

Roadmap to Mercury-Free Lighting Transition in Japan:

How Japan can join global efforts to phase-out fluorescent lighting and accelerate a domestic transition to LED

I. Overview

Japan is on a path to stall a global transition to efficient, mercury-free LED lighting by preventing efforts under the Minamata Convention to phase-out fluorescent lamps by 2025. Around the world, a transition to 100% LED markets is taking place as the technology has become highly accessible and affordable. However, Japan's lighting market transition to LED has fallen behind due to national policies that are limiting LED accessibility for Japanese consumers. Japan is thus seeking to delay the phase-out of mercury-containing fluorescent lamps proposed under the Minamata Convention, hindering international progress.

Despite these challenges, Japan can hasten implementation of national policies to ensure Japanese consumers have access to safe, efficient and quality LED technologies. Fluorescent lamps currently represent the largest share of mercury demand in Japan. By phasing out fluorescent lighting in 2025, Japan would avoid the installation of 523 million linear fluorescent lamps and achieve electricity savings of 419 terawatt-hours.

While addressing their national policy, Japan should not block the global shift to LED sought by Parties to the Minamata Convention on Mercury. Instead, **Japan should support a 2025 phase out date for all fluorescent lighting or register for an exemption pursuant to Article 6 to allow the country's LED market to catch up while not stalling global progress.**

This document provides an overview of the Japanese lighting context, and recommendations for policy actions to accelerate the global and domestic transition to LEDs by 2025.

II. Advances in LED technology globally and in Japan

Major advances in light-emitting diode (LED) technology over the last decade have accelerated the transition from fluorescent lighting toward more efficient, mercury-free, LED lighting. Globally, direct, drop-in replacement LED lamps are highly cost-effective and compatible with over 90% of existing fluorescent fixtures in buildings and homes. These LED retrofits are widely available in online and physical retail shops. In Japan, however, due to

safety standards and other obstacles, consumers are not able to use some retrofit LED lamps in existing fluorescent lighting fixtures (more details in section VI).

In 2022, the global LED lighting market was valued at an estimated US\$71 billion and is projected to grow at a compound annual growth rate (CAGR) of 11.0% from 2023 to 2030. Japan was positioned well to be a global leader at the start of the LED transition. The country was one of the earliest countries to implement industry-focused policies to adopt LED lighting. Japan announced a national target of 100% LED sales by 2020 and a full conversion of lighting stock to LED by 2030.¹ In 2019, Japan exported \$0.66 billion (21%) of total global exports of LED packages and chips for general lighting packages, placing Japan second behind Malaysia as the biggest exporter of these components. **However, in subsequent years, Japan delayed its ambitious domestic LED market plan and today – in 2023 – remains a heavy user of fluorescent lighting.**

The **2014 Nobel Prize in Physics** was awarded to Japanese physicists Isamu Akasaki and Hiroshi Amano at Nagoya University, and Japanese-born Shuji Nakamura at the University of California Santa Barbara, for the invention of energy-efficient blue LEDs. Their invention has enabled bright, energy-saving and environmentally friendly white light sources. As stated by the Royal Swedish Academy of Sciences, "incandescent light bulbs lit the 20th century; the 21st century will be lit by LED lamps."

III. Lighting & The Minamata Convention on Mercury

The [Minamata Convention on Mercury](#) is a global environmental treaty adopted in 2013. It is named after Minamata Bay in Japan where, in the mid-20th century, methylmercury-contaminated industrial wastewater released into the Bay poisoned thousands of people, leading to severe health damage that became known as "Minamata Disease."

Since entering into force on 16 August 2017, 141 governments (Parties) have ratified the Minamata Convention to date. The Parties are working together to reduce the supply, use and release of mercury, raise public awareness, and build the necessary institutional capacity to *Make Mercury History*.

Despite significant progress to reduce mercury, the Minamata Convention includes special exemptions for mercury-containing fluorescent lighting products. While these fluorescent exemptions may have been necessary in 2013 when the Convention was adopted, lighting technology has moved on rapidly – and today in the rest of the world, the accessibility and

¹ In 2010, Japan promoted "Green Innovation" initiatives as a core concept of the "New Growth Strategy" and the "Strategic Energy Plan". The basic policy decided by the Cabinet was to achieve 100% sales of next generation LED and OLED by 2020 and 100% of lighting stock by 2030: <https://www.env.go.jp/council/06earth/y060-120/y060-120%EF%BC%8Fref05.pdf>

affordability of mercury-free LED retrofit lamps makes the aforementioned fluorescent lamp exemptions unnecessary.

IV. Proposed Lighting Amendments to Phase-out Mercury in Lighting

In response to the significant advances in LED technology, in 2021, 36 governments representing the African region submitted an Amendment proposal to the Fourth Conference of Parties (COP4) of the Minamata Convention to accelerate the phase-out of fluorescent lighting – both compact fluorescent lamps (CFLs) and linear fluorescent lamps (LFLs) – in favour of a global transition to mercury-free LED alternatives. At COP4, 137 Parties agreed to phase out integrally ballasted CFLs by 2025 – a significant achievement, but they delayed taking a decision on the phase-out of LFLs until COP5 in October 2023.² **Despite demonstrated commitment to protect human and environmental health from the risks of mercury³, Japan was one of a few countries pushing to delay action to phase-out LFLs.**

According to the Clean Lighting Coalition⁴, if the Minamata Convention adopts a 2025 phase-out year for all fluorescent lighting, the cumulative global savings through 2050 would amount to:

- 227 metric tonnes of mercury avoided (lamps and power plant emissions);
- US \$1.48 trillion in electricity bill savings; and
- 3.5 gigatonnes of carbon dioxide avoided – the equivalent of approximately three and a half times the annual CO₂ emissions of Japan.

Each year the phase out of LFLs is delayed after 2025 significantly diminishes global benefits. If the Convention adopts a 2027 phase-out date (a two-year delay compared to 2025), the mercury savings would be reduced by 36 metric tonnes. In turn, the world would be burdened with US \$221 billion more costs on their electricity bills and an excess of 600 million metric tonnes of CO₂ will be released to the atmosphere.

² Minamata COP-4 closes with global commitment to evaluate, expand and strengthen the efforts against toxic mercury. Minamata Convention on Mercury. <https://mercuryconvention.org/en/news/minamata-cop-4-closes-global-commitment-evaluate-expand-and-strengthen-efforts-against-toxic>

³ See section V for more on Japan's efforts to mitigate mercury risks.

⁴ For information on the Clean Lighting Coalition savings estimates: <https://cleanlightingcoalition.org/>

V. Japan and the Minamata Convention on Mercury

In 2017, Japan became the 23rd country to ratify the Convention. Japan mobilized quickly after ratification to prohibit the manufacture, import and export of mercury-added products listed in Annex A, three years earlier than the Convention required (2020).⁵ Japan also launched the MOYAI Initiative to support developing countries by sharing Japan's advanced mercury management technology and expertise.⁶

In addition to ratifying the Convention, Japan has several national initiatives aimed at mitigating the risks posed by mercury – such as the Act on Preventing Environmental Pollution of Mercury and amending their Air Pollution Control Act in 2015. Japan remains an active Party in the Convention, working to bring countries together to resolve differences and achieve ambitious phase-out dates for mercury added products.

However, Japan recently submitted a comment⁷ to the Minamata Secretariat which indicates that the country seeks to delay the phase-out of mercury-containing fluorescent lamps due to safety risks – **the comment does not acknowledge the reality that unlike the rest of the world, Japan has no safety standards for retrofit LED lamps.** Globally, LED lamps and lighting fixtures comply with IEC international safety standards. However, **Japanese lighting fixtures have their own safety standards, which are different from the rest of the world.** Japan's comment is misleading and not representative of other Parties' lighting market situations where IEC safety standards have been adopted to facilitate the use of LED retrofit lamps, in combination with other LED replacement options such as rewiring and full fixture replacement.

VI. Japan Lighting Safety Standards Do Not Align with International Best Practices

Japan appears to have used its minimal safety standards to control its market and slow the rate of transitioning fluorescent fixtures to LED. While the rest of the world adopted the International Electrotechnical Commission's (IEC) safety standards for LED retrofit lamps designed as a direct replacement⁸ for LFLs (IEC 62776:2014⁹), Japan did not.

⁵ Japan. Minamata Convention on Mercury. <https://mercuryconvention.org/en/parties/jpn>

⁶Minamata convention on mercury. Ministry of the Environment, Government of Japan. <https://www.env.go.jp/en/chemi/mcm.html>

⁷ https://mercuryconvention.org/sites/default/files/inline-files/Japan_AnnexA.pdf

⁸ Direct replacement LED retrofit tubes do not require rewiring or removal of ballasts. Also, referred as ballast-compatible LED retrofit tubes.

⁹ IEC 62776:2014 | IEC International Electrotechnical Commission | Double-capped LED lamps designed to retrofit linear fluorescent lamps - Safety specifications. <https://webstore.iec.ch/publication/7425>

Furthermore, Japan did not develop its own national safety standard for retrofit LED tubes. In the absence of safety standards for retrofit LED lamps, Japanese consumers and businesses are put at risk when installing retrofit LED lamps into existing fluorescent fixtures – a hazard that the rest of the world does not face. Additionally, LED retrofit lamps are not covered in Japan’s Electrical Appliance and Material Safety Law, which is the primary regulatory instrument to address safety risks and avoid hazards from electrical equipment.¹⁰

Japan did develop safety standards for a variety of LED lighting products such as fixtures and mains-voltage LED tubes¹¹, but notably not for LED retrofit tubes that operate on the fluorescent ballast – the most convenient way to upgrade from fluorescent to LED. In the global market, a majority of consumers have access to fluorescent ballast-compatible LED tubes which can be installed in existing fluorescent fixtures without any modification. LED retrofit tubes that require wiring modification offer another widely used solution. Governments around the globe ensure feasible and safe transition to LED lighting through enforcement of the relevant IEC safety standard for that product.¹²

Rather than give its citizens this option, **Japan’s government and the lighting industry have instead conducted national communications campaigns highlighting the danger and risk of switching to LED retrofit tubes.**^{13,14} Japan’s Consumer Affairs Agency (CAA) noted that in the transition period from fluorescent to LED lighting, consumers must be aware of compatibility and the extent of deterioration of fluorescent fixtures before installing new lamps. The Japanese Lighting Manufacturers Association (JLMA) reminded consumers that fluorescent fixtures that have been modified will no longer have safety warranty – indirectly discouraging use of LED bulbs in existing fluorescent fixtures. **These**

¹⁰ To date, there are 457 items designated in the Cabinet Order of the Electrical Appliances and Materials Safety Act – 116 items in Category A (Specified), 341 items in Category B (Non-specified). Electrical appliances and materials safety act / METI ministry of economy, trade and industry. (2023, April 13). 経済産業省のWEBサイト (METI/経済産業省) (METI/経済産業省) . <https://www.meti.go.jp/english/policy/economy/consumer/pse/index.html>

¹¹ JIS C 8154 in 2009 for LED modules used in general lighting, JIS C 8156 in 2011 for LED bulbs, JIS C 8159a in 2013 and IEC 62931 in 2017 for LED tubes with GX16t-5 fitting type, and JLMA 301 in 2020 for G13 ballast-bypass LED retrofit lamps with one-side power input.

¹² IEC 62776:2014 - Double-capped LED lamps designed to retrofit linear fluorescent lamps - Safety specifications, <https://webstore.iec.ch/publication/7425> ; IEC 62031:2018 - LED modules for general lighting - Safety specifications <https://webstore.iec.ch/publication/30600> ; IEC 62612:2013 - Self-ballasted LED lamps for general lighting services with supply voltages > 50 V - Performance requirements <https://webstore.iec.ch/publication/7259> ; IEC 62560:2011 - Self-ballasted LED-lamps for general lighting services by voltage > 50 V - Safety specifications <https://webstore.iec.ch/publication/7199>

¹³ News Release – Use LED Lighting Correctly. If you use it in incorrect fixtures, it may cause smoke or fire. Consumer Affairs Agency, the Government of Japan. 27 Mar 2019.

https://www.caa.go.jp/policies/policy/consumer_safety/release/2018/pdf/consumer_safety_release_190327_0001.pdf

¹⁴ (2019, April 15). As LED bulbs catch on in Japan, consumer affairs agency issues public fire warning. The Japan Times. <https://www.japantimes.co.jp/news/2019/04/15/business/consumers-switch-led-bulbs-consumer-affairs-agency-issues-fire-warning/>

communications efforts have greatly influenced Japanese consumers' perception of LED safety and coupled with the lack of safety standards, restrict options for cost-effective direct retrofit LED lamps.

Despite the growing global market shift to LED, Japan's transition away from fluorescent lamps is moving at a slow pace. Even though new fixture sales are almost entirely LED, sales of fluorescent lamps are still very high, with the decline in LFL sales recently halted by the CAA and JLMA campaigns. Annual demand for LED lamps remains relatively stagnant, not showcasing growth as seen in other lucrative national markets. **Japan is lagging behind the world, costing people and businesses billions of Yen and putting public health at risk of mercury exposure.**

VII. Policy Recommendations to Accelerate Japan's Transition to 100% LED

Despite these challenges, Japan can hasten implementation of national policies to ensure Japanese consumers have access to safe, efficient and quality LED technologies.

The following policy recommendations offer Japan a roadmap to accelerate the transition to mercury-free, safe and energy-efficient LEDs.

- 1. The Japan Delegation to COP5 can support the 2025 global phase-out of fluorescent lamps or apply for an exemption under the Minamata Convention to avoid blocking the global transition to LED lighting in 2025,** enabling the Convention to help governments to protect the planet's climate and human health. At the Minamata Convention on Mercury's Fourth Conference of the Parties (COP4), Japan and a few other parties stalled global progress, arguing for 2027 as the phase-out date for the manufacture, import and export of linear fluorescent lamps (LFLs). A report¹⁵ from lighting experts found that each year of delay after 2025 significantly diminishes global benefits - approximately 300 Mt of CO₂ emissions are lost for each year of delay, whereas 178 metric tonnes of mercury can be avoided if the Parties choose 2025 as the phase-out date. **At the upcoming Conference of the Parties fifth meeting (COP 5), the Japanese Delegation can support the [Proposal by Botswana and Burkina Faso, on behalf of the Africa region, to amend Part I of Annex A to the Minamata Convention on Mercury to eliminate fluorescent lighting](#) which proposes to phase-out all remaining fluorescent lighting by 2026 latest.**

¹⁵ <https://cleanlightingcoalition.org/resources/global-report/>

2. **The Government of Japan can work with municipalities to promote the replacement of fluorescent fixtures through subsidy programmes.** In Japan, some prefectures and cities are already running replacement programmes to accelerate the replacement of fluorescent fixtures with LED alternatives (e.g., [Fukushima](#), [Hiroshima](#), [Kyoto](#), [Osaka](#) and [Noshiro](#)). These programmes accelerate the business-as-usual approach and enable the citizens of those prefectures and cities to benefit from the transition to LED – immediately cutting energy and CO₂ emissions, while removing toxic, inefficient fluorescent lamps from their homes and buildings.

3. **The Government of Japan can develop a national policy to ban fluorescent lamps in 2025 and accelerate the transition to 100% LED lighting.** The Japanese Government should adopt a national policy that bans fluorescent lamps in 2025, thus ensuring that all replacement bulbs sold henceforth are LED. To support this effort, the Japanese Lighting Manufacturers Association (JLMA) should extend their existing safety standard ([JLMA301:2020](#)) to include retrofit linear and non-linear LED lamps that do not require rewiring of the ballast. LED retrofit lighting compliant with the updated JLMA301¹⁶ could be disseminated rapidly to support a 2025 fluorescent phase-out. **Japan should establish a policy for the widespread promotion of JLMA301-compliant LED retrofit lighting along with policies and programmes for converting fluorescent lamp fixtures entirely to LED lighting fixtures as soon as possible.**

4. **Japan should include retrofit LED lighting in the Electrical Appliance and Material Safety Law.**
 Retrofit LED tubes, both linear and non-linear, can enable a smooth transition of all fluorescent fixtures to LED. Upon installation these technologies immediately enable energy saving and CO₂ emission reductions, while also removing toxic, inefficient fluorescent bulbs from homes and businesses. In Japan, retrofit LED tubes are not

¹⁶ JLMA 301:2020 AC Direct G13 Base Straight Tube LED Light Source - Safety Standard.

<https://www.jlma.or.jp/siry/pdf/kokai/JLMA301.pdf>. JLMA 301 is technical standard established by the Japan Lighting Manufacturers Association to ensure the safety of AC direct-coupled G13 base straight tube LED light sources with built-in LED controllers (power supply circuits). When converting lighting to LED, it is recommended to replace it with LED lighting fixtures. In addition, there have been dangerous accidents in which smoke or fire occurred inside the lamp, causing the lamp to fall. In order to avoid such serious accidents, "JLMA301" was enacted.

covered by the Electrical Appliance and Material Safety Act (EAMSA), and thus no safety standard for retrofit LED lighting exists in Japan. Outside of Japan, the international community follows the IEC safety standard [IEC 62776:2014](#) which ensures safety for citizens and businesses globally. **Japan should add LED retrofit lamps to EAMSA to prioritise the health and safety of Japanese citizens over the commercial interests of the lighting businesses.** Once this is done, the Japanese lighting market can rapidly follow the trend around the world to easily shift towards energy-efficient, mercury-free LED tubes – catalysing widespread benefits from lower energy bills and CO₂ emission savings.

- 5. Grow Local LED Industry.** LED lighting continues to dominate market share and will soon be the sole lighting technology on the market, due to its efficiency and cost-effectiveness. Japanese industry used to be at the forefront of this industry, and industry has led efforts to stop the production of fluorescents fixtures¹⁷. Today, Japan's government has an opportunity to take advantage of the growing LED export market, leveraging innovation and expertise to grow the domestic LED lighting industry. By encouraging and promoting LED exports, Japan will once again be a world-leader in the LED lighting market.

VIII. LEDs Support National Climate & Environment Commitments

According to the Ministry of Environment¹⁸, lamps represent the largest share (35.4%) of mercury demand in Japan, equating to 3.3 tonnes annually¹⁹. Stopping the production and consumption of fluorescent lamps offers a clear solution – eliminating issues with lighting-based mercury waste management. Further, removing fluorescent lamps from offices, schools, homes and other community buildings eliminates the health risk of mercury exposure when a fluorescent bulb breaks.

Shifting demand to energy-efficient LED lamps in Japan will support a global transition to an all-LED lighting market by 2025 – an essential deadline to achieve carbon neutrality by 2050, according to the International Energy Agency.

¹⁷ Panasonic in March 2019: <https://www2.panasonic.biz/jp/lighting/conventional/fluorescent/>

¹⁸ <https://www.env.go.jp/chemi/tmms/keiken.html>

¹⁹ Other statistics from the Ministry of Environment (2017) found that the use of mercury in lighting was 25% out of a total 5.6 ton of material flow of mercury in Japan.

- Japan can capture significant national savings and benefits from phasing-out fluorescent lighting. If all fluorescent lighting were phased out in 2025, Japan would avoid the installation of 523 million linear fluorescent lamps, which, combined with the CFL phase-out adopted at COP4 of Minamata in 2025, **would avoid 4.5 metric tonnes of mercury in the lamps alone**. This would contribute to savings of over US \$96.4 billion dollars and 419 terawatt-hours of electricity and avoid 92.2 million metric tonnes of CO₂ between 2025 to 2050.

Transitioning to LEDs Bolsters Eight SDGs

Switching to mercury-free LED lighting brings significant cost savings for people, businesses and governments and is aligned with eight of the United Nations' Sustainable Development Goals, as noted below.

SDG 3. Good Health and Well-Being. Phasing out mercury-laden fluorescent lamps will help to achieve objective 3.9 which seeks to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

SDG 7. Affordable and Clean Energy. Switching to cost-effective LED lighting will save energy as LEDs use half the power required by fluorescent lighting to provide the same service. This supports objective 7.1 on universal access to affordable, reliable and modern energy services.

SDG 8. Decent Work and Economic Growth. Supporting the phase-out of fluorescent lighting would reduce occupational exposure to mercury and help to achieve objective 8.8, which aims to protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those in precarious employment situations.



SDG 10. Reduced Inequalities. Banning the sale and export of fluorescent lighting will help achieve objective 10.4 which calls on countries to adopt policies, including social protection policies, that will progressively achieve greater equality. It will also contribute to objective 10.5, which calls for a framework to implement these policies. Banning fluorescent lights prevents emerging economies from becoming a dumping ground for toxic, inefficient lighting and promotes access to safe, efficient, clean LED lighting for all.

SDG 11. Sustainable Cities and Communities. Replacing fluorescent lights with LEDs will eliminate the risks associated with managing hazardous wastes, and contribute to objective 11.6; to reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

SDG 12. Responsible Consumption and Production. The Minamata Convention requires Environmentally Sound Management of products containing mercury (including fluorescent lighting) which directly links to objective 12.4; to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, [...] and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

SDG 13. Climate Action. Phasing out fluorescents, through the Convention would provide Parties with a global framework for eliminating inefficient, mercury-laden lighting and contribute to objective 13.2; to integrate climate change measures into national policies.

SDG 14. Life Below Water. Island states and arctic countries are particularly exposed to transboundary mercury pollution in the water which presents a threat to the ecosystem and communities who rely on fish as the main source of food. Replacing fluorescent lights with LED would contribute to preventing water contamination, and support objective 14.1 to prevent and significantly reduce marine pollution of all kinds.

Conclusion

Phasing out the manufacture, import and export of mercury-containing fluorescent lighting will support Japan to reach climate, environment and health targets. While the country faces unique challenges in achieving a 100% LED market, several policy interventions can accelerate the domestic and international transition to mercury-free lighting.

The Government of Japan, with support from the Japanese Lighting Manufacturers Association, can:

- At the minimum, support the Proposal by Botswana and Burkina Faso, on behalf of the Africa region, to amend Part I of Annex A to the Minamata Convention on Mercury to eliminate fluorescent lighting at the upcoming Conference of the Parties fifth meeting (COP5);
- Develop a national policy to ban fluorescent lamps in 2025. The policy can accelerate the transition to 100% LED lighting and allocate resources to municipalities to promote the replacement of fluorescent fixtures through subsidy programmes;
- Include retrofit LED tube lighting in the Electrical Appliance and Material Safety Law; and
- Support local LED industry growth to meet rising domestic demand for LED products.

Switching to LEDs will support eight UN Sustainable Development Goals, while offering an opportunity for economic growth and industry development.