetimes.com/whatever-happened-to-cfls/#*



Item	Incandescent	CFL	LED
Life	1000 hrs (1 yrs)	6000 hrs (6 yrs)	15000 hrs (15 yrs)
Price each	UGX 1850	UGX 7400	UGX 8150
Power	60 W	15 W	7.5 W
Use (4hr/day)	88 kWh/yr	22 kWh/yr	11 kWh/yr
Elec cost.	UGX 59,100	UGX 15,000	UGX 7,400
10-year cost	UGX 612,000	UGX 166,000	UGX 82,000
Payback period		7 weeks	6 weeks

Figure 2. Payback Period for a General Service LED Lamp in Uganda

Similar analysis of general service lamps in Madagascar found that the payback period of moving from incandescent bulbs to an LED retrofit is just 3.5 months. And the net-present value of the savings over a 10-year period (including bulb purchases and electricity to operate the bulb), discounted back to today's value is MAG 560,700. These savings – over half a million Malagasy ariary – far exceed the higher purchase price of the LED (which is MAG 16,100 more expensive than an incandescent lamp).

In Zambia, the payback period of moving from an incandescent lamp to an LED lamp is just 3.9 months. And, much like Madagascar, the net-present value of the energy savings over a 10-year period including bulb purchases and electricity, discounted back to today's value is ZMW 1078. Thus, in Zambia consumers will save over 1000 Kwacha (in today's currency) for every socket in their home where they replace an incandescent with an LED. These savings far exceed the additional 30 Kwacha that it costs to buy an LED lamp compared to an incandescent.

For each of the markets we have studied, we have found the same situation – LED lamps are the same price or very close to the price of CFLs, and because LED bulbs are twice as efficient as CFL, they are much less expensive to operate. Thus, the total cost of ownership – the total cost of light in the home - is roughly half with an LED bulb compared to the fluorescent, and there is no mercury. Payback periods were generally a matter of a few months. Finally, it should be noted that while some LED lamps can be purchased at US$1.00 per lamp, some of the better-quality ones are more expensive, costing two or three times as much. The prices used for our examples above were US$2.20-$3.00.

Environmental and health risks and benefits of alternatives: LEDs remove unnecessary risk of exposure to toxic mercury for consumers and workers when lamps break in homes, offices, schools, and businesses. They also reduce the amount of mercury contamination at landfill and waste sites due to improper disposal.

A 2016 report by the Danish Environment Protection Agency found that Denmark had achieved an overall bulb collection rate of only 36%, even though Denmark has one of the highest collection rates in the EU. In the United States, recycling rates have been reported at 29% for industry recycled fluorescent lamps and CFLs, and at only 2% for consumers[4]. In Africa, collected and properly recycled e-waste (not just lighting products) was at 4% in Southern Africa, 1.3% in Eastern Africa and close to 0% in other regions[5]. The small size and weight of bulbs makes them easy for consumers to mistakenly dispose of in general waste, and consumers may not be aware that they require special disposal. In addition, due to their fragility fluorescent bulbs break easily when discarded in general waste streams, releasing mercury into the environment and putting the health of workers and the public at risk.

In addition to the direct mercury use avoided through mercury-free alternatives, the energy savings associated with switching from fluorescent to LED lamps can also indirectly reduce mercury pollution by reducing the use of fossil-fuel generators or coal-fired power use. LEDs generally use 40% - 60% less electricity than a fluorescent lamp to generate the same level of light output.

[4] https://pubmed.ncbi.nlm.nih.gov/23635464/

[5] https://www.statista.com/statistics/1154659/ewaste-documented-recycling-africa/

II. Linear Fluorescent Lamps (LFLs)

Summary of Key Points for LFLs:

- **Overview**: LFL is an inefficient, expensive technology which contains mercury
- **Choice**: Mercury-free retrofits are available for virtually all LFLs; with tens of thousands of models available there is a wide selection of light output levels and white light colours
- **Economic**: LED retrofits are highly cost-effective, payback in less than one year for T8 LFL; LEDs cost 50% less than LFLs to buy and use; LED is the least life-cycle cost option
- **Technology**: LED continues to improve, getting cheaper and more efficient each year
- **Waste**: most fluorescent bulbs are not disposed of safely at end of life
- **Business**: Africa has many new local manufacturing companies producing LED lamps, but there is no manufacturing of fluorescent on the continent
- **Policy**: Some African countries are phasing out LFL based on energy savings and cost
- **Equity**: Risk that suppliers will dump more mercury lighting in Africa as fluorescent lamps are phased-out of the OECD

Linear Fluorescent Lamps (LFLs)

LFLs for general lighting purposes, including both triband phosphor ((which is a rare earth) and halophosphate phosphor lamps. Coverage includes LFLs of all diameters (e.g., T5, T8, T12), lengths, and shapes (e.g., straight, U-bend). Minamata currently covers LFLs which use triband phosphors up to 60 watts and LFLs that use halophosphate phosphors up to 40 watts, however, to avoid loop-holes and confusion in the market, this scope can be simplified to include all LFLs.



Based on the economic feasibility and environmental and public health benefits of eliminating mercury-added LFLs, and considering the near-universal availability of mercury-free alternatives, these products should be banned for manufacture, import and export by 2025. LFLs are declining in sales around the world thanks to the market adoption of LED retrofit tubes. In Europe, all T2 and T12 LFL lamps will be banned by the Ecodesign Directive from 1 September 2021. The most popular lengths of T8 LFLs (2-foot, 4-foot and 5-foot) will be banned by Ecodesign from 1 September 2023.

Availability of mercury-free alternatives: Linear fluorescent tubes are commonly used in offices, hospitals, schools and other areas which have the lights on for long periods of time. Today there are literally tens of thousands of mercury-free LED replacement lamps available to replace fluorescent tube lamps, and they are available in virtually any size, length, ballast type, color temperature, and light output level. These LED products are designed as direct retrofits into fixtures originally designed to accept fluorescent tubes. In this way, the mercury-free LED tubes are simple drop-in replacements that completely avoid the need for rewiring that was present in some of the first-generation LED tubes.[6]

Technical feasibility of alternatives:
The issue of LED retrofit lamp compatibility relates to the ballast installed in the existing fluorescent fixture. There are two types of ballast (the primary electronics component) in fluorescent fixtures: magnetic (also called "choke") ballasts, which are the most common type in Africa and around the world, and electronic ballasts. All magnetic ballasts are 100% compatible with LED retrofit lamps, supporting simple like-for-like replacement. For electronic ballast fixtures, the rates of compatibility range from 80 to 99% (as per manufacturer declarations). Compatibility can be assessed by consulting with suppliers and published literature. A spreadsheet providing compatibility information for several of the largest global suppliers is posted on the Minamata Secretariat's website.[7]

[6] Assessing Annex III Fluorescent Lamp Exemptions in the Light of Scientific and Technical Progress: Report to the Committee on the Restriction of Hazardous Substances, Swedish Energy Agency, Feb 2020.

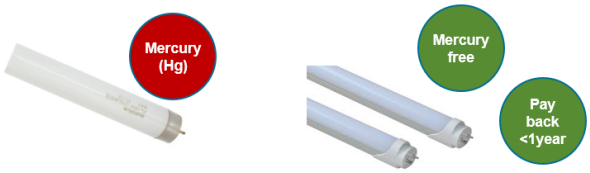
[7] Please click on this link to download the Excel spreadsheet:

For LFL configurations that are not readily available for purchase, research shows that the main barrier is lack of demand not technical impediments. Custom manufacturing is widely advertised for LED lamps of any length, base type, wattage, color rendering index, and color temperature with delivery lead times as short as one month.

In the market today, LED retrofit lamps are available and match all the color rendering indexes (CRI) of fluorescent lamps. Fluorescent lamps range from 77 to 98, and LED replacements for those lamps range from 80 to 98 CRI. As with CRI, there is no technical barrier to LED lamps producing all of the correlated color temperature (CCT) values as those of fluorescent lamps – the CRI is a product design decision that is made when selecting LEDs for the lamp. Fluorescent lamps are available from 2700K to 12,000K, and LED retrofits are available from 2700K to 20,000K, so LED represents an expansion of the available CCT range.

Economic feasibility of alternatives: The replacement of LFLs with mercury-free alternatives is highly cost-effective. In general, the initial investment in LED retrofit lamps is recovered within one year, with the marginal up-front cost differential offset within just a few months by the substantial energy savings. Replacement lamps also offer labor cost savings due to their longer life spans, typically twice that of LFLs. The short payback periods for LED replacement lamps are typically a key feature advertised by manufacturers, along with other benefits associated with LED lighting (Dansk Supermarked[8], Denmark and Verhoef Access Technology[9], The Netherlands).

An example of a cost-payback calculation with LED retrofit bulbs is shown for South Africa below. We compared a ZAR 49.00 T8 linear fluorescent lamp at 36W (16,000 hours life) with an LED retrofit lamp which is rated for more than double the lifetime and consumes only 18W but produces the same light. Assuming operation for 10 hours per day and R1.25/kWh, the LED option offers a payback of 10 months compared to the fluorescent (and will last 2.5 times longer than the fluorescent lamp). These calculations reflect energy costs and bulb costs, but do not incorporate labor costs saved over time from reduced frequency of bulb changes.



Item	Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	16000 hrs	40000 hrs (~11 years)
Lamp Price*	**R 49.00**	**R 119.00**
Power	36 W	18 W
Use (10 hr/day)*	131 kWh/yr	66 kWh/yr
Elec cost.*	R 164.25/yr	R 82.13/yr
10-year total lighting cost	R 1600	R 862
Payback period		10 months

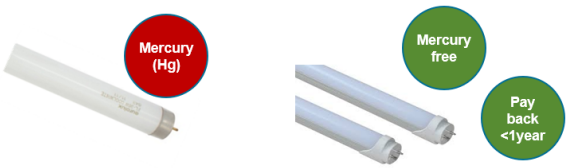
Figure 3. Payback Period for a T8 Magnetic Fluorescent Lamp, South Africa

In Uganda, the payback period for the same LED retrofit bulb is even shorter because the difference in first cost between the fluorescent and the LED tube from the wholesaler is not as large as in South Africa. In both countries the payback period is less than one year.

http://www.mercuryconvention.org/Portals/11/documents/meetings/COP4/submissions/CLASP_AnnexAB_spreadsheet.xlsx

[8] https://www.lighting.philips.com/main/cases/cases/food-and-large-retailers/dansk-supermarked

[9] https://www.lighting.philips.com/main/cases/cases/industry-and-logistics/verhoef-access-technology



Item	Linear Fluorescent Lamp	Equivalent LED Retrofit
Life	16000 hrs	30000 hrs
Lamp Price	**UGX 12,500**	**UGX 30,000**
Power	36 W	18 W
Use (10 hr/day)	131 kWh/yr	66 kWh/yr
Elec cost.	UGX 88,700/yr	UGX 44,350/yr
8-year total lighting cost	UGX 732,300	UGX 384,800
Payback period		5 months

Figure 4. Payback Period for a T8 Magnetic Fluorescent Lamp, Uganda

The economic case for LED retrofit tubes is improving across Africa as more suppliers enter the market, and new businesses are established that offer these products to consumers.

Environmental and health risks and benefits of alternatives: LED retrofit lamps remove the risk of mercury exposure and pollution associated with the use and breakage of LFLs. Industrial, commercial, and multi-family residential building staff, who may handle large quantities of LFLs, are particularly at risk from this exposure route, as are waste management workers.

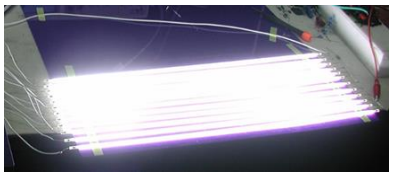
III. Cold Cathode Fluorescent Lamps (CCFLs) & External Electrode Fluorescent Lamps (EEFL)

Summary of Key Points for CCFLs and EEFLs:

- **Overview**: CCFL and EEFL are an old, outdated technology that was used for back-lighting LCD electronic displays about 20 years ago; these lamps have been replaced by LED backlights in new displays starting in 2008
- **Technology**: today, LED backlight units have completely replaced CCFL/EEFL; no new displays are being made with this old technology anymore
- **Waste**: the clause allowing for spare parts could be retained in Minamata to enable end-users to continue using old monitors, but this is considered to be a very small (non-existent?) market

CCFLs and EEFLs

CCFLs and EEFLs used in electronic displays are exempted from the Minamata Convention in the following size categories:
a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp
b) medium length (> 500 mm and ≤ 1500 mm) with mercury content exceeding 5 mg per lamp
c) long length (> 1500 mm) with mercury content exceeding 13 mg per lamp





This product group was used in flat screen television technology until about ten years ago. These very narrow tubes were used in backlit display units, but have since been replaced by LED, and CCFL/EEFL technology has been phased out of the market. This category of fluorescent bulb is defunct and the exemption can be retired immediately. We propose ending the exemption in 2024 along with that for CFLs, for implementation convenience.

A paper[10] published in 2018 in *Waste Management & Research: The Journal for a Sustainable Circular Economy* summarized the situation of this technology on the market:

> *"Cold cathode fluorescent lamps (CCFLs), with mercury as their essential component, were widely used as backlight in liquid crystal display (LCD) appliances before 2008. Since 2008, the mercury-free light emitting diode started to be used as a substitute for CCFLs and the replacement finished in about 2014. Nowadays, CCFLs are obsolete products from the viewpoint of manufacture."*

It should be noted that in the preamble text of Annex A in the Minamata Convention, an allowance is made for CCFL and EEFL where they are being supplied as a spare part:

> *(c) Where no feasible mercury-free alternative for replacement is available, switches and relays, cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays, and measuring devices;*

This text can remain in the Convention, to allow for exceptional cases where old electronic displays are still in use and people wish to continue to use them. However, this is very rare as LED has been the dominant display backlighting unit for well over a decade.

Other relevant information pursuant to Decision MC-3/1

1. Progress on energy efficiency policies

Over the last two years, significant progress has been made in the development of quality and performance standards for lighting products across Southern and Eastern Africa. A project called "Energy Efficient Lighting and Appliances" (EELA) is currently developing regionally harmonised quality and performance standards for lighting and appliances. This work is carried out through the two Regional Centres for Renewable Energy and Energy Efficiency - EACREEE in the EAC (located in Kampala, Uganda) and SACREEE in SADC (located in Windhoek, Namibia) - and in cooperation with the two regional standardization bodies - the East African Standards Committee (EASC) and SADC Cooperation in Standards (SADCSTAN).

The EELA project has been actively engaged for the last 18 months developing quality and performance standards for all lighting products – both lamps and luminaires. These standards cover both general service lamps (including CFLs) and linear lamps (including LFLs) and establish minimum efficacy requirements that exceed the values that fluorescent technology can achieve. Thus, these standards effectively phase out fluorescent bulbs.

Through the development, implementation and enforcement of new, harmonised energy-efficiency regulations for lighting, the region will not only enjoy improvements in energy security and economic development, but will also reduce energy bills for households and businesses and improve lighting quality. These standards are in the final stages of review and adoption at this time, and will affect 21 countries across SADC and EAC.

In parallel to this significant regional development, several African countries are working to update their national lighting regulations, to phase out fluorescent lighting and transition to more energy-efficient, mercury-free LED. On 1 March 2021, South Africa published compulsory specifications for energy efficiency and functional performance requirements of general service lamps in the Gazette for a 60-day comment period.[11] This regulation, which the EELA specification is modelled after, phases out CFLs.

In 2020, Kenya adopted standards for general lighting LED products[12] and is in the process of updating the standards to include higher efficacy requirements for all lighting technologies. Cote d'Ivoire approved minimum energy performance standards (MEPS) for lighting in 2018 (NI 3011) and updated the standards in 2019 to include MEPS for LED lighting products. While Burkina Faso and Gabon do not have specific lighting regulations, both countries have national strategies to support implementation of their energy policies.

[10] https://journals.sagepub.com/doi/10.1177/0734242X18785727

[11] https://archive.opengazettes.org.za/archive/ZA/2021/government-gazette-ZA-vol-669-no-44210-dated-2021-03-01.pdf

[12] Please copy this link to your browser to download the standards list:

https://www.kebs.org/index.php?option=com_phocadownload&view=category&download=115:sac-approved-list-of-kenya-standards-april-2020&id=62:year-2020&Itemid=253

The sale of incandescent lamps has been banned in multiple countries such as Cote d'Ivoire, Mauritius, South Africa and Ghana. To support these bans, many countries carried out trade-in programmes with consumers to actively encourage the transition from incandescent lamps to more efficient technologies. Mozambique and Eswatini are developing the necessary regulation to implement bans on incandescent technology.

This sample of countries illustrates the trend towards more energy efficient, lower life-cycle cost and safer mercury-free LED lighting.

2. Equity and anti-dumping considerations

Environmentally harmful dumping[13] is the practice of exporting products to another country or territory that:

- Contain hazardous substances;
- Have environmental performance lower than is in the interest of consumers or that is contrary to the interests of the local and global commons, or
- Can undermine the ability of the importing country to fulfil international environmental treaty commitments.

African countries are at risk of becoming dumping grounds for mercury-containing lamps that no longer have a viable domestic market in their places of origin. As lighting markets in wealthy countries shift to clean LED lighting, less-regulated markets may experience "environmental dumping" of old fluorescent technologies. Manufacturers that cannot sell mercury-laden, inefficient lighting products in their own markets will export to un- and under-regulated markets – largely in developing economies.

In addition, proper end-of-life lamp management including waste separation and collection, transport, disposal, and mercury recovery remains a main concern in African countries. In most countries where there are systems in place for electrical and electronic waste management, recycling is still limited. A 2016 report by the Danish Environment Protection Agency found that Denmark had achieved an overall bulb collection rate of only 36%, even though Denmark has one of the highest collection rates in the EU. In the United States, recycling rates have been reported at 29% for industry recycled fluorescent lamps and CFLs, and at only 2% for consumers.[14] In Africa, collected and properly recycled e-waste (not just lighting products) was at 4% in Southern Africa, 1.3% in Eastern Africa and close to 0% in other regions.[15]

Recycling facilities for fluorescent lighting are not widely available. The UNEP Global Mercury Partnership Catalogue of Technologies and Services on Mercury Waste Management[16] identifies service providers of mercury waste management, including for mercury-containing lighting. The majority of facilities listed are located in the US and the EU, with only a few in developing countries and one facility in Africa (South Africa).

3. LEDs improve livelihoods in rural areas

The lighting technology used in portable (pico-) solar lanterns has changed over the years, and is reflective of the change now taking place in on-grid lighting systems. In 2008, the solar lantern lighting technology primarily relied upon CFLs as reflected in the IEC standard, IEC/TS 62257-9-6 Edition 1.0 2008 which set quality and performance standards for pico solar lighting systems, including CFL. IEC reviewed this standard and in the most recent edition, IEC/TS 62257-9-6 Edition 2.0 2019, it has shifted to an all LED based standard.

Today, all pico-solar lanterns are based on LED lighting technology – which due to its high efficiency and durability allows for better quality light that lasts longer and is less expensive. Advances in LED efficacy, coupled with falling prices and longer run-times, reduce the size and cost of the solar PV and batteries needed for energy services, making energy more affordable for low-income consumers and enabling multiple energy services to run simultaneously with a solar home system, i.e. mobile phone charging, fans, refrigerators, etc, alongside solar lights.

[13] Andersen, Stephen O., Ferris, R., Picolotti, R., Zaelke, D., Carvalho, S., Gonzalez, M. (2018). Defining the legal and policy framework to stop the dumping of environmentally harmful products. Duke Environmental Law & Policy Forum: Vol. XXIX:1. http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1356&context=delpf

[14] https://pubmed.ncbi.nlm.nih.gov/23635464/

[15] https://www.statista.com/statistics/1154659/ewaste-documented-recycling-africa/

[16] https://wedocs.unep.org/bitstream/handle/20.500.11822/27819/WMA_catalog.pdf?sequence=1&isAllowed=y