

Global **Mercury** **Waste** Assessment

Review of Current National Measures



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Foreword

Mercury is used in a wide range of products and applications, including fluorescent lamps, batteries, dental amalgam, artisan gold mining and even some mascaras. The poor handling and disposal of such products can damage our health and our environment, yet there has been insufficient assessment of mercury waste management. As we approach the inaugural Conference of the Parties to the Minamata Convention on Mercury, this report provides the first such global overview.

The ratification and entry into force of the Minamata Convention is a great achievement, giving the world the first such environmental health agreement in nearly a decade. However, it is just the start of a huge global effort to bring mercury under control. This report makes a vital contribution to that work by taking stock of existing waste management practices in several countries.

When it comes to mercury, the consequences of poor waste management are clear. Far too many are people condemned to a life of suffering, in some cases from before they are even born. I witnessed the impact of this at the Hotto Hausu Vocational Program in Minamata. It is from here that the Convention takes its name to honour the thousands poisoned by industrial waste dumping. Among those I was privileged to meet was Masami Ogata, who has carved over 4,000 commemorative dolls using trees from a forest that now covers part of Minamata Bay. He gives them to people who can share these stories to build a better life for victims and help prevent any more. One has pride of place in the UN Environment Executive Office to remind everyone who passes that any convention or report is only as good as the action it helps to deliver and the lives it protects.

The time is right for governments, private sector and individual citizens to take that action and to protect people by ensuring the sound management of mercury waste. The Minamata Convention clearly explains what must be done, I hope this assessment will help nations around the world deliver on those commitments.



A handwritten signature in black ink that reads "Erik Solheim". The signature is written in a cursive, flowing style.

Erik Solheim

United Nations Under-Secretary-General and
Executive Director, United Nations Environment Programme

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Executive Summary

The Minamata Convention on Mercury mandates that mercury waste be managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention, and in accordance with requirements to be adopted by the Conference of the Parties. The United Nations Environment Programme, through its International Environmental Technology Centre, conducted this Global Mercury Waste Assessment, which included fact-finding missions to almost 30 countries.

The assessment describes the current mercury waste management practices in these countries, and provides a basis for understanding the size and nature of the gap between current practices and the environmentally sound mercury waste management envisioned in the Minamata Convention. The central finding is clear: The gap between the provisions of the Minamata Convention and the current mercury waste management practices is wide.

For many of the countries in this assessment, the fundamental challenge is waste management itself. For the most part, these countries manage mercury waste as part of municipal or industrial waste, and dispose of it as mixed waste in landfills or at open dumping sites. Some countries have no mechanism for the separate collection of wastes, except for recyclables, and some have no formal waste collection system, no formal disposal site, and little or no awareness of waste management. Several of the countries in the study identify mercury waste in their regulatory frameworks, but do not have the capacity to implement the mercury provisions.

Some of the countries that implement waste management do not have specific control measures for mercury waste but manage it as part of hazardous waste. The challenge of separate collection of mercury waste, in particular household mercury wastes, remains. Some

countries do collect fluorescent lamps separately from other waste, but have no final disposal option within their borders. In these cases, the countries need to store the waste in country until they find final disposal options, which include exporting the mercury waste to another country under the Basel Convention.

Only a limited number of the countries surveyed have the advanced technology and equipment to manage mercury waste according to the Basel Convention guidelines.

Some countries have already started, or plan to start, the decommissioning of mercury-based chlor-alkali facilities in order to comply with the Minamata Convention. Europe alone is expected to generate about 6,000 tonnes of waste mercury from the decommissioning of these facilities, and other regions will generate large amounts as well. The countries generating this waste mercury will need available and practical final disposal options.

The options for disposal of mercury waste under the Basel Convention Technical Guidelines are final disposal of stabilized and solidified mercury in a specially engineered landfill or permanent storage of stabilized and solidified mercury in a secure underground storage facility that uses storage vessels specifically designed for the purpose. Only a few countries have the technology and equipment for the solidification and stabilization of mercury, and only a limited number of appropriate final disposal facilities are available around the world. Countries without facilities of their own can export mercury waste for the purpose of environmentally sound disposal.

Among the countries with artisanal and small-scale gold mining, mercury-contaminated sites are common. Artisanal and small-scale gold mining sites are usually scattered across remote areas, and the scope of sites contaminated with mercury is difficult to assess.

Chapter 1



Introduction



Introduction

The Minamata Convention on Mercury obliges Parties to the convention to manage mercury waste in an environmentally sound manner taking into account the guidelines developed under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and in accordance with requirements that the Conference of the Parties adopts after the Convention enters into force.

Historically, most waste that contains some mercury has been handled as hazardous waste. Under the Minamata Convention, mercury wastes are substances or objects:

- Consisting of mercury or mercury compounds
- Containing mercury or mercury compounds
- Contaminated with mercury or mercury compounds

In general, mercury concentrations in waste in the latter two categories are relatively low. In addition to these mercury wastes, the Minamata Convention considers elemental mercury as waste in cases such as excess mercury from decommissioning of chlor-alkali facilities.

The Basel Convention defines environmentally sound management as taking all practical steps to ensure that hazardous waste is managed to protect human health and the environment against the adverse effects that may result from hazardous and other wastes. The Basel Convention Technical Guidelines on the Environmentally Sound Management of Wastes Consisting of, Containing or Contaminated with Mercury or Mercury Compounds¹ provide guidance on mercury waste management. In addition, the United Nations Environment Programme developed a Practical Sourcebook on Mercury Waste Storage and Disposal², which provides practical options on commercially available storage, treatment, recycling and disposal technologies for mercury waste.

Some countries already have in place advanced management systems for mercury waste, but many countries still face general waste management challenges. The Global Mercury Waste Assessment describes the current mercury waste management practices in selected countries around the globe, and provides a basis for understanding the size and nature of the gap

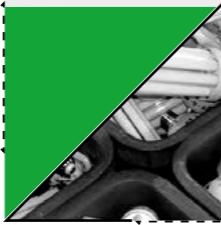
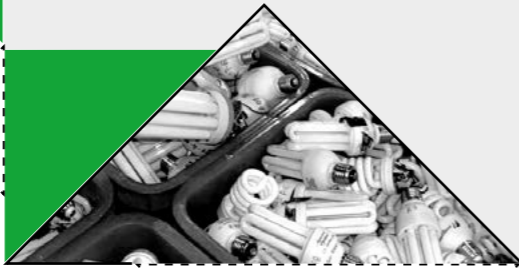
between current practices and the environmentally sound mercury waste management envisioned in the Minamata Convention.

To gather the information in this assessment, the United Nations Environment Programme, through its International Environmental Technology Centre, conducted desk studies and a series of fact-finding missions to 28 countries and 9 regional organizations, and organized a project meeting of 11 countries. Chapter 2 provides country-by-country summaries of current practices, and descriptions of two advanced facilities. Chapter 3 provides selected data on thresholds for categorizing mercury waste, a summary of lighting equipment waste volumes in the European Union and a description of the flow of mercury in waste streams in Japan. Chapter 4 summarizes the findings and offers recommendations.

Each of the entries in Chapter 2 includes a brief introduction followed by a description of the legislative and regulatory framework for mercury waste management in the country. These descriptions may include information on municipal solid waste and hazardous waste management laws and guidelines, as well as information specific to mercury waste management. The entries conclude with summaries of current practices with a focus to the extent possible on mercury waste management practices.



Chapter 2



Current Mercury Waste Management Practices



Argentina

Argentina opened its first treatment facilities and final disposal sites for mercury waste in 1994. The country has been increasing its capacity to manage mercury waste even as the amount of such waste is increasing, and is introducing prevention in the generation of mercury waste. The sources of mercury waste include mercury-containing products, medical devices, the mining sector, the petrochemical industry and the chlor-alkali industry. The Ministry of Environment and Sustainable Development takes a life cycle management approach to waste management, and accounts for material recovery from wastes.

Legislative and Regulatory Framework

The regulatory framework for waste management in Argentina is based on the General Environmental Law, the Law on Sound Management of Household Waste, the Law on Sound Management of Industrial Waste and Service Activities, the Law of Sound Management of Empty Containers of Phytosanitary Products, the Law of Sound Management and Elimination of Polychlorinated Biphenyls, and the Law on Hazardous Waste Management. This framework is the basis for mercury waste management, although there are no specific mercury waste provisions in the existing laws.

Current Practices

Five engineered landfill sites handle the disposal of stabilized residues containing mercury generated from the chlor-alkali industry. Out of seven chlor-alkali facilities using mercury, six facilities were converted to mercury-free technologies, and mercury waste generated in the conversion process was stabilized and sent to the secured landfill sites for disposal. The last remaining chlor-alkali plant using mercury will be converted to a mercury-free plant by 2020.

Mining areas contaminated with mercury are monitored by national authorities, and have been remediated. Waste contaminated with mercury generated from mining areas has been stabilized and sent for disposal to engineered landfill sites.

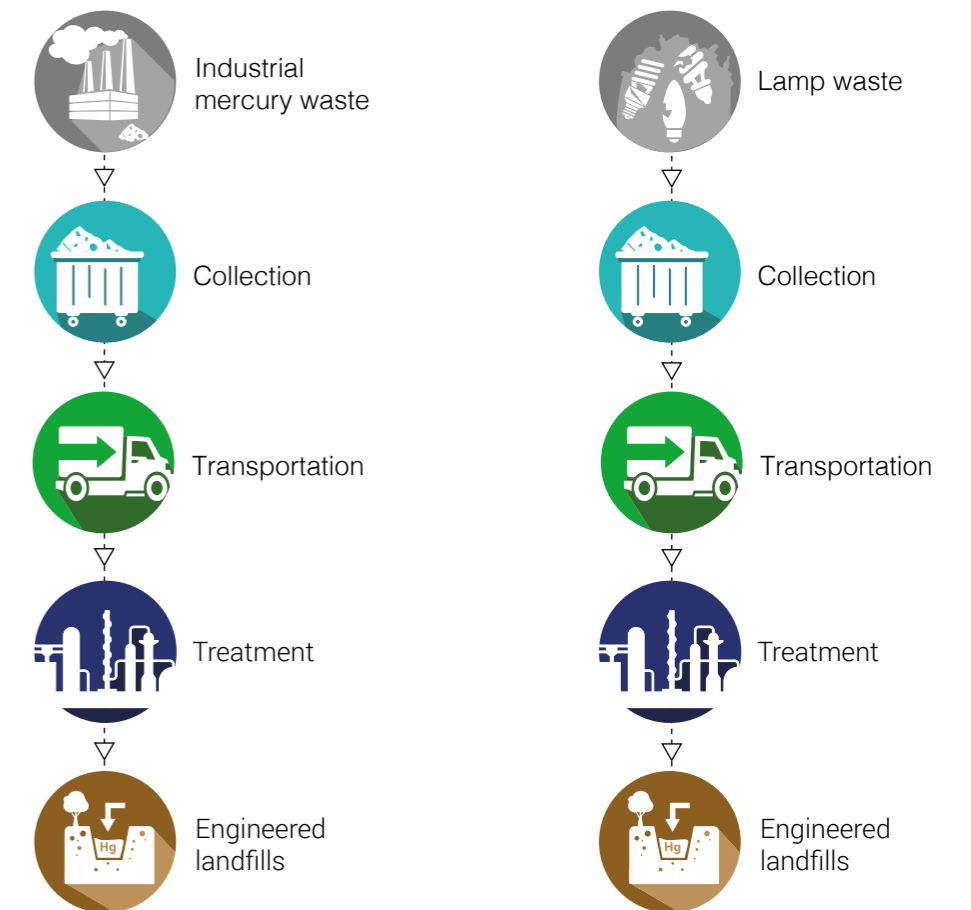
Fluorescent lamps are collected as part of hazardous wastes, although there is no uniform system for lamp

waste collection. At one hazardous waste treatment facility lamp crushers reduce the volume of fluorescent lamp waste, and recyclables such as aluminium and glass are sold on secondary markets. Residues containing mercury are sent to engineered landfills. Another facility treats mercury-containing waste from health services.



Lamp crushers © UN Environment

Regulatory framework and mercury waste management in Argentina



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Meetings at the Basel Convention Regional Centre for South America and the Ministry of Environment and Sustainable Development, Argentina, 28-29 November 2016

Bolivia

Bolivia's integrated waste management includes source separation, transportation, treatment and final disposal of those wastes that cannot be recycled. Solid waste is collected as part of the waste management system. Those without access to the waste collection service find other methods of disposal.

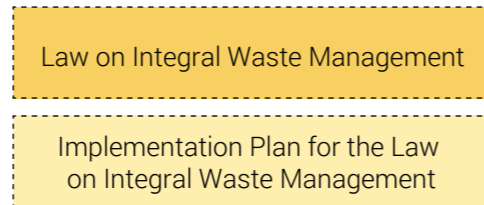
Legislative and Regulatory Framework

Law No. 755 on Integral Waste Management, in force from 2015³, establishes the general policy and legal regime for integrated waste management, and places priorities on waste reduction and environmentally safe disposal.

The Implementation Plan for Law No. 755 establishes management mechanisms and strategies for the coordination of state entities and other related actors. The plan identifies the following strategies to optimize the integrated waste management approach:

- Institutional development
- Capacity-building
- Dissemination of information
- Environmental education
- Extended Producer Responsibility
- Promotion of public and private investment
- Transboundary movement of waste
- Incentive mechanisms

Regulatory framework and mercury waste management in Bolivia



Waste dump © Vice-ministry for Environment, Biodiversity, Climate Change and Forest Management, Bolivia



Waste collection © Vice-ministry for Environment, Biodiversity, Climate Change and Forest Management, Bolivia

Current Practices

Mercury waste, in particular household mercury waste, is usually mixed with other waste as part of solid waste. An estimated 39 per cent of the total population has access to adequate waste service (collection, transporting and final disposal in landfills), and 48 per cent of the municipalities have controlled landfill sites, only a few of which are sanitary landfills. The rest, due to lack of financial resources and trained personnel, have opted to continue operating open dumps. In the absence of treatment and disposal facilities, mercury waste management remains a challenge.

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Meetings at the Vice-ministry for Environment, Biodiversity, Climate Change and Forest Management and Development and the Vice-ministry of Basic Sanitation and Drinking Water, Bolivia, 23-24 March 2017

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Brazil

The federal, state and municipality levels of government in Brazil each has specific responsibilities for waste management, which has been an issue of discussion in the country for several decades.

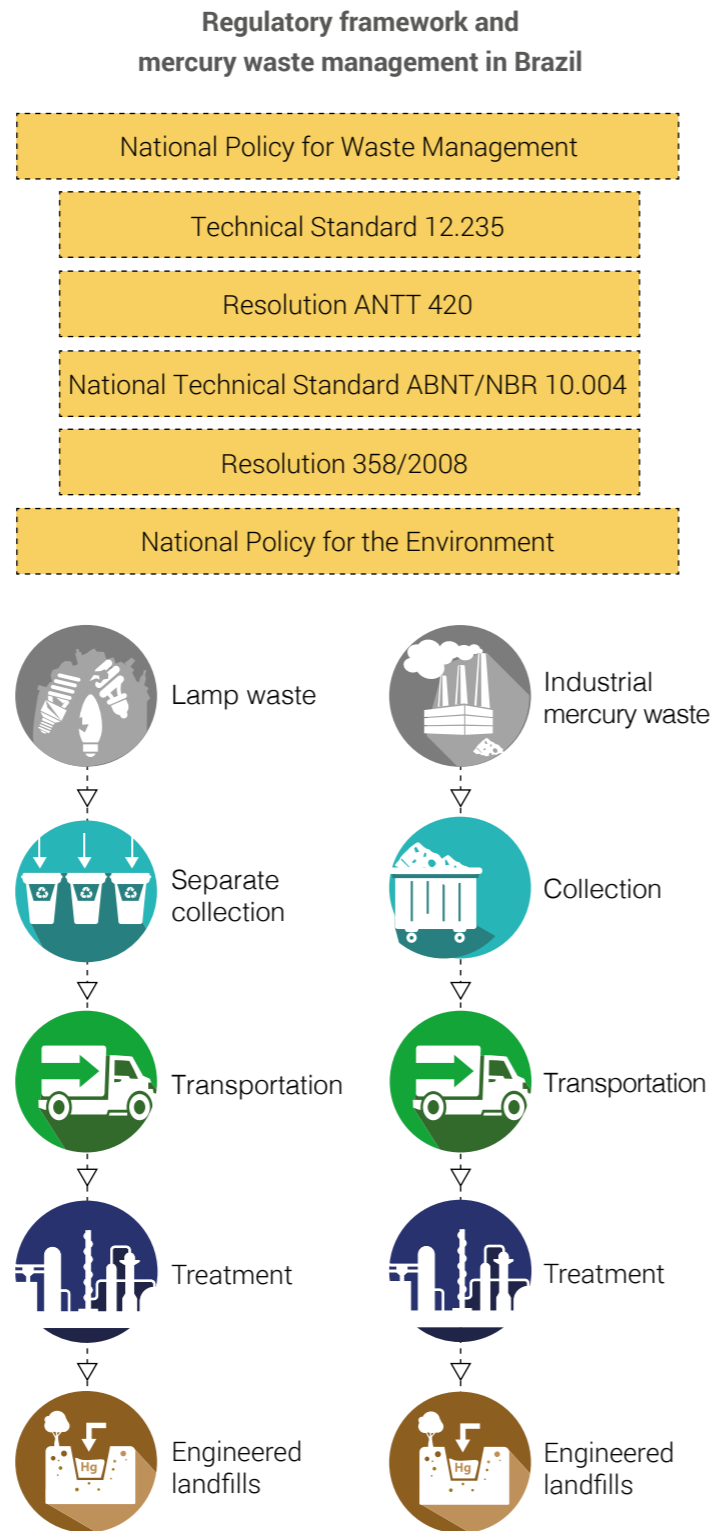
Legislative and Regulatory Framework

The National Policy for Waste Management (Law Nº 12.305/2010)⁴ classifies waste as hazardous or non-hazardous. Mercury waste is classified as hazardous, and special procedures and obligations cover storage (Technical Standard 12.235), transportation (Resolution ANTT Nº 420)⁵, treatment and disposal.

National Technical Standard ABNT/NBR 10.004⁶ sets the threshold for mercury waste at 0.1 mg/l by leachate test.

The National Council for the Environment Resolution Nº 358/2008⁷ establishes special treatment and final disposal of waste generated from health services. In addition, the National Surveillance Agency has standards that govern the procedures for storage of mercury waste in health facilities.

The National Policy for the Environment (Law 6.938/1981)⁸ requires all facilities with the potential to cause environmental impacts to hold an environmental permit. Such facilities must produce a waste management plan that must be approved by the government.



Current Practices

Hazardous waste, such as mercury waste, must be sent to special landfills, and any company that operates in any phase of hazardous waste management must be registered in the National Registry of Hazardous Waste Operators.

The National Policy for Waste Management specifies that some waste containing mercury, such as fluorescent lamps and batteries, be treated under reverse logistics, a tool for applying the principle of shared responsibility throughout the product lifecycle. This approach provides a process that enables the return of specific kinds of waste to the distributor or manufacturer for reuse or environmentally sound disposal.

The country has the technical capacity to properly treat lamps containing mercury. Specialized companies handle collection and recycling of non-hazardous materials, the recovery of mercury, and disposal. The recycling rate for fluorescent lamps has been increasing over the last few years, and the trend is expected to continue under the reverse logistics approach.

Artisanal and small-scale gold mining operations are required to hold an environmental permit, so in theory at least, all mercury waste must be properly stored. Artisanal and small-scale gold mining sites occur mainly in regions of difficult access, however, with little capacity to manage mercury waste.

Source
Meeting at the Ministry of Environment, Brazil, 21 March 2017



Collection of non-hazardous waste and hazardous waste (batteries) at the Ministry of Environment of Brazil © Ministry of Environment, Brazil



Apliquim Brasil Recycle facility specializing in treatment of fluorescent lamps © Apliquim Brasil Recycle

Burkina Faso

Waste management is a national challenge, and in the capital city of Ouagadougou, urbanization is increasing the amount of waste generated. Although the capital area has a waste management system, the existing landfill sites lack the capacity to meet future demand. In other cities, waste management is not as effective as in the capital.

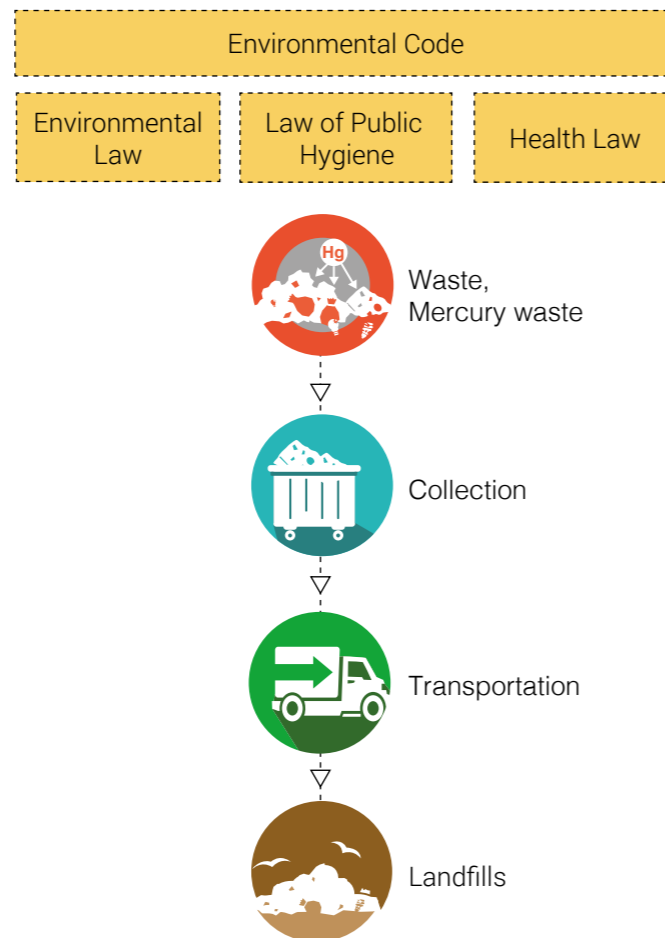
Legislative and Regulatory Framework

The Environmental Code⁹ (2013) of Burkina Faso promotes the fundamental environmental principles of prevention, precaution, polluter pays and sustainable development. The code distinguishes among municipal, industrial and hazardous waste. The Environmental Code and the Law of Public Hygiene define hazardous waste as any waste presenting serious risks to public health and safety or the environment. Based on the description in these laws, mercury waste is hazardous waste.

The dumping or burning of toxic industrial waste is prohibited (Article 23, the Health Law) as is dumping hazardous waste in the environment (Article 109 and 110, the Law of Public Hygiene)¹⁰. Waste management facilities need the approval of the Ministry of Environment and require an environmental impact assessment (Article 53, Environmental Law)⁹. Transboundary movements of hazardous wastes are to be conducted pursuant to the Basel Convention.

In the absence of a specific regulation for mercury waste, it is managed under the general legislative and regulatory framework.

Regulatory framework and mercury waste management in Burkina Faso



Collection of recyclables at a landfill site © National Center for Scientific and Technological Research

Current Practices

Municipalities are responsible for waste collection, transportation and disposal. Because there is no sorting at the source, household mercury waste is mixed with other municipal solid waste, which is collected and transported to landfills for disposal without any treatment. At the landfill site, only recyclables are separated from municipal solid waste.

Waste contaminated with mercury is not currently treated. In artisanal and small-scale gold mining, for example, residues and tailings as well as wastewater contaminate the environment surrounding the mining sites.

Source

Presentation by a representative from Burkina Faso at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Cambodia

Waste management is a national priority. With continuous economic growth over the last 20 years, the amount of waste generated has increased, and Cambodia now needs to further develop its waste management capacity and strategy. Phnom Penh, the capital, faces waste management challenges due to rapid urbanization. Cambodia has been implementing various programmes on waste management, including e-waste.

Legislative and Regulatory Framework

The Law on Environmental Protection and Natural Resources Management (1996)¹¹ lays out general environmental provisions. The Sub-decree on Solid Waste Management (1999)¹² defines wastes and regulates solid waste management to ensure the protection of human health and the environment. Under the sub-decree, mercury waste is classified as a hazardous waste, and waste from end-of-life lamps is listed as hazardous waste. The Sub-decree on Environmental Impact Assessment (1999)¹³ specifies when an environmental impact assessment is necessary, including for waste processing and burning.

The Sub-decree on E-waste (2016)¹⁴ prohibits disposal of e-waste in water resources, public areas, and undesignated landfills, and bans open burning and other harmful e-waste practices. The Sub-decree on Litter and Solid Waste Management (2015)¹⁵ promotes effective solid waste and

litter management at the provincial and municipal levels for the protection of public health and the environment. This sub-decree covers collection, treatment, storage, transportation and recycling of solid waste, and calls for cooperation among the relevant agencies. The Declaration on Battery Management (2016) prohibits disposal of batteries in water resources, public areas and undesignated landfills, and bans harmful recycling practices.

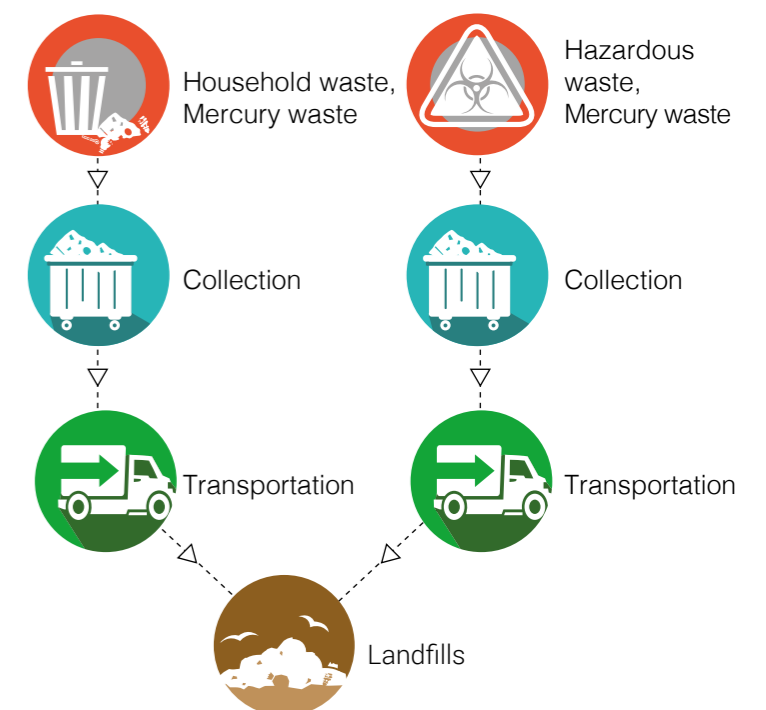
The Mercury Waste Management Action Plan 2013-2017 aims at the reduction of mercury waste from anthropogenic activities and lays out a five-year plan for mercury management in processes and products; mercury waste management approaches; research, monitoring, assessment and inventories; awareness raising; and implementation and compliance.

Current Practices

Municipalities are responsible for the collection, transportation and disposal in landfills of household waste, which includes mercury waste mixed with other wastes at the source. Generally, the municipalities contract with private companies for these services. Industrial waste generators are responsible for collection, transportation and disposal of the waste they generate, including mercury waste, and generally pay private companies for these services. The country has no treatment facilities for mercury waste, so disposes of untreated mercury waste directly in landfills.

Programmes to phase out artisanal and small-scale gold mining using mercury have been implemented.

Regulatory framework and mercury waste management in Cambodia



Landfill site
© Ministry of Environment,
Cambodia

Source

Presentation by a representative from Cambodia at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Canada

Mercury waste is managed in accordance with federal, provincial and territorial laws, and municipal by-laws. The laws set requirements for facility siting, design, construction, operations and closure; worker health and safety; collection and storage; transport; and disposal.

Legislative and Regulatory Framework

At the federal level, the Canadian Environmental Protection Act (1999)¹⁶ is the primary element of the federal legislative framework for protecting the environment and human health. Mercury and its compounds are toxic substances listed on Schedule 1 of the Act. Additional measures include regulations that implement the requirements of the Basel Convention on the import and export of hazardous waste; regulations on interprovincial movement of hazardous waste; pollution prevention planning notices for dental amalgam waste and mercury switches in end-of-life vehicles; and a code of practice for the environmentally sound management of end-of-life lamps containing mercury. A technical document outlines best management practices for minimizing the releases of mercury from incinerators.

Provincial and territorial governments have legislation and requirements for waste management facilities and operations. These jurisdictions also implement standards and guidance that incorporate federal policies into provincial or territorial regulations or permitting requirements. The Canadian Council of Ministers of the Environment has endorsed countrywide standards for mercury emissions and action plans for extended producer responsibility.

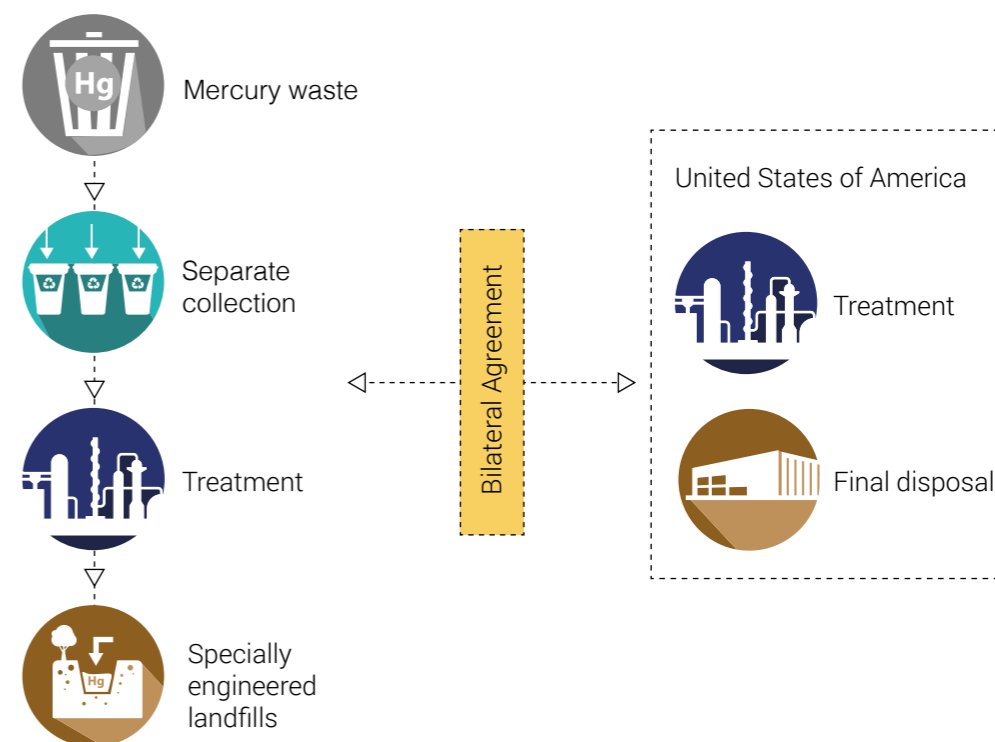
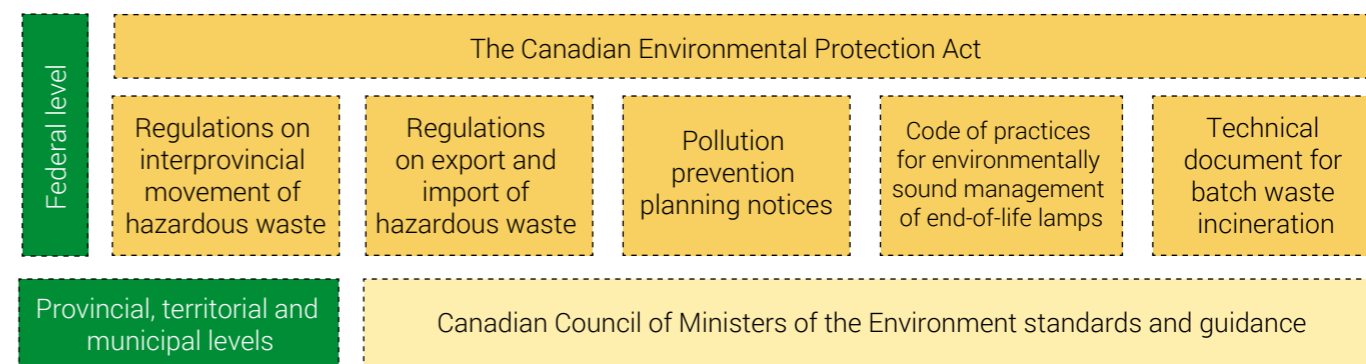
The provinces of British Columbia, Manitoba, Quebec, and Prince Edward Island have legislation that requires producers to implement or join Extended Producer Responsibility programmes for end-of-life mercury-containing lamps. In addition, municipalities have by-laws for waste management, and many have programmes that collect household products containing mercury.

Current Practices

Consumer products containing mercury can be taken to household hazardous waste drop-off depots and retail collection sites, or sent to an authorized waste management facility. Industrial by-products and residues containing mercury may be sent to facilities in or outside of Canada for proper recycling or disposal. Specially engineered landfills accept mercury waste for disposal. Leachability limit criteria may require that the mercury be solidified and/or stabilized before disposal in the landfill.

Mercury wastes may be exported from Canada for proper disposal or recycling. From 2010 to 2015, all exports of mercury wastes were sent to facilities in the United States for treatment or disposal. Mercury wastes may also be imported to Canada from other countries for proper treatment and disposal.

Regulatory framework and mercury waste management in Canada



Example of drop-off depot © UN Environment

Source

Meeting at Environment and Climate Change Canada, Canada, 13 September 2016

Egypt

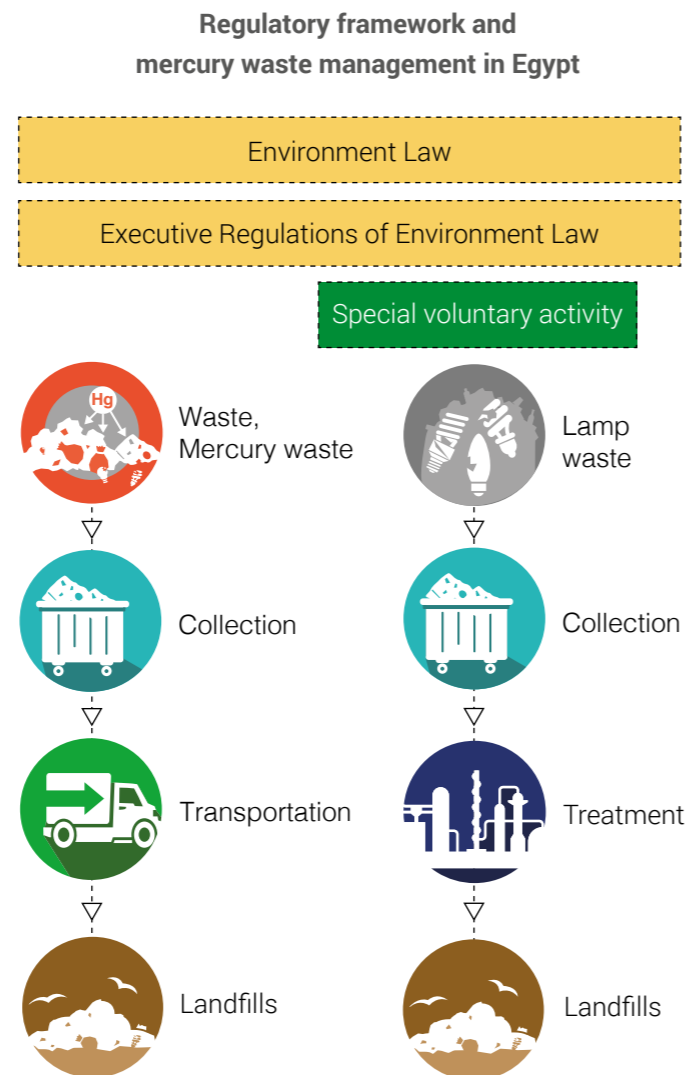
The pressures associated with a rapidly increasing population include corresponding increases in the amount of waste generated and changes in waste characteristics. Local authorities collect waste in most areas, but informal operators still collect, transport and dispose of waste that is not covered by public services. Household mercury waste is generally mixed with other waste that goes to landfills. Some hazardous waste treatment facilities, however, are capable of treating various kinds of hazardous waste, including mercury waste – in particular, fluorescent lamp waste – in an environmentally sound manner.



Lamp treatment
© Ministry of Environment, Egypt

Legislative and Regulatory Framework

The Environment Law (1994)¹⁷ lays out general provisions for waste management, including hazardous waste, and distinguishes between hazardous substances, which are hazardous to human health or which adversely affect the environment, and hazardous waste, which retains the properties of hazardous substances but has no subsequent uses. Waste disposal includes processes that do not extract or recycle waste. The handling of hazardous substances and waste requires a licence from the competent administrative authority. Executive regulations specify the rules and procedures for disposal of hazardous waste, and provide the details for the management of hazardous substances and waste.



Current Practices

In general, source separation of municipal solid waste is not implemented except for partial separation of plastics, paper, glass and metals that are collected by small enterprises, the informal sector and other waste pickers for recycling. All municipal solid waste is sent to landfills for disposal.

Inorganic hazardous waste from industrial sources is treated at a hazardous waste treatment centre that provides solidification or stabilization, storage and final disposal at a landfill. Fluorescent lamp waste is collected as a special voluntary activity at the hazardous waste treatment centre. Fluorescent lamps are crushed, and each component, such as metal, glass and powder containing mercury, is separated. Powder containing mercury is thermally treated and mercury is distilled.

Source

Meeting at the Egyptian Environmental Affairs Agency, Ministry of Environment, Egypt, 13 October 2016

El Salvador

El Salvador is a small country with major waste problems. The lack of proper waste collection coverage is causing health problems for the population and affecting the environment. The collection and treatment infrastructure for hazardous waste is weak.

Legislative and Regulatory Framework

The Environmental Law (1998)¹⁸ covers general waste issues, and the Special Regulation on Hazardous Substances, Residues and Wastes (2000)¹⁹ applies to hazardous waste.

The special regulation considers wastes containing mercury to be hazardous wastes, and refers to the Basel Convention, indicating that the categories in the Convention's Annexes are also considered hazardous wastes, as well as those mentioned in any other international legal instrument ratified by the country. The special regulation further states that those generating hazardous wastes should aim to minimize waste production through the application of best available technologies, and through the development of activities and procedures that lead to the sustainable management of wastes.

Current Practices

Household mercury waste most often goes to collectors from the informal sector, or is abandoned in places such as roadsides. The accepted form of final disposal is through landfills. An environmental licence authorizes 16 sanitary landfills to operate, but illegal open pit dumps or unauthorized collection sites are still available.

Suitable environmental management for treatment and final disposal of wastes containing mercury is not available, and only three companies are authorized to manage e-waste, specifically computer and telecommunications equipment. Treatment, recovery and recycling are unavailable for mercury-containing lamps and batteries, so the recommended practice is to place these items in covered temporary storage while adequate alternatives are identified for final disposal.

A 2015 inventory of health care equipment containing mercury identified 93,310 measuring devices, and 293,600 capsules of amalgam for dental use. Some hospitals are voluntarily storing mercury waste until a final disposal option becomes available.

The main source of mercury emissions in El Salvador is artisanal and small-scale gold mining.

Regulatory framework and mercury waste management in El Salvador



Mercury waste stored at a hospital
© UN Environment

Sources

Meetings at the Ministry of Environment and Natural Resources, El Salvador, 27-28 March 2017

Report on mercury waste management, Ministry of Environment and Natural Resources, El Salvador, March 2017

Meeting at the Ministry of Health, El Salvador, 27 March 2017

Meetings at the Social Insurance Institute, El Salvador, 27-28 March 2017

Ethiopia

Ethiopia faces various environmental challenges, waste management foremost among them. The authorities have been improving waste management from a simple collection and disposal scheme to one that considers waste as a resource. In addition to the solid waste programme, the country collects e-waste and separates recyclable materials for metal recycling outside the country.

Legislative and Regulatory Framework

The Environmental Policy of Ethiopia (1997)²⁰ gives priority to waste collection and safe disposal, and initiates the review and development of guidelines for waste disposal and the formulation and implementation of a country-wide strategy on the management of wastes from medical, agricultural and other sectors. The National Conservation Strategy²¹ includes provisions on the appropriate methods and technologies for the treatment and disposal of wastes.

The Environmental Pollution Control Proclamation (2002)²² covers the management of hazardous waste and management of municipal waste. The Solid Waste Management Proclamation (2007)²³ covers solid waste management planning, inter-regional movement of solid wastes, management of household solid wastes and the construction of solid waste disposal sites.

The Industrial Pollution Prevention and Control Regulations (2006)²² set guidance for preventing industrial pollution, but while “factories” are targeted, the regulation does not provide a clear definition of the term. The regulations cover grace periods for existing factories, emergency responses, licensing and penalties.

Mercury waste is managed within this general legal framework, and while Ethiopia has no specific legislation on mercury or mercury waste, the country is currently undergoing a Mercury Initial Assessment.

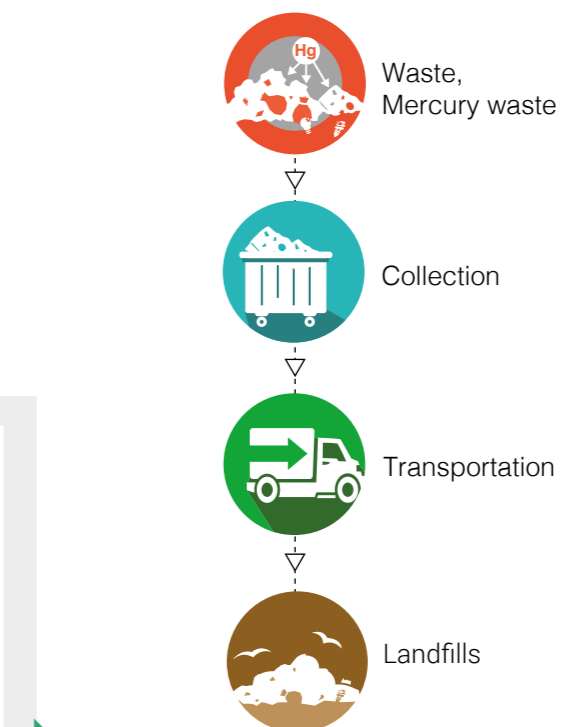
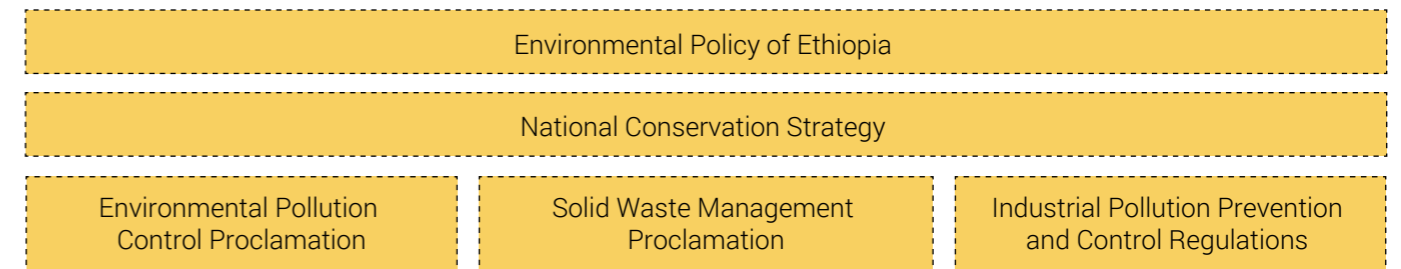
Current Practices

Household mercury waste is mixed with other wastes and collected as municipal solid waste. Micro-entrepreneurs collect all municipal waste, and transport the waste to collection points where local authorities receive the waste and transport it to landfills for final disposal. Private companies collect and transport all other wastes such as industrial waste to landfills for final disposal. Local authorities plan to introduce waste separation and collection schemes, and sorting for recyclables.



Micro-entrepreneur for waste collection
© Addis Ababa Solid Waste Reuse and Disposal Project Office

Regulatory framework and mercury waste management in Ethiopia



Sources

- Meeting at the Ministry of Environment, Forest and Climate Change, Ethiopia, 21 and 22 November 2016
- Meeting at the Ministry of Mining, Ethiopia, 21 November 2016
- Meeting at Addis Ababa Solid Waste Reuse and Disposal Project Office, 22 November 2016

European Union

The European Union recognized mercury as a global threat to human health and the environment and launched a Mercury Strategy in 2005²⁴. A life cycle approach aims to reduce mercury levels in the environment, and a key measure in implementing the strategy was the adoption of Regulation (EC) No 1102/2008 (Export and Storage of Mercury)²⁵, which characterizes mercury from certain sources as waste and has special provisions for safe disposal. This 2011 regulation was replaced by a new regulation with a wider scope and tighter provisions on mercury waste disposal, applicable from 1 January 2018²⁶.

Legislative and Regulatory Framework

The European Union legislation includes specific provisions on elemental mercury while waste containing mercury falls under the applicable hazardous waste provisions. A specific law applies to certain waste containing mercury, such as waste electrical and electronic equipment.

The new regulation on mercury²⁶ specifies safe storage options for metallic mercury. The amount of mercury generated by mandatory conversion of chlor-alkali facilities to mercury-free technology by the end of 2017 will exceed the treatment capacity, so metallic mercury will have to be stored. This temporary storage is limited to maximum five years ending 31 December 2022, and is permitted only in salt mines adapted for the disposal of metallic mercury, in deep underground hard rock formations providing a level of safety and confinement equivalent to that of salt mines and in above-ground facilities dedicated to and equipped for the temporary storage of metallic mercury. Analysts expect that about 6,000 tonnes of waste mercury will be generated in Europe.

Starting 1 January 2018, metallic mercury must be converted to mercury sulphide before final disposal (permanent storage). Permanent underground storage of converted mercury is permitted, as is above-ground storage, subject to measures to ensure a level of protection at least equivalent to underground storage, and after solidification.

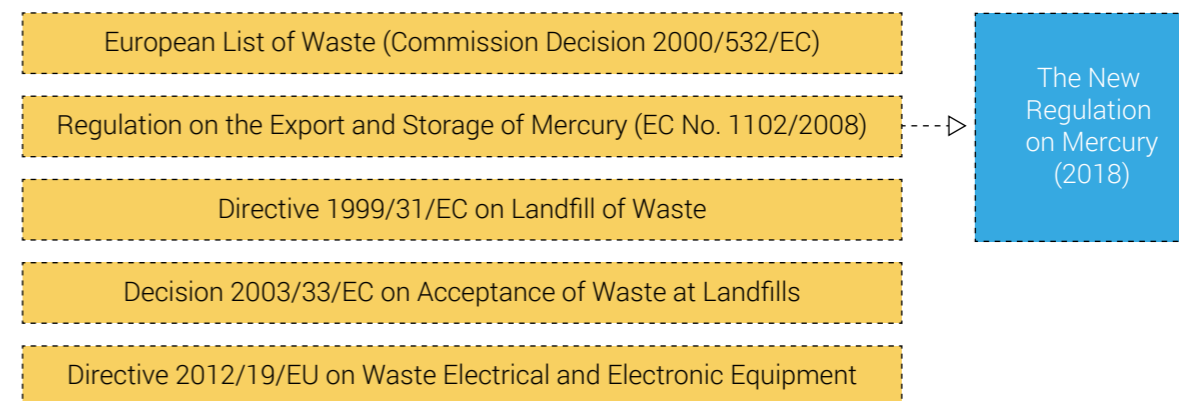
For waste containing mercury, Directive 1999/31/EC²⁷ together with Decision 2003/33/EC²⁸ lay down storage requirements and waste acceptance criteria for landfills including technical standards, acceptance procedures, limit values, monitoring and control activities. Member States may adopt more stringent protective measures.

Whether mercury waste is hazardous or not is determined according to the criteria contained in the European List of Waste (Commission Decision 2000/532/EC)²⁹. The list provides reference waste codes including several for waste containing mercury. Waste types specified as containing heavy metals or containing hazardous substances may also contain mercury or mercury compounds.

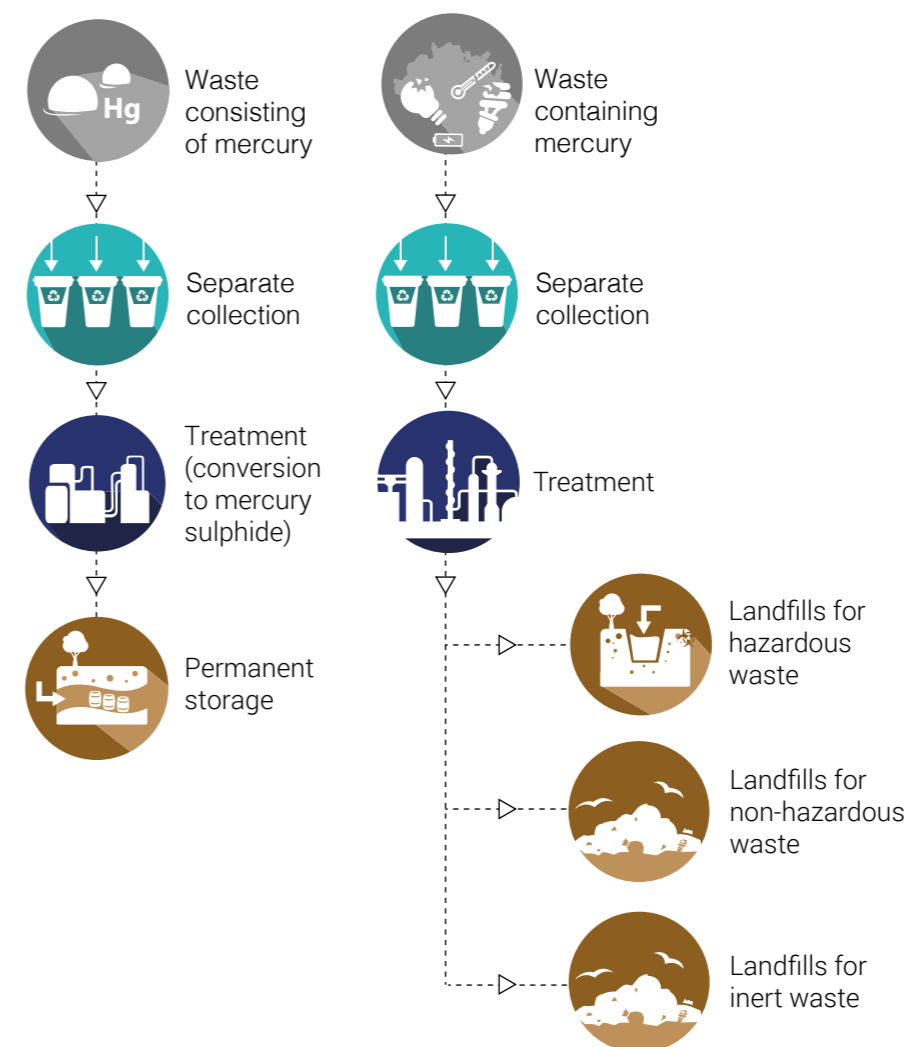
The European Union has already phased out many products containing mercury. Where the use of mercury is still allowed (certain lamps, switches and relays), Directive 2012/19/EU³⁰ on Waste Electrical and Electronic Equipment stipulates separate collection and specific treatment to reduce the amount, maximize recycling and guarantee environmentally sound management of the waste generated.

Source
Meeting at the European Commission, Belgium, 9 September 2016

Regulatory framework and mercury waste management in the European Union



Effective 1 January 2018



Georgia

The current waste management programmes have been developed since July 2016 when the Association Agreement between the European Union and Georgia entered into force. At the municipal level, waste management practices do not yet include source separation, so mercury waste is mixed with other waste, and sent to landfills for disposal.

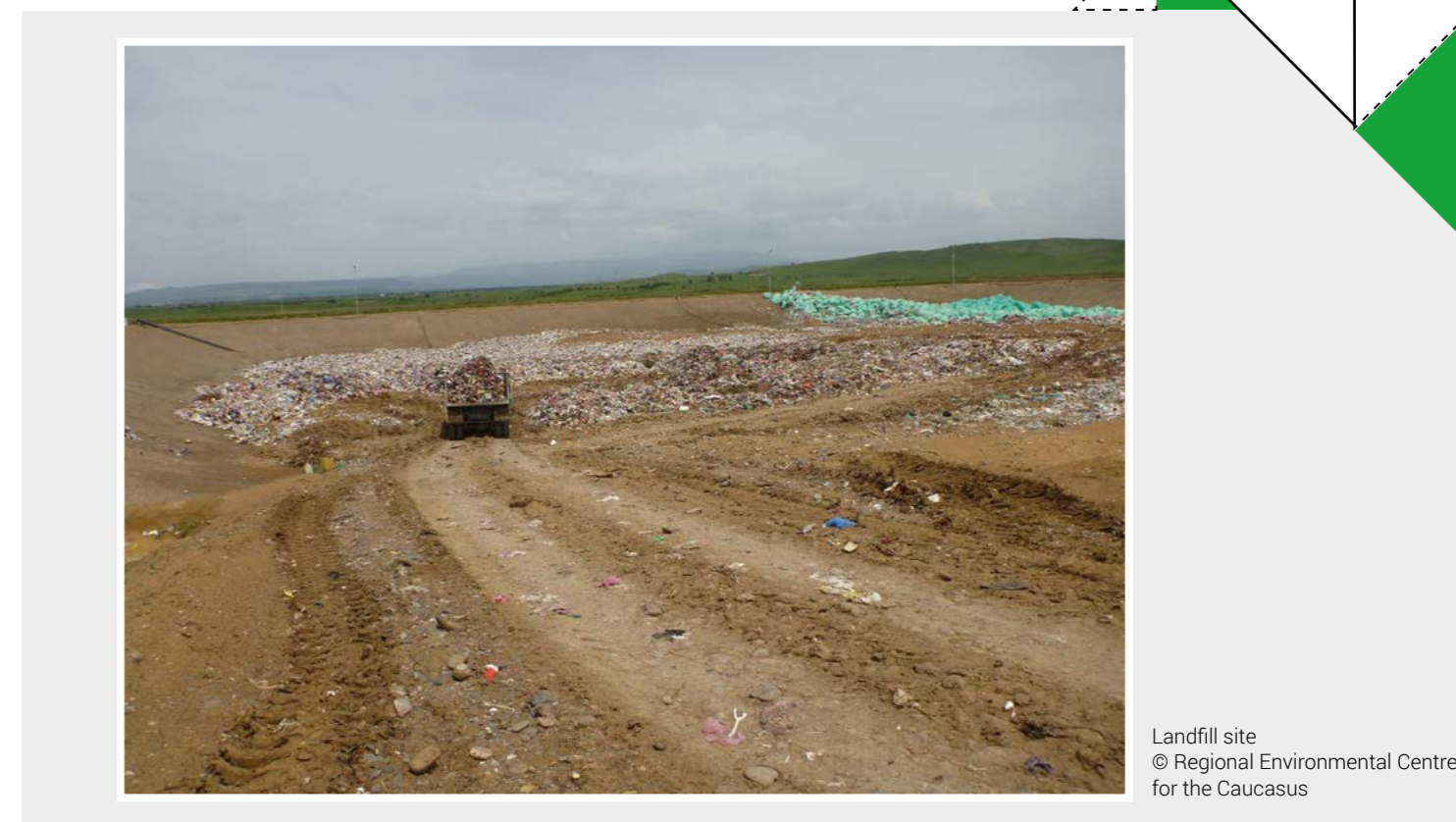
Legislative and Regulatory Framework

Under the Association Agreement³¹, Georgia enforces its national environmental programmes, including waste management. The Waste Management Code 2015³² establishes waste management measures to facilitate prevention, reuse and environmentally safe treatment. Municipalities are responsible for municipal waste management, and for ensuring the gradual introduction and proper functioning of a system of separate collection. Hazardous waste is to be managed to protect human health and the environment, and may not be mixed with other waste. Landfills are designated for hazardous waste, non-hazardous waste or inert waste.

The National Environmental Action Plan 2012-2016³³ includes action plans for treatment and disposal of municipal wastes and for hazardous waste management.

The National Waste Management Strategy 2016-2030³⁴ and the Action Plan 2016-2020³⁵ cover the waste generated by industry, the service sector, hospitals, agriculture and households. Given the complexity of waste management, the strategy focuses on specific waste streams, and sets objectives for all types of waste (except for radioactive waste and obsolete persistent organic pollutants).

Regulatory framework and mercury waste management in Georgia



Landfill site
© Regional Environmental Centre for the Caucasus

Current Practices

Household mercury waste is collected as municipal solid waste. Municipalities collect and transport municipal waste for disposal at landfills, but their collection coverage extends to only about 50 per cent of the waste. Private service providers and the informal sector handle the other 50 per cent. Hazardous waste is not separated at the source, but is collected and transported for disposal at landfills.

Source

Presentation by a representative from Georgia at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Japan

Based on its experience with Minamata disease, Japan has adopted environmentally sound measures on mercury throughout its life cycle. The country has already phased out or minimized the use of mercury in products and industrial processes. Downstream management treats mercury wastes in an environmentally sound manner under an established procedure involving all stakeholders.

Legislative and Regulatory Framework

Mercury wastes are mainly regulated under the Waste Management and Public Cleansing Act³⁶. Hazardous wastes are defined as “specially controlled waste” and must be treated with the permission of prefectures in accordance with special standards. Specially controlled waste includes waste consisting of mercury or mercury compounds and industrial waste contaminated with mercury or mercury compounds with leachate levels >0.005 mg Hg/l.

Additional standards apply to industrial waste contaminated with mercury or mercury compounds and to waste from specific mercury-added products. The standard of effluent gas from newly established waste incinerators with a grate area >2 m² is <30µg/Nm³ and the standard of wastewater from landfills is <0.005mg/l.

If mercury wastes that contain at least 1,000 mg Hg/kg are traded as commodities, they are categorized as “recyclable resources containing mercury” under the Act on Preventing Environmental Pollution of Mercury and must be managed in an environmentally sound manner. Export and import of mercury wastes are regulated under the Act on the Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes.

Current Practices

Mercury wastes are mainly treated in designated facilities where mercury is removed from wastes. (See the flow of mercury in wastes in Japan in Chapter 3). Mercury recovered from waste is used for domestic production of mercury-added products or exported as a commodity. This incentive to recover mercury, however, may decrease as the demand for mercury declines. When the Minamata Convention enters into force, recovered mercury may have to be treated as waste consisting of mercury.

Waste consisting of mercury is purified, then solidified by modified sulphur for disposal in specially engineered landfills. For waste contaminated with mercury (at least 1,000 mg Hg/kg) and for mercury-added products, mercury must be recovered before further treatment. The Ministry of the Environment promotes appropriate collection of waste containing mercury from households along with raising public awareness in collaboration with municipalities.

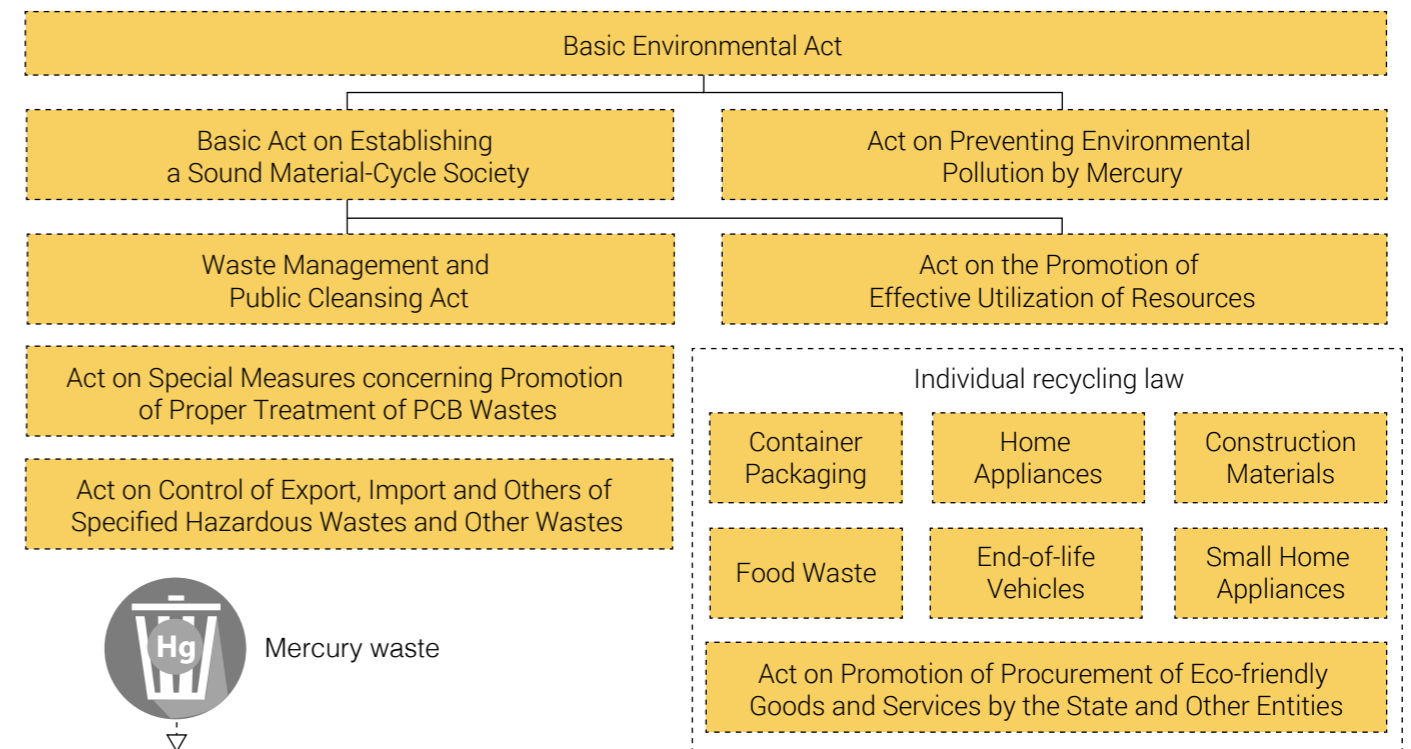
The Kumamoto Prefectural Government implements a unique mercury waste management programme at the prefectural level. The private sector treatment facility that extracts mercury from waste sells the recovered mercury on the commodity market, so the Prefectural Government has decided to offset those sales by purchasing and storing an equivalent amount of elemental mercury.

Sources

Presentation by a representative from Japan at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Meeting at the Kumamoto Prefectural Government, Japan, 23 February 2017

Regulatory framework and mercury waste management in Japan



Mercury storage at the Kumamoto Prefectural Government © Kumamoto Prefectural Government



Collection box for thermometers containing mercury © Ministry of the Environment, Japan



Lamp collection boxes © Ministry of the Environment, Japan

Jordan

Jordan's management of hazardous waste is not sustainable from the financial, environmental or social standpoint. In the absence of sound enforcement, most hazardous waste is not properly managed. The following challenges have been identified in Jordan for effective management of mercury waste:

- Insufficient governmental resources for effective management of mercury waste
- Lack of awareness of mercury impacts on human health and the environment
- The mixing of household mercury waste for disposal in municipal landfills
- Insufficient capacity for storage and disposal of mercury waste



Thermometers containing mercury stored at Swaqa hazardous waste storage site © UN Environment

Legislative and Regulatory Framework

The Ministry of Environment is the national focal point for chemicals and hazardous waste management. Within the overarching Environmental Protection Law No. 52/2006³⁷, the management of hazardous waste is currently covered by the Hazardous Materials Management Regulation No. 24/2005³⁸, and by the Instruction for Hazardous Waste Management and Handling (2003)³⁹. Mercury containing waste is listed as hazardous waste and must be managed for disposal in an environmentally sound manner.

Public Health Law No. 47/2008⁴⁰ prohibits the import of mercury and its compounds.

The Ministry of Environment is aiming to develop a comprehensive, controlled and effective hazardous waste management and treatment centre that ensures environmentally sound management of different types of hazardous waste.



Current Practices

The Ministry of Health encourages the purchase of non-mercury devices in all medical equipment tenders. Instructions have been also developed to monitor mercury emissions resulting from the incineration of medical waste.

Currently, the only facility for the management of hazardous waste is the storage site at the Swaqa hazardous waste landfill. Swaqa was established in the 1980s, and utilizes a 500-hectare fenced area for receiving and storing hazardous waste for treatment and disposal. The site is located in a remote desert area. The Ministry of Environment manages Swaqa, and charges a gate fee on the hazardous waste stored there. The facility accepts mercury-containing waste, which it stores in relatively good conditions.

Household mercury waste is mixed with other waste for disposal in landfills without treatment.

Source

Meeting at the Ministry of Environment, Jordan, 9 January 2017
Report submitted by the Ministry of Environment, Jordan, April 2017

Kenya

The population in Kenya has been growing at the rate of 3 per cent per year, resulting in rapid growth in municipal and hazardous waste especially in the cities. The amount of waste more than tripled between 1990 and 2015, and it is expected to continue increasing exponentially in the coming decades. The increase in industrial, agricultural and health wastes has increased mercury emissions from informal dumping and open burning of waste.

Legislative and Regulatory Framework

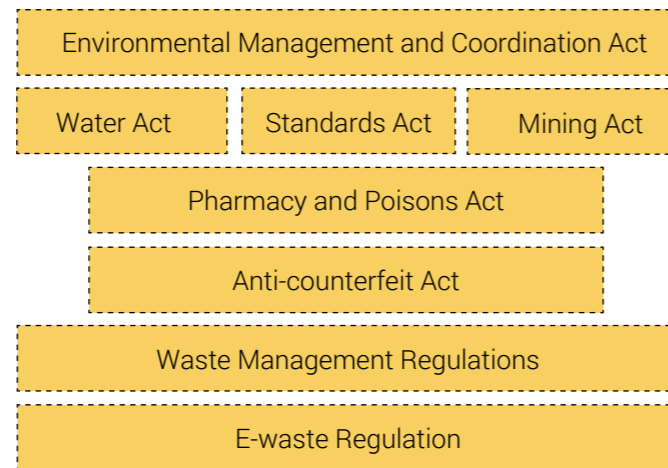
The Environmental Management and Co-ordination Act (2012)⁴¹ is the framework law that covers waste management, transboundary transport and disposal technologies. The act prohibits the dangerous handling and disposal of wastes, introduces a licensing system for waste management, and specifies methods for disposal of mercury waste.

The Waste Management Regulations (2006)⁴² cover the sound management of solid, industrial and hazardous waste, including source separation and a licensing system for transportation, treatment and disposal. The law requires an environmental impact assessment on plans for new waste treatment and disposal facilities, and an annual environmental audit of licensed facilities.

The Waste Regulations of 2006 provide the best definition of mercury waste, but numerous other acts have some bearing on mercury and mercury waste: the Water Act (2002)⁴³ for the prevention of waste disposal to water resources; the Standards Act (2012)⁴⁴; the Anti-counterfeit Act (2012)⁴⁵; the Pharmacy and Poisons Act (2009)⁴⁶; and the Mining Act (2012)⁴⁷.

The E-waste Regulation, drafted in 2013⁴⁸, prohibits disposal of e-waste by burning, establishes an e-waste licence system and categorizes lighting equipment, including fluorescent lamps, as e-waste.

Regulatory framework and mercury waste management in Kenya



Disposal site for medical wastes including mercury waste © Ministry of Environment and Natural Resources, Kenya

Current Practices

Due to low collection rates, the disposal of the majority of waste, including mercury waste, is by open burning or dumping at open sites. Household mercury waste is mixed with other waste and transported for disposal at landfills under the responsibility of local authorities. Collection rates do not reach 30 per cent of households and are even lower in rural areas. Recyclables are sorted at landfills and sold on the domestic resource market. Other wastes, including incineration residues, go to landfills for disposal.

Source

Presentation by a representative from Kenya at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Mali

Mali is facing several environmental challenges including desertification, drought and pollution. Urbanization, in particular around the capital, Bamako, is spurring economic development, and creating urban waste management challenges.

Legislative and Regulatory Framework

Law 01-020/AN-RM on Pollution and Nuisances (2001)⁴⁹ lays out the principles of pollution control, generally prohibits the disposal of solid waste in a manner that causes damage to people or the environment, and specifically prohibits the incineration of solid waste in open air. Liquid waste not complying with discharge standards may not be discharged into aquatic environments or public or private drainage systems. Disposal of biomedical and industrial waste at a landfill site without prior authorization by the Ministry for the Environment is prohibited, as is incineration of those wastes in open air. Prior authorization is required for import, export, transport, treatment, storage and disposal of hazardous wastes.

Decree N°07-135/P-RM on the List of Hazardous Waste (2007)⁵⁰ categorizes mercury waste as hazardous waste.

Decree N°01-394/P-RM on Solid Waste Management (2001)⁵¹ covers the principles of waste management, including waste prevention and the minimization of hazardous waste. Hazardous waste is to be treated at licensed facilities that must meet certain reporting requirements and must carry insurance to cover any potential damage. The collection, transportation and storage of hazardous waste is subject to labelling, and the authorities concerned are to issue an ordinance to regulate hazardous waste management, including the minimization of hazardous waste.



Current Practices

The primary collection system for household waste includes small enterprises that collect those wastes and transport them to collection points or landfill sites. All waste, including household mercury waste, is mixed at the source. Some waste goes to landfills for disposal, and some is dumped on open ground.

The local municipalities responsible for household waste management face various challenges in delivering public services.

Artisanal and small-scale gold mining generates tailings, other residues and mercury contamination.

Source

Presentation by a representative from Mali at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand



Lamp disposal in a landfill site © Direction Nationale de l'Assainissement et du Contrôle des Pollutions et des Nuisances

Nigeria

A growing population and urbanization have given rise to a high rate of waste generation in Nigeria. The existing solid waste management system is rudimentary and inefficient. Waste collection is either non-existent or insufficient, and in most cities with collection systems, wastes are dumped in open sites. Under the current situation, all waste is collected without source separation.

The federal government through the Ministry of Environment is promoting the implementation of an integrated waste management programme and facilitating its adoption through public-private partnerships in major cities nationwide. The programme includes key infrastructure, such as material recovery facilities, landfills for hazardous waste, landfills for general wastes and leachate treatment facilities.

Legislative and Regulatory Framework

The National Policy on the Environment (1999)⁵² mandates relevant agencies to:

- Set up appropriate handling, transportation and storage codes for municipal and hazardous waste
- Minimize the generation of hazardous waste through the adoption of clean technologies
- Determine and use environmentally sound techniques for disposal of municipal, hazardous and radioactive waste

The National Environmental Sanitation Policy (2005)⁵³ describes solid waste management strategies to improve and safeguard public health and welfare. The National Environmental Protection (Management of Solid and Hazardous Waste) Regulations (1991)⁵⁴ cover proper management of solid and hazardous wastes.

The National Environmental (Sanitation and Wastes Control) Regulations (2009)⁵⁵ provide the legal framework for the adoption of environmentally friendly practices in sanitation and waste management.

Guidelines for the Management of Solid and Hazardous Waste and National Healthcare Waste Management Guidelines are used for sound management of hazardous and healthcare wastes. The Harmful Waste (Special Criminal Provisions) Act 2004⁵⁶ prohibits the depositing of harmful waste in the air, land or waters.

Current Practices

In current waste management practice, wastes are mixed, transported and dumped in designated – and most times non-designated – open sites where burning releases hazardous pollutants. Mercury wastes are lumped together with municipal waste at dump sites.

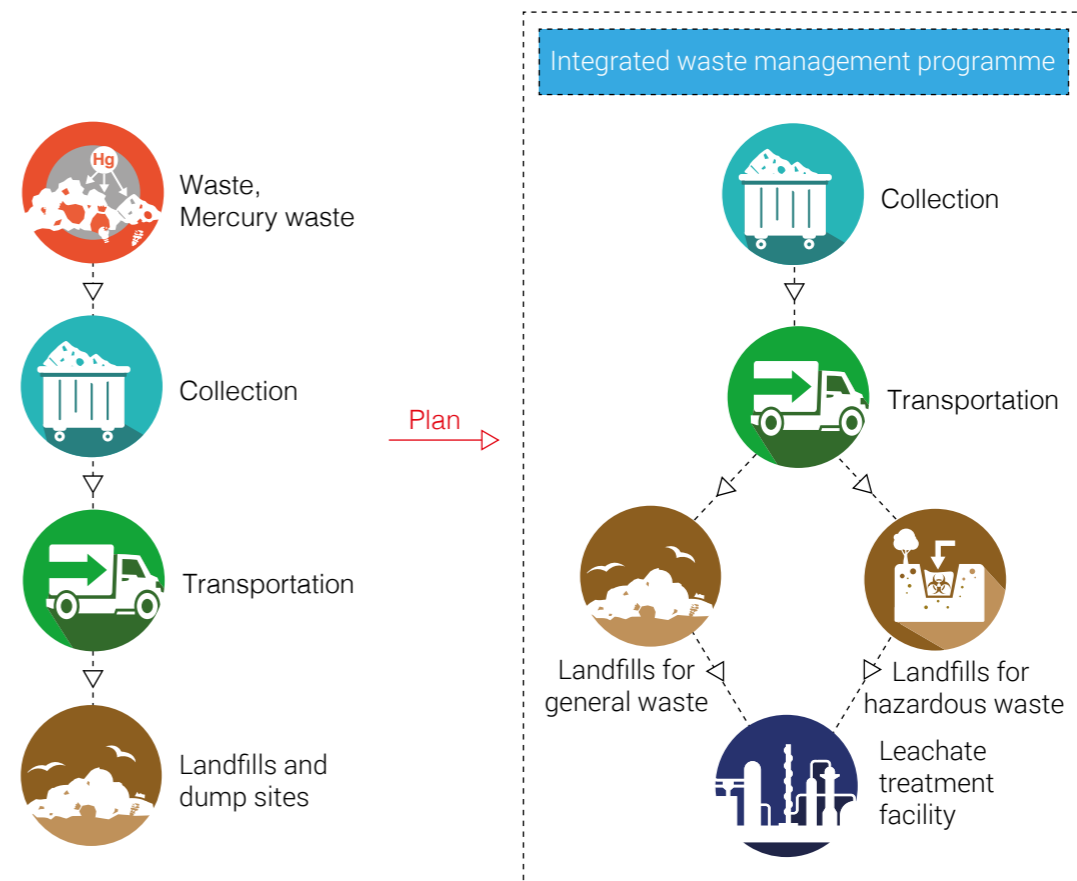
Many scavengers manually segregate resources from waste at the dump sites. Some private companies have recently started using a fluorescent tube lamp-crushing machine fitted with high efficiency particulate arrestor filters for small-scale recycling of fluorescent lamp waste.

Source
Meeting at the Federal Ministry of Environment, Nigeria, 17 and 18 October 2016

Regulatory framework and mercury waste management in Nigeria



Manual resource collection at the end of the waste management system © UN Environment



Panama

Population growth and urbanization in Panama have contributed to economic growth, but have also increased the generation of waste by 38 per cent from 2010 to 2014. There is currently no source separation for waste except for some voluntary pilot projects.

Legislative and Regulatory Framework

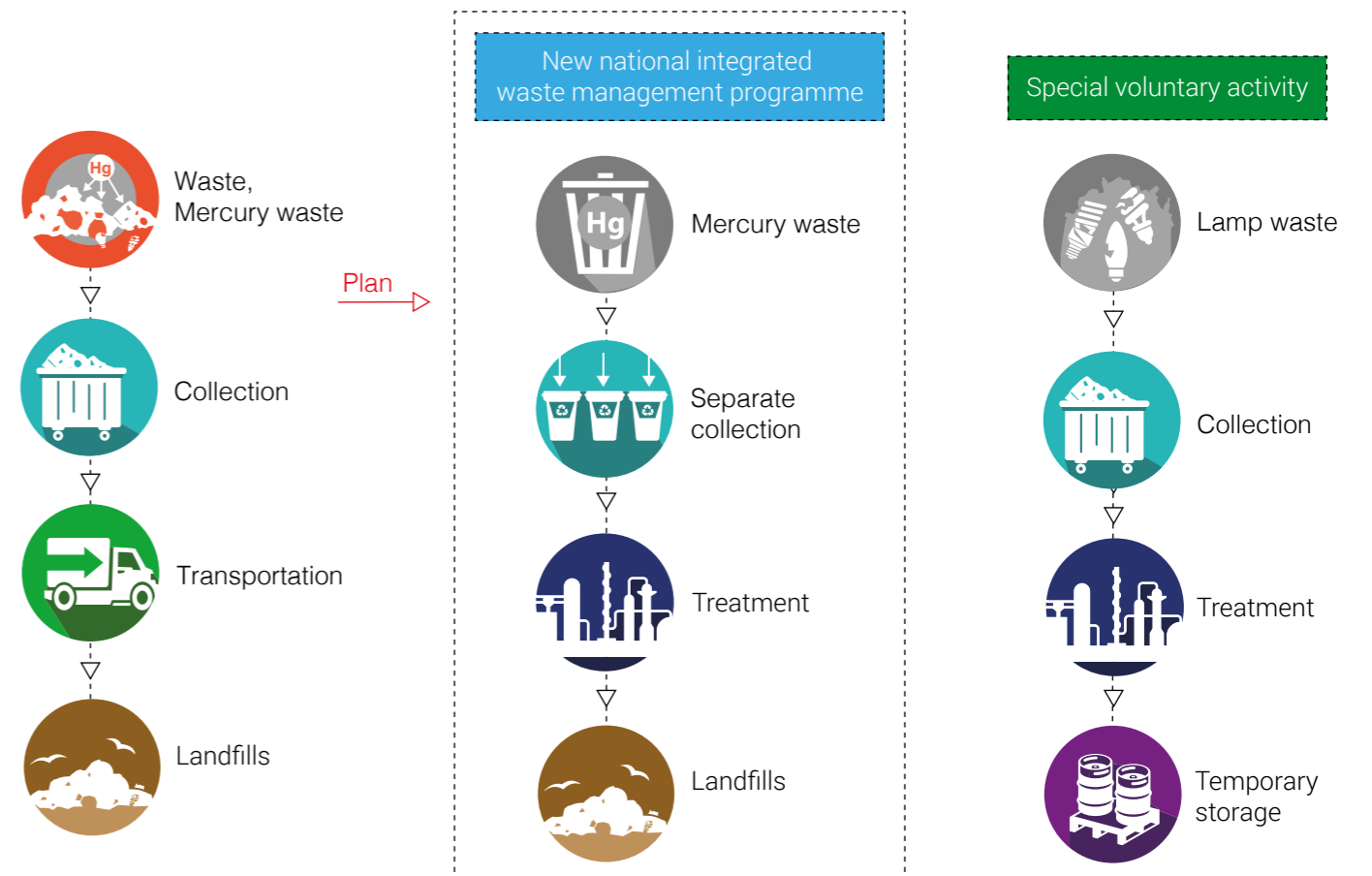
Although Panama currently has no legislative and regulatory framework for waste management, the country has been developing a new national integrated waste management system that includes solid and hazardous waste. Under the new system, mercury waste is one of the hazardous waste streams, and will be treated in an environmentally sound way.

Current Practices

With the exception of a few demonstration projects on waste management, solid wastes are mixed, collected and transported for disposal at landfills. A national governmental agency, the Waste Management Authority of Panama, is responsible for waste management at the national level. Some waste management companies provide waste management services. Mercury waste is mixed with other waste for disposal at landfills.

The Zero Pollution Alliance runs voluntary programmes on mercury, one of which promotes separation, collection and pretreatment of fluorescent lamps. People can bring their fluorescent lamp waste for disposal at collection boxes at the premises of local partners. Crushing machines are employed to treat the lamps. A new United Nations-numbered plastic box (UN2025) is now in use for better storage, handling and transportation of fluorescent lamps, and the programme is also collecting and storing mercury thermometers and high-intensity discharge lamps, pressure gauges and switches containing mercury as well as batteries. Other Zero Pollution Alliance programmes focus on raising awareness of mercury waste among large generators and the general public.

Mercury waste management in Panama



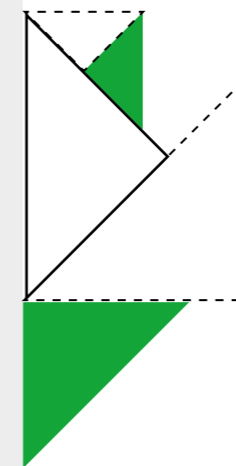
Campaign for used lamp collection © The Zero Pollution Alliance



Battery collection © UN Environment



Crushing lamps © The Zero Pollution Alliance



Sources

- Meeting at the Ministry of Health, Panama, 10 October 2016
- Meeting at the Zero Pollution Alliance, 11 October 2016

Philippines

The population in the Philippines recently crossed the 100 million mark, and the positive effects of economic development are accompanied by the increase in negative environmental effects. Of these challenges, waste management is one of the high priorities, particularly in urban areas.

Legislative and Regulatory Framework

The Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (Republic Act No.6969)⁵⁷ governs the storage, treatment, and disposal of hazardous wastes in the Philippines.

The Implementing Rules and Regulations of the Republic Act 6969 lay out general provisions for hazardous wastes, complemented by the Revised Procedures and Standards for the Management of Hazardous Wastes (Administrative Order 2013-22)⁵⁸. Mercury and mercury compounds (total mercury concentration > 0.1 mg/l) are included in hazardous waste. Hazardous waste generators are responsible for the proper storage, treatment, and disposal of the hazardous wastes they generate, and are liable for spills or illegal disposal.

Hazardous waste treatment, storage, and disposal facilities are required to register with the Environmental Management Bureau and to have an environmental compliance certificate, a discharge permit, permit-to-operate air pollution source and control installations, a pollution control officer, a contingency plan, and financial resources in the form of an environmental guarantee fund or insurance for spills. They must adhere to detailed waste acceptance criteria and procedures, maintain a process flow description, and prepare storage and long-term management plans.

Current Practices

Household hazardous wastes are often still mixed with other municipal solid wastes. Recycling events conducted by local government and some shopping malls collect household hazardous waste and send it to registered treatment, storage, and landfill facilities.

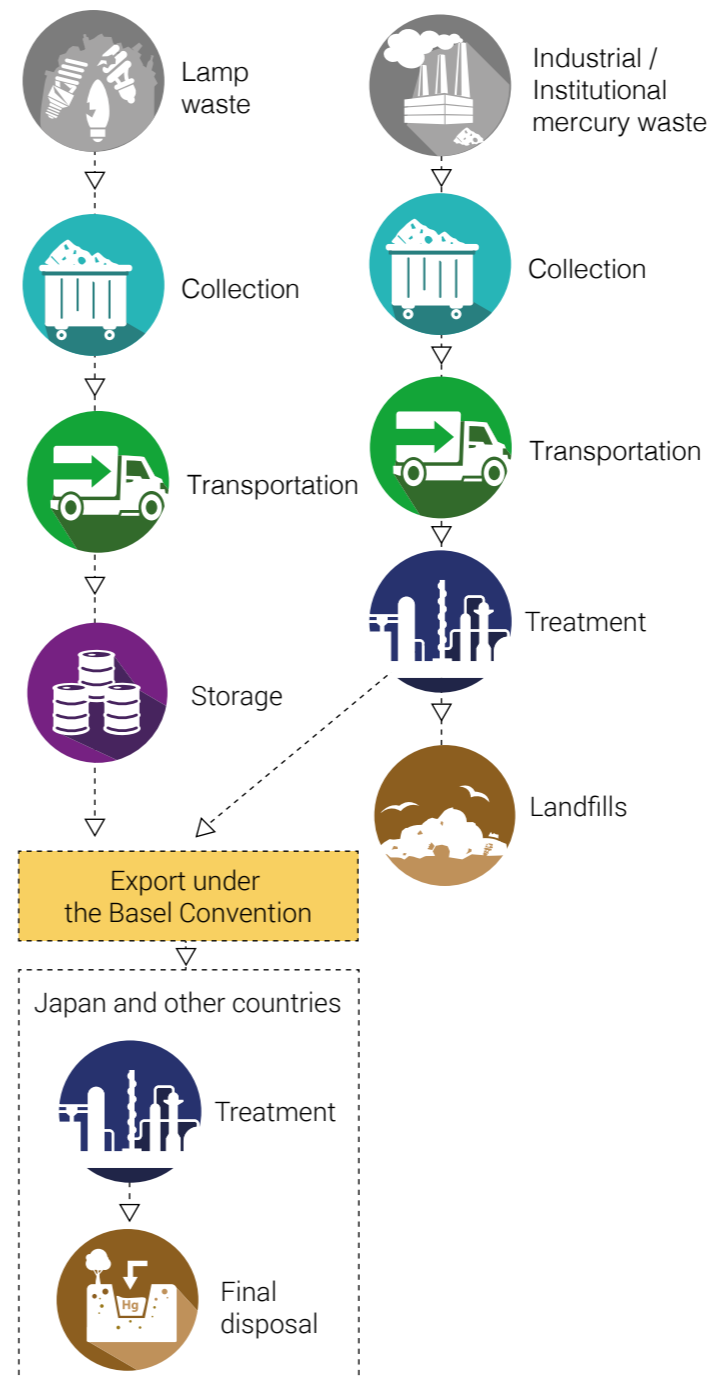
Based on the administrative order mandating gradual phase-out of mercury in the Philippine health care sector, medical devices containing mercury are properly collected and stored with a labelling system at dedicated storage areas in compliance with Department of Health Guidelines on Interim Storage of Mercury Devices.

Mercury wastes generated from industrial, commercial and institutional sectors go to registered hazardous waste facilities for treatment and disposal in landfills or export to other countries, such as Japan, following the Basel Convention procedures. Other mercury wastes such as sludge contaminated with mercury or other metals are encapsulated for disposal at a registered hazardous waste facility or landfill.

Source

Presentation by a representative from the Philippines at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Regulatory framework and mercury waste management in the Philippines



Lamp collection
© Department of Environment and Natural Resources, Philippines

Senegal

The main sources of mercury waste are artisanal and small-scale gold mining, batteries, dental amalgam, mercury-containing lamps, and thermometers and barometers.

According to the national mercury inventory, 65 per cent of mercury releases to soil came from informal waste management, including informal landfills, while 31 per cent of mercury releases to air came from open burning of waste, and 16 per cent of mercury releases to water came from leachates from landfills.



Artisanal and small-scale gold mining © Ministry of Environment and Sustainable Development, Senegal

Legislative and Regulatory Framework

The 2001 Environmental Code⁵⁹ covers waste management including biomedical waste, but does not deal specifically with hazardous wastes, which Senegal mostly exports to other countries because the country has no hazardous waste treatment facilities.

The Legal Framework of Biomedical Waste⁶⁰ provides guidance for biomedical waste management as part of a pilot project for the environmentally sound management of dioxins and mercury.

Current Practices

Mercury waste, including household mercury waste, is collected as part of municipal solid waste management. The coverage rate of municipal solid waste, however, is between 15 and 60 per cent, and on average only 25 per cent of the population has access to waste management services. The gap in coverage between urban and rural areas is wide – 47 per cent for urban and 2 per cent for rural. Most of the collected waste is dumped in uncon-

trolled landfills and other informal sites. Mercury waste that is part of municipal solid waste goes to the same sites for disposal, and is recognized as one of the sources that pose a serious threat to human health and the environment.

The hospital in Dakar is voluntarily storing spent medical devices containing mercury as waste until a final disposal option is available.

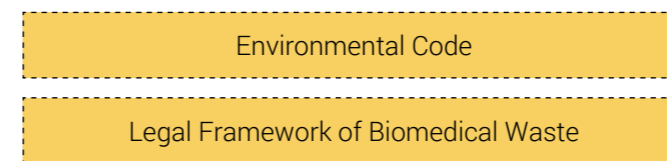
Mercury contamination at artisanal and small-scale gold mining sites is often untreated, and mercury is found downstream from the artisanal and small-scale gold mining sites.

Sources

Report submitted by the Ministry of Environment and Sustainable Development, Senegal, April 2017

Meeting with the Ministry of Environment and Sustainable Development, Senegal, 15 and 16 March 2017

Regulatory framework and mercury waste management in Senegal



Singapore

Singapore has adopted a comprehensive strategy to control the generation of toxic industrial waste and ensure safe treatment and disposal as follows:

- Avoid generation of intractable wastes
- Encourage waste minimization, reuse, recovery and recycling
- Regulate and monitor collection, treatment and disposal
- Promote educational and training programmes

Legislative and Regulatory Framework

The Environmental Public Health Act (Chapter 95)⁶¹ and Environmental Public Health (Toxic Industrial Waste) Regulations⁶² control the import, sale, transport, treatment and disposal of toxic industrial waste. The regulations list the toxic industrial wastes that are controlled and link waste streams from specific industrial activities to wastes with specified toxic components. Mercury and its compounds are the components of one of the toxic industrial waste streams listed in the regulations. The regulations require a licence for the collection and treatment of industrial mercury.

The Environmental Protection and Management Act⁶³ restricts the import and sale of certain mercury-containing products.

Current Practices

Since 1992, Singapore has prohibited the import of mercury-containing batteries that exceed certain mercury limits, and since 2009, has controlled mercury-containing clinical thermometers as hazardous substances not to be imported. In 2012, Singapore began controlling fluorescent lamps that exceed certain mercury limits as hazardous substances. These measures have helped to reduce the amount of household mercury waste entering municipal waste incineration facilities under the public waste collection system.

The municipal waste incineration facilities are equipped with pollution control technologies to ensure that residues comply with the leaching limits for waste disposal at a landfill (mercury threshold = 0.2 mg/l). The waste incineration facilities are also required to comply with the national air emission standards for incineration flue gas (mercury threshold = 0.05 mg/Nm³).

The technologies commonly adopted for the treatment of industrial mercury waste include stabilization and thermal treatment. Similarly, the toxic industrial waste treatment facilities are required to comply with the same set of waste disposal limits and national air emission standards.

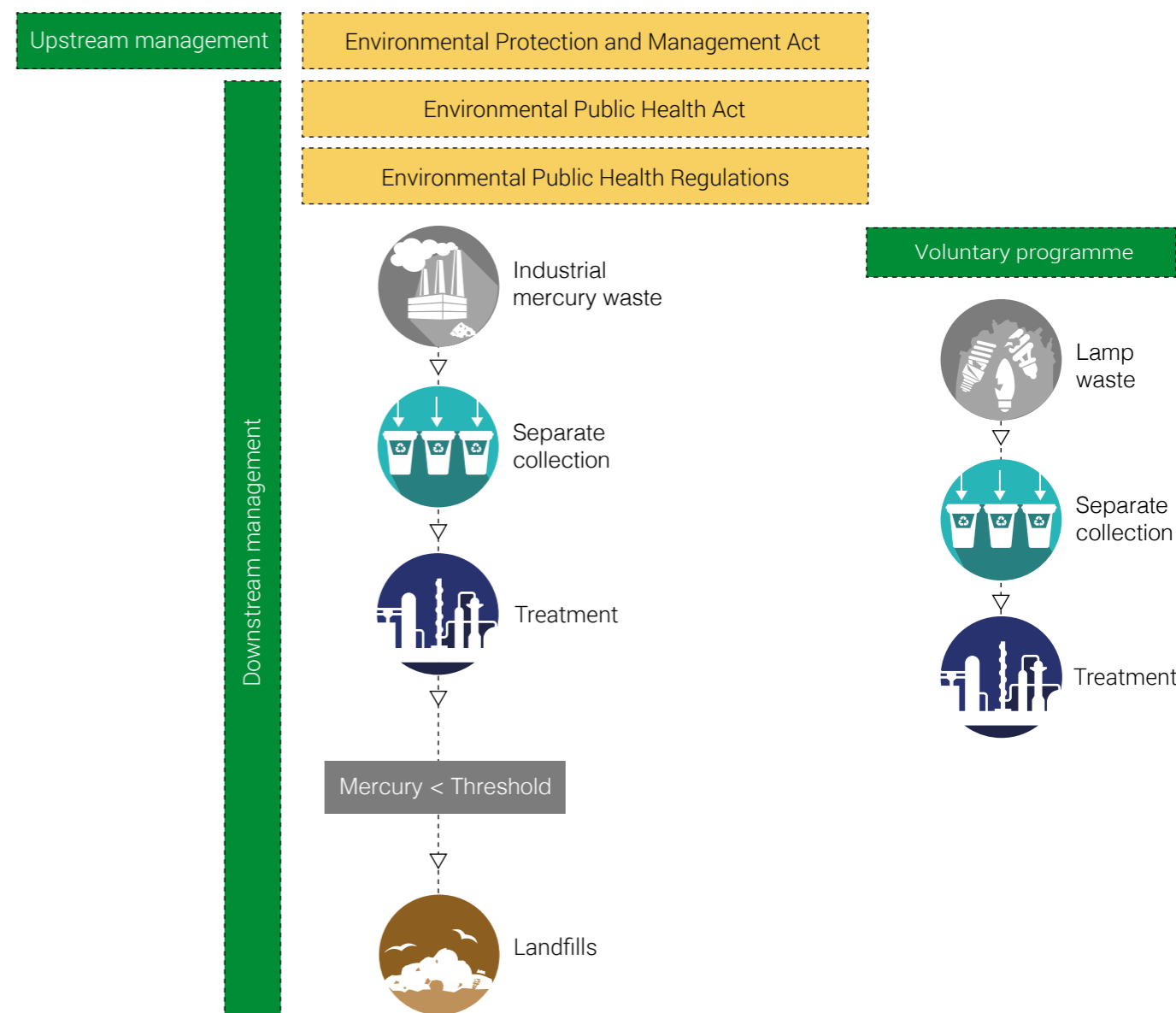
Voluntary programmes for household mercury waste include lamp collection points at shopping malls and collection initiatives of community recycling groups. The collected lamps are sent to a recycling facility where fluorescent powder containing mercury and the other materials are separated and recovered for recycling into new products.

Sources

Meeting with the National Environment Agency, Singapore, 14 July 2016

Meeting with Eco Special Waste Management Pte. Ltd, 16 July 2016

Regulatory framework and mercury waste management in Singapore



Voluntary lamp collection © UN Environment



Voluntary lamp collection © UN Environment

Slovakia

Waste collection coverage is 100 per cent, and separate collection of waste streams such as waste electrical and electronic equipment is generally available. Municipalities are responsible for local waste management. The country has sufficient treatment capacity, including a variety of facilities for waste recovery and final disposal. Extended producer responsibility schemes are also in place for packaging, electrical equipment, lead-acid batteries, end-of-life vehicles, tyres and non-packaging materials.

Reducing the use of mercury and its content in products is a key objective in the effort to reduce mercury waste. Slovakia bans the export of mercury and its use in control and measuring equipment where safe alternatives exist.

Legislative and Regulatory Framework

The national waste legislation is in line with the European Union requirements. The Waste Act of Slovakia⁶⁴ regulates waste management, and the Waste Management Programme is a basic planning document for the entire waste management system. The Waste Act specifies the conditions for temporary and permanent storage of metallic mercury, and categorizes mercury waste as a hazardous waste. The act prohibits the landfill disposal of liquid waste, health care waste including dental amalgam and waste exceeding 3,000 mg Hg/kg.

The legislation prohibits the sale of measuring devices containing metallic mercury and batteries that contain more than 0.0005 per cent mercury by weight to the general public.

Current Practices

Household mercury waste such as batteries, lamps and waste electrical and electronic equipment is collected separately, and treated in waste recycling facilities within the country. Some of this waste is then exported to the Czech Republic, the Netherlands or other countries for further treatment and final disposal.

Recycling of high and low pressure gas discharge lamps containing mercury involves the crushing and separation of materials in a special airtight container. Mercury from the fluorescent dust and other mercury waste sources is distilled in a vacuum chamber after a thermal process, resulting in mercury of over 99.9 per cent purity.

Waste contaminated with less than 3,000 mg Hg/kg goes to landfills for disposal, and waste contaminated with more than 3,000 mg Hg/kg is treated at hazardous waste treatment facilities. Currently there are 11 landfill sites for disposal of hazardous waste.

In dentistry, amalgam was an important and widely used filling material, but its use has declined significantly in recent years due to the increasing popularity and availability of composite filling materials. Under European Union legislation, dental practices are required to install amalgam separators. A specialized facility based in Slovakia purifies the amalgam sludge from the separator, and sends it to the Netherlands for final recovery.

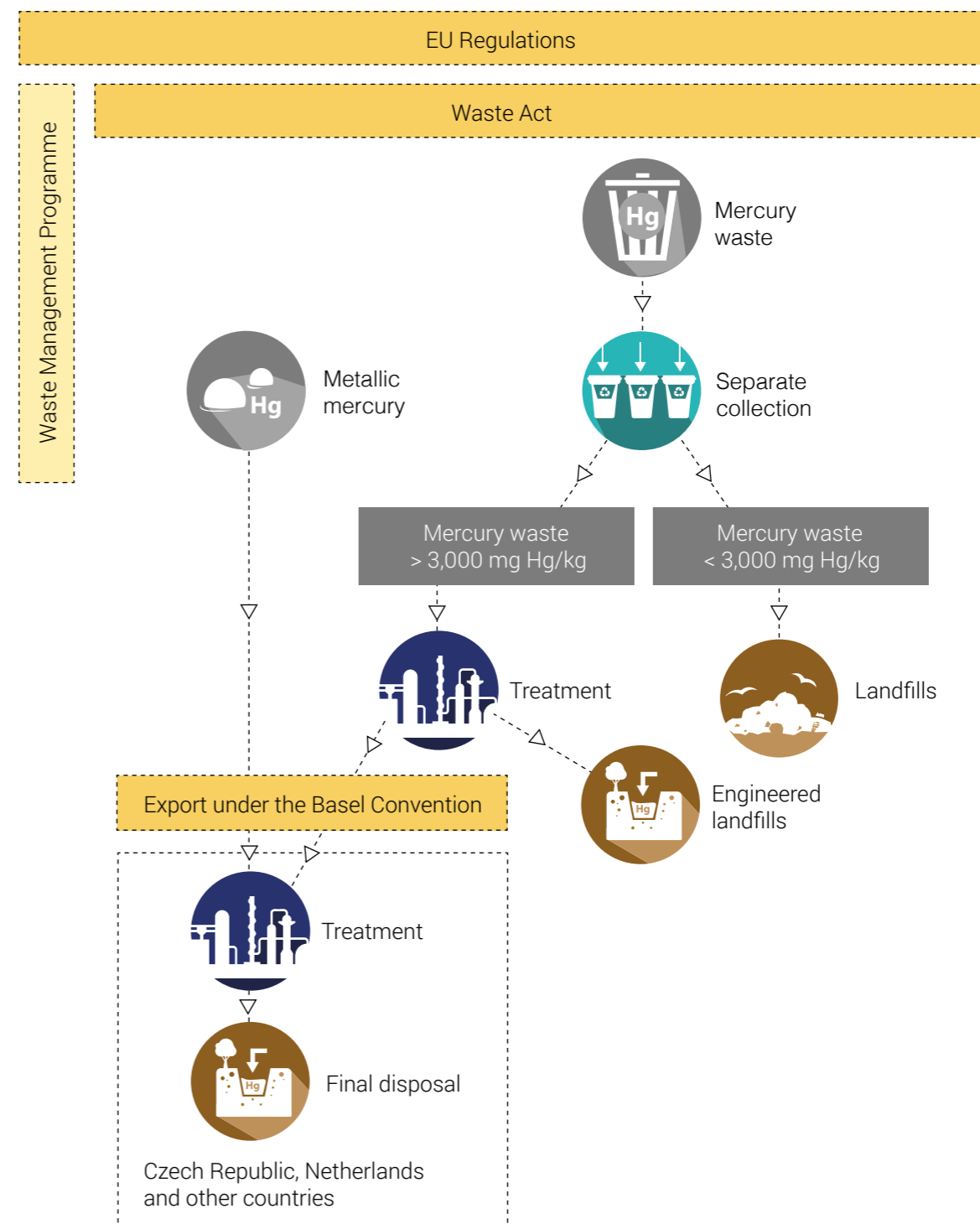
Source

Meeting with the Basel Convention Regional Centre for Central Europe in Slovakia, 7 September 2016



Lamp container © Ekolamp Association

Regulatory framework and mercury waste management in Slovakia



Slovenia

Slovenia has developed its own waste management system based on European policies. Wastes are separated at the source and collected separately for disposal in order to increase recycling rates. Advanced waste collection infrastructure includes underground collection points for paper, packaging and glass in the capital city Ljubljana.

On the other hand, in Idrija – once home to the second largest mercury mine in the world – Slovenia still faces the clean-up from mining that started in the late fifteenth century and ended around 1980. Treating the disposal site for waste and tailings in an environmentally sound way is one of the national priorities for complying with the Minamata Convention. The government has adopted various programmes for site remediation, and the Slovenian people have a high awareness of mercury management based on their history with mercury mining.

Legislative and Regulatory Framework

The Environmental Protection Act⁶⁵, the Decree on Waste Management⁶⁶, and the Decree on Implementation of Regulation (EC) No. 1013/2006 on Shipments of Waste⁶⁷ are the basic legislative and regulatory framework for waste, including mercury waste. Additional legislation covers different types of waste; waste management for landfilling and incineration; and the monitoring of emissions from waste treatment.

The National Environmental Action Programme aims to reduce waste generation at the source, to set up an effective waste management system, and to gradually eliminate old waste management pollution sources.

Current Practices

Waste for which the country has no safe disposal options, including mercury waste, is exported to other countries under the Basel Convention.

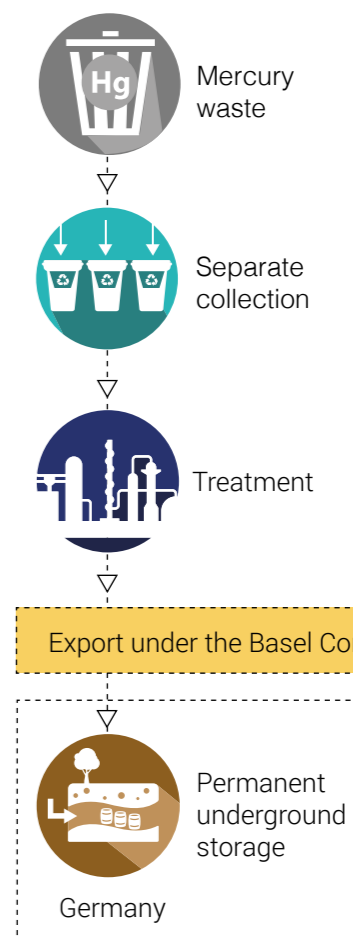
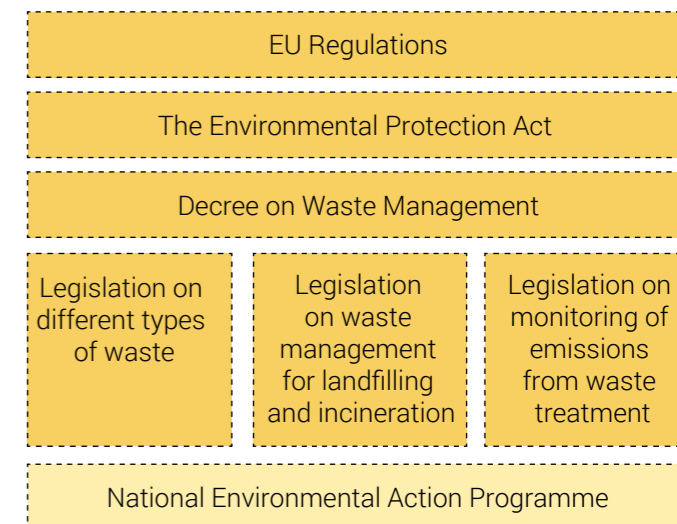
The main mercury wastes include fluorescent lamps, medical devices and batteries. These mercury wastes are separately collected at their sources. Household mercury waste, mainly fluorescent lamps, is also collected separately, and people can bring wastes to collection centres where there are containers for paper and cardboard, glass, plastics, metals, batteries, lamps and waste electrical and electronic equipment.

There are three waste management facilities that treat hazardous waste, including mercury waste. Since Slovenia has no final disposal facility for mercury wastes, they are exported to Germany for final disposal.

Source

Meeting with the Ministry of the Environment and Spatial Planning, Slovenia, 31 August 2016

Regulatory framework and mercury waste management in Slovenia



Voluntary lamp collection
© UN Environment

Spain

Spain runs a national waste management system based on European policy and its own history of waste management starting in the 1980s. The system includes source separation, residential collection services and waste collection centres.

Mercury mining in Almadén in the province of Ciudad Real dates from the time of the Romans until 2001, and is home to the world's largest mercury reserve. The mine and the Mercury Technological Center in Almadén are state-owned. Based on the vast local knowledge and experience with mercury management, the centre has developed a technology for the stabilization and solidification of metallic mercury. The final product is an inert compact solid with no significant mercury releases and no need for containers. The application of this technology ensures the environmentally sound management of metallic mercury waste.

Legislative and Regulatory Framework

Within the context of the European Union regulations, Spain manages mercury waste under the Waste and Contaminated Soils Act⁶⁸ and several Royal Decrees. The act regulates hazardous waste, and under the act mercury waste is a hazardous waste to be treated in an environmentally sound manner. The Royal Decree on waste electrical and electronic equipment⁶⁹ provides for collection, transportation, treatment and disposal, includes recycling and upstream management and covers the management of household mercury waste, in particular fluorescent lamps.

Royal Decree 9/2005 on contaminated sites⁷⁰ establishes the basis for setting Generic Reference Levels – the concentration of a contaminant in the soil that does not imply a risk to human health and the environment. Based on local policy, each autonomous community sets Generic Reference Levels for industrial, public, urban and other land uses within a range of 0.36 to 250 mg Hg/kg. The Guidelines on Best Environmental Practices for Environmentally Sound Management of Mercury Contaminated Sites in the Mediterranean⁷¹ cover site remediation.

Current Practices

Lamp wastes are collected at about 33,300 collection points and treated at five recycling facilities under the auspices of EucoLight, which is the European association of collection and recycling organizations for waste electrical and electronic equipment lamps and lighting.

Elemental mercury from the decommissioning of chlor-alkali facilities is stored at temporary storage sites. Spain expects to generate 900-1,000 tonnes of elemental mercury from these facilities, and expects that this metallic mercury will be stabilized and solidified for disposal in an environmentally sound manner in specially engineered landfills.

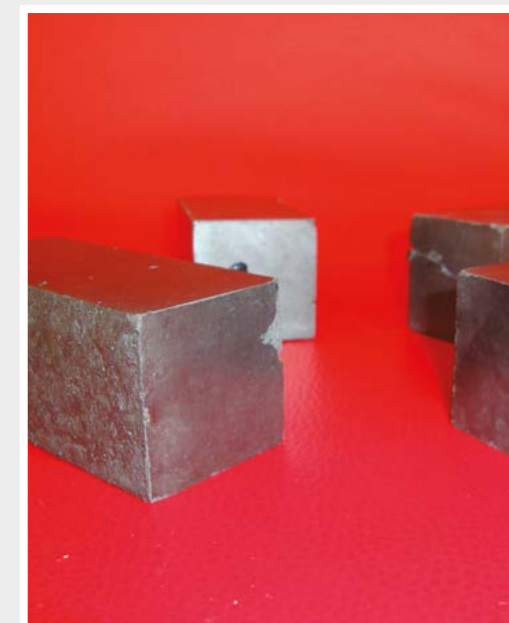
Remediation of the Almadén mercury contamination occurred between 2006 and 2009, and remediation activities are currently under way at other small old mines. Industrial chlor-alkali facilities are phasing out their mercury technology, and developing plans that include site characterizations, proposed remediation actions and monitoring activities.

Source

Meeting at the Ministry of Agriculture, Food and the Environment, Spain, 12 September 2016

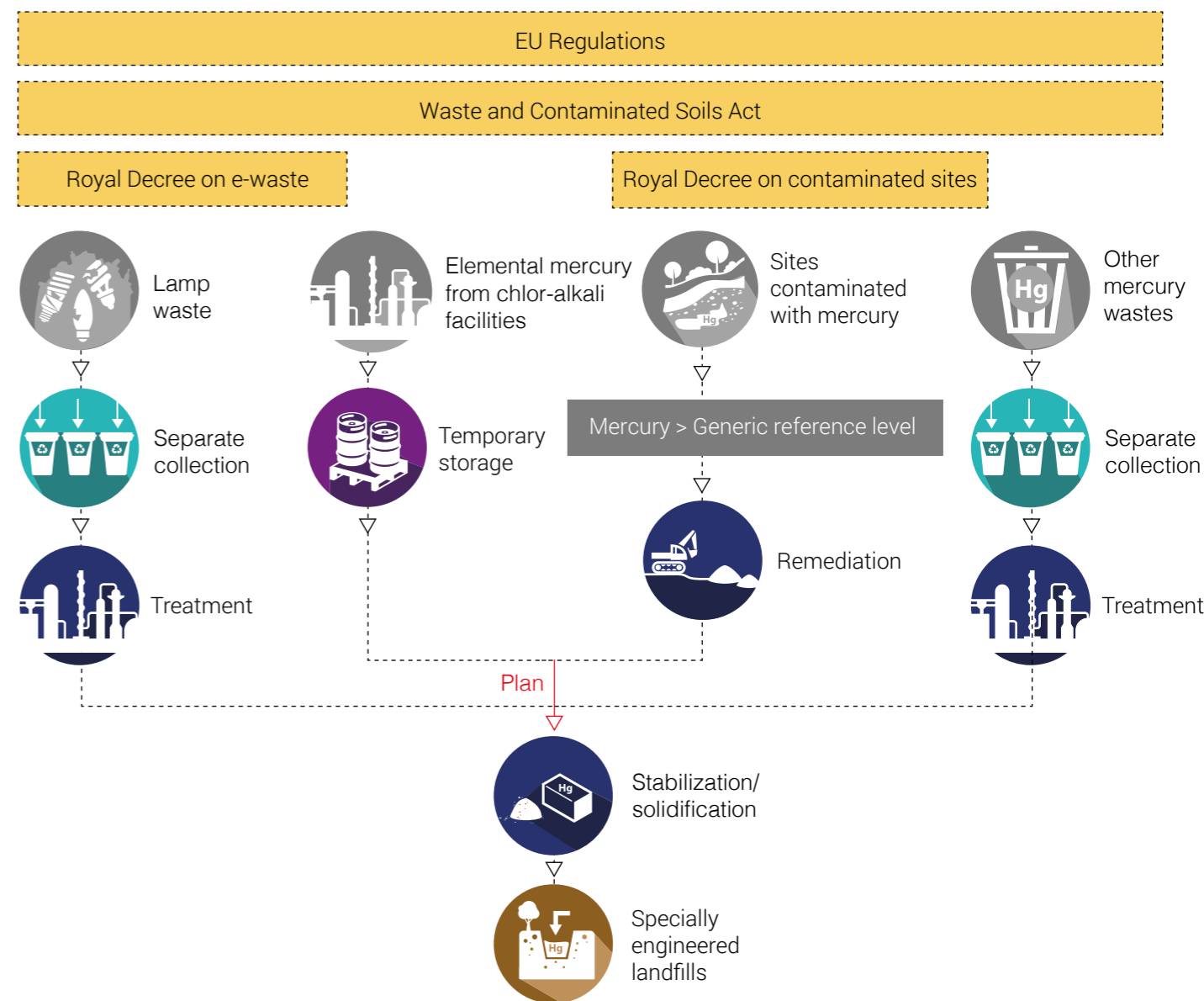


Lamp collection © AMBILAMP



Final product of the stabilization and solidification technology © Ministry of Agriculture, Food and the Environment, Spain

Regulatory framework and mercury waste management in Spain



Sweden

In the early 1990s, Sweden was already implementing programmes to phase out the use of elemental mercury and mercury-containing products. Through the successful implementation of outreach programmes, and through information materials, training sessions, and other activities, Sweden raised the awareness of mercury to high levels.



Lamp collection © UN Environment

Legislative and Regulatory Framework

In accordance with the general requirements of the Environmental Code⁷², mercury should be treated in an environmentally sound manner. The Government Ordinance on Waste (2011:927)⁷³ stipulates that waste containing 0.1 per cent or more mercury by weight be put into deep underground storage within a year unless it is covered by Article 2 of European Union Regulation 1102/2008 on export and storage of mercury, or otherwise already placed in final disposal in accordance with the Environmental Code. The Ordinance on Landfilling of Waste (2001:512)⁷⁴ and the Acceptance Criteria for Landfills as well as the European Union Landfill Directive (1999/31/EC) prohibit the landfilling of wastes with mercury content at 0.1 per cent or more by weight.

Current Practices

Waste collection centres receive for disposal certain household wastes – mercury waste, waste electrical and electronic equipment, metal wastes, construction waste, and bulk waste – that are not suitable for disposal through the regular waste collection schemes. The number of mercury-added products has declined considerably since the implementation of phase-out programmes over the past decades.

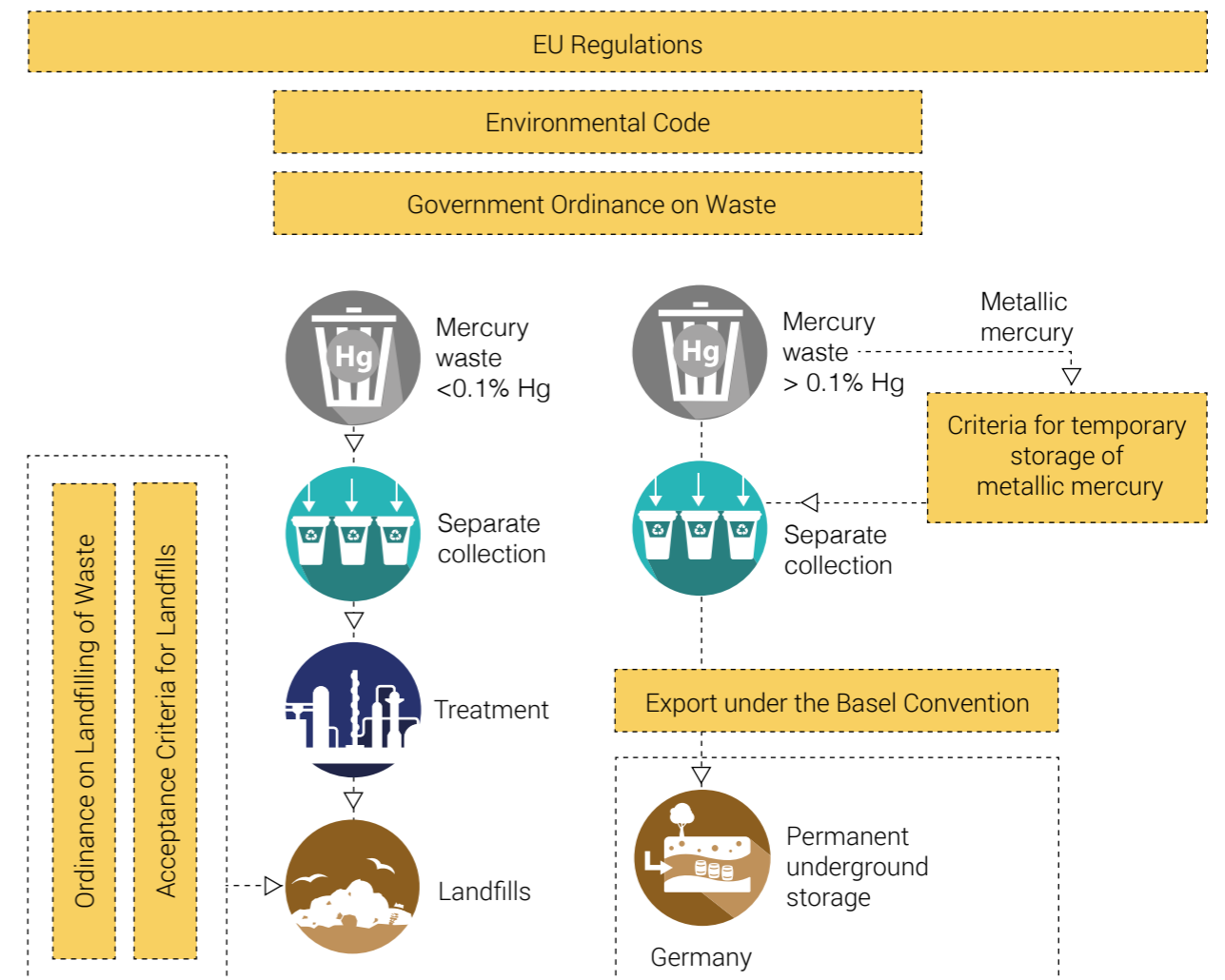
Stable inorganic waste and other inorganic waste with mercury content less than 1,000 mg Hg/kg is stabilized and solidified for final disposal at landfills. Organic waste and waste containing persistent organic pollutants with mercury content less than 1,000 mg Hg/kg are incinerated at high temperature. Stable inorganic waste with mercury content more than 1,000 mg Hg/kg is exported for disposal in deep underground storage in accordance with the Basel Convention.

Sources

Meeting with the Ministry of Environment and Energy, Sweden, 1 September 2016

Meeting with Ekokem AB, 2 September 2016

Regulatory framework and mercury waste management in Sweden



Switzerland

Switzerland has a comprehensive set of laws and regulations in place dealing with waste, hazardous waste, transboundary movement of waste, contaminated sites, soil and water protection, air pollution control, and other environmental protection matters. In most cases, the enforcement of regulations is delegated to the 26 cantons. The Federal Office for the Environment handles the transboundary movement of waste under the Basel Convention.

Legislative and Regulatory Framework

The Federal Act on the Protection of the Environment⁷⁵ covers mercury waste, and lays out a waste management system that includes collection, treatment, recovery and disposal as well as the remediation of contaminated sites. The act requires that waste disposal be handled in an environmentally safe way and, insofar as possible and reasonable, that waste treatment and disposal occur within Switzerland. The Ordinance on the Prevention and Disposal of Waste⁷⁶ specifies the details of waste management including thresholds of mercury for landfills. The Ordinance on the Return, Take-Back and Disposal of Electrical and Electronic Equipment⁷⁷ requires that batteries containing mercury be managed in an environmentally sound manner.

Current Practices

Collection of separated household wastes is conducted nationwide in accordance with the procedures in each canton. Household mercury waste, mainly in the form of fluorescent lamps, is also collected separately from other wastes. Common practices among the cantons include returning fluorescent lamps to the place of purchase or to drop-off points in waste collection centres. A large proportion of fluorescent lamps can be treated within Switzerland, and the rest are exported to Germany or France for further treatment and final disposal.

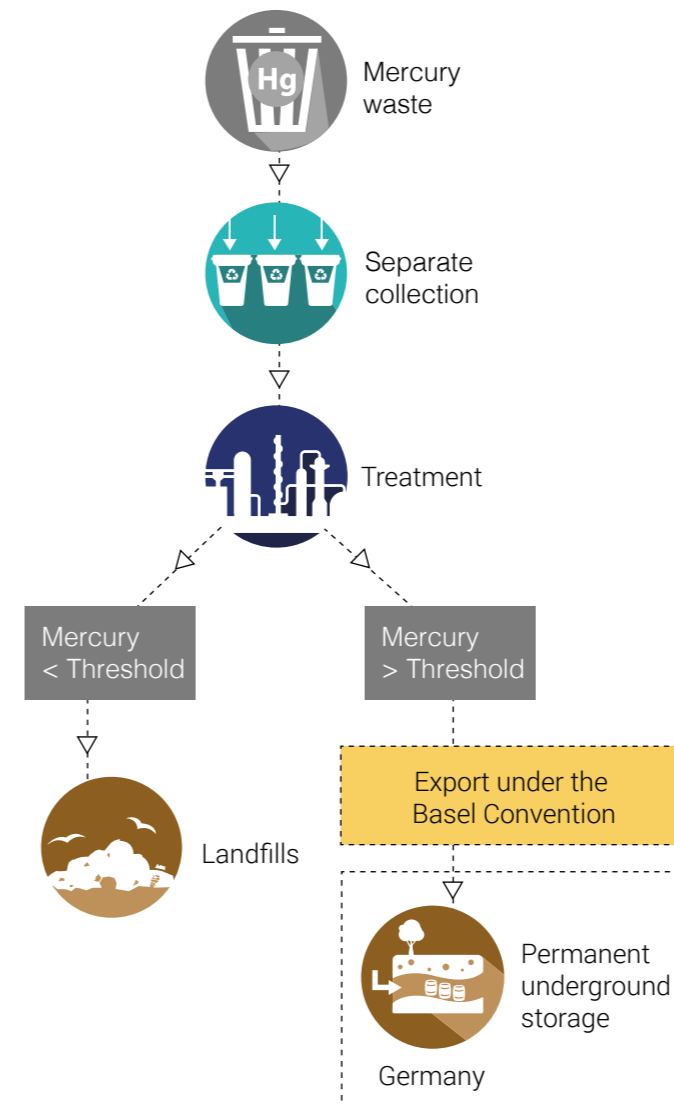
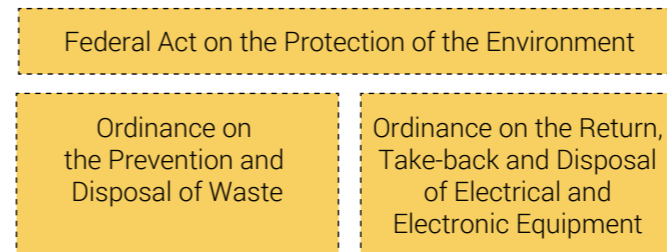
Other mercury waste, such as batteries, elemental mercury, activated carbon and other waste contaminated with mercury, is treated in an environmentally sound manner within the country at a specialized hazardous waste treatment facility. The treatment processes include thermal treatment where mercury in waste is vaporized; purification of raw mercury after thermal treatment; and stabilization with sulphide. Mercury sulphide with very low mercury vapour emissions meets the acceptance criteria for permanent storage. All treated mercury waste is exported in accordance with Basel Convention rules to Germany for final disposal in underground storage.

Sources

Meeting at the Federal Office for the Environment, Switzerland, 6 September 2016

Meeting at Batrec Industrie AG, 5 September 2016

Regulatory framework and mercury waste management in Switzerland



Stabilization process © Batrec Industrie AG

Tanzania

Tanzania faces some of the same challenges as other developing countries – inadequate waste management technologies, economic difficulties and many competing development needs that make hazardous waste management a low priority. Hazardous waste volumes and the associated environmental and health risks are increasing.

Waste collection falls within the jurisdiction of local authorities. The main sources of mercury waste include healthcare waste, artisanal and small-scale gold mining, industrial hazardous waste and e-waste.

Legislative and Regulatory Framework

A number of environmental protection policies and legal frameworks are in place, but there is no single policy or regulation for mercury waste management. The Environmental Management Act (2004)⁷⁸ covers waste treatment and disposal, including toxic and hazardous waste, and municipal solid waste, and the Environmental Management (Hazardous Waste Control) Regulations (2009)⁷⁹ list mercury as waste that needs to be properly handled and managed.

The Public Health Act (2009)⁸⁰ covers hazardous and health care waste management, and the Standards Act No.2 (2009)⁸¹ sets out national standards on maximum tolerance limits, including mercury (0.005 mg/l) in municipal and industrial wastewater. The Guidelines for Management of Hazardous Waste (2013)⁸² provide for the environmentally sound management of hazardous waste through the promotion of best practices.



Dump site © REUTERS/E. Kwitema

Current Practices

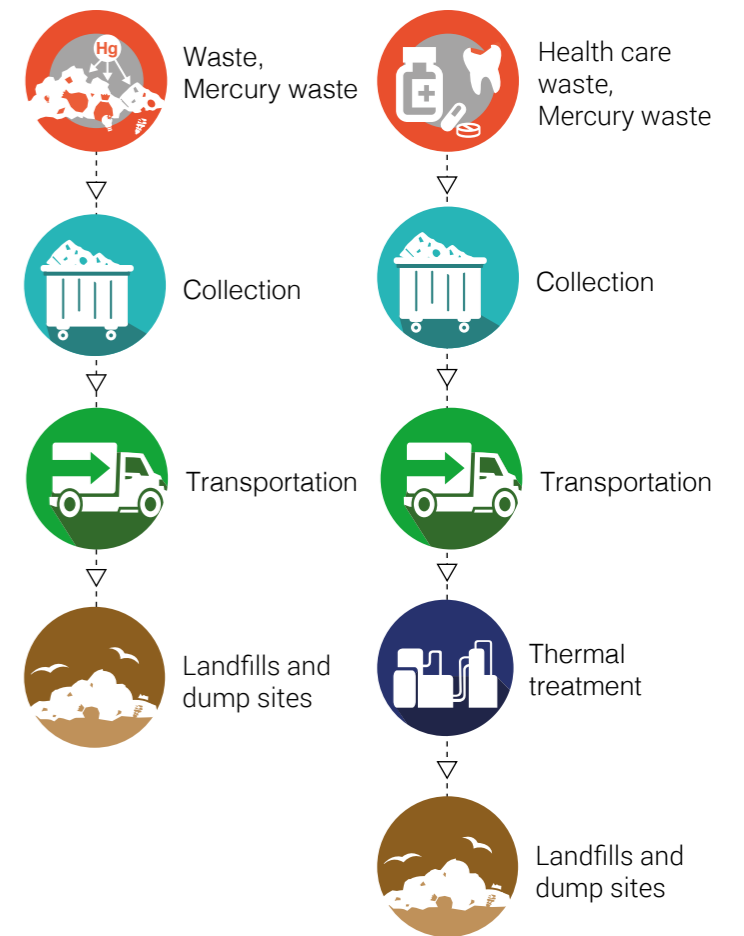
Household mercury-containing wastes are mixed with other municipal solid waste. Local authorities collect municipal solid waste for disposal at dump sites, but other uncollected municipal wastes are buried, burned or left in open fields.

Healthcare waste, which is categorized as hazardous waste, is sorted and then transferred for thermal treatment. Normally, the treatment of small amounts of mercury-containing waste is done at referral hospitals. Larger quantities of hazardous waste and mercury-containing waste are transferred to thermal treatment facilities. These facilities, however, are not well maintained, and very few of them are equipped with state-of-the-art technology.

Source

Presentation by a representative from United Republic of Tanzania at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Regulatory framework and mercury waste management in Tanzania



Thailand

Thailand has been implementing various waste management activities including a nationwide campaign for separate collection of batteries, fluorescent lamps and e-waste. A Roadmap and Master Plan of Municipal Solid Waste and Household Hazardous Waste Management for 2016-2021 aims to accelerate development of an environmentally sound waste management system. An action plan, Thailand Zero Waste, is to be implemented for 2016-2017. The action plan intends to establish one household hazardous waste collection centre per community. The roadmap contemplates the collection of household mercury wastes as well as other wastes.

Legislative and Regulatory Framework

Notification of the Ministry of Industry B.E. 2548 (2005)⁸³ classifies waste as mercury waste if the content of mercury and/or mercury compounds is equal to or more than 20 mg/kg (as the total threshold limit concentration) or 0.2 mg/l as the soluble threshold limit concentration.

The notification also relates to Disposal of Wastes or Unusable Materials issued under the Factory Act (1992)⁸⁴. The act requires the permission of the Department of Industrial Works and compliance with storage, transportation, handling, and disposal of hazardous waste procedures. The Public Health Act (1992)⁸⁵ regulates household hazardous waste. Local authorities are responsible for both hazardous waste and municipal solid waste.

Import, export or possession of mercury wastes requires a Department of Industrial Works permit as per the Hazardous Substances Act and compliance with the Basel Convention.

Current Practices

Local authorities collect, store and dispose of household mercury wastes within their currently available options – door-to-door collection, drop-off points and special collection days. Final disposal is at landfill sites. Campaigns to raise awareness and activities at the national and city levels promote the separate collection of wastes.

Thailand treats mercury-contaminated waste generated from industries at a special waste facility that meets international environmental standards, and disposes of the waste in landfill sites.

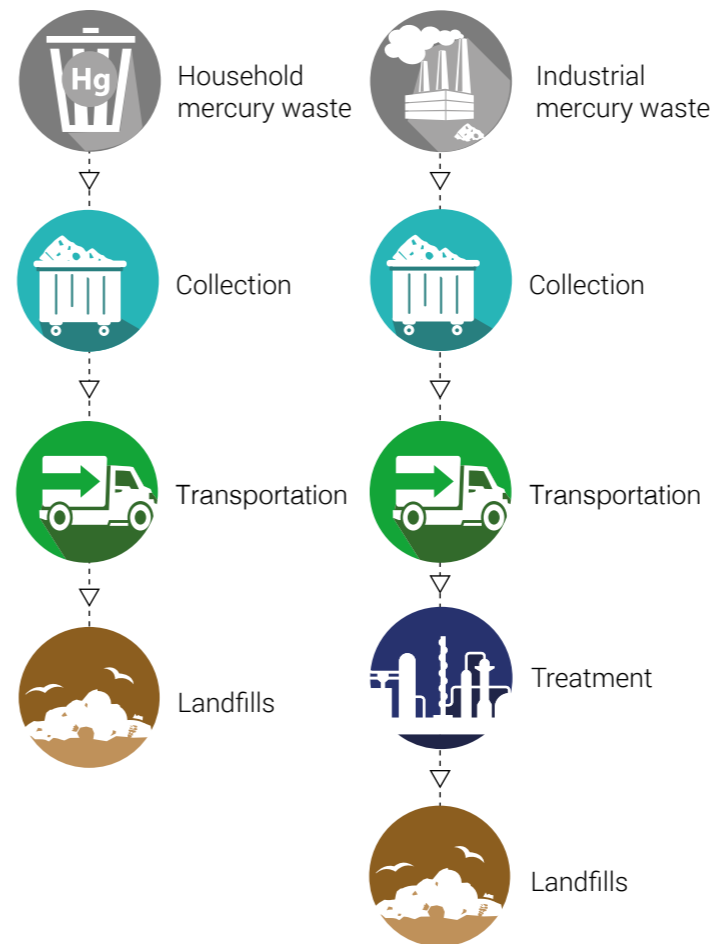
Sources

Presentation by a representative from Thailand at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Meeting at the Nonthaburi Municipality, 17 November 2016

Meeting at BMT Pacific Co. Ltd., 17 November 2016

Regulatory framework and mercury waste management in Thailand



Lamp waste at the waste storage site in Nonthaburi municipality © UN Environment



Mercury waste storage area at BMT Pacific Co. Ltd © BMT Pacific Co. Ltd.

Trinidad and Tobago

Trinidad and Tobago is a small island developing state facing waste management challenges with an underdeveloped waste management framework. Currently, there is no legal provision for waste separation, and household wastes are mixed and transported to landfills for disposal.

Legislative and Regulatory Framework

The Litter Act (1973)⁸⁶ is the primary law governing all kinds of wastes, including domestic and industrial waste. The Municipal Corporations Act (1990)⁸⁷ stipulates that municipalities are responsible for the disposal of waste from public and private property, and for the development and maintenance of sanitary landfills. The Pesticides and Toxic Chemicals Act (1979)⁸⁸ prescribes the procedures for the import, export and disposal of controlled products containing certain chemicals, including mercury.

The Environmental Management Act (2000)⁸⁹ provides for the making of rules and regulations for waste management. The Certificate of Environmental Clearance Rules (2001)⁹⁰ is an environmental permitting system used specifically for assessing development activities, and includes requirements for the management of waste. The Certificate of Environmental Clearance (Designated Activities) Order (2001)⁹¹ lists the activities requiring a Certificate of Environmental Clearance. The activities include establishment of solid waste disposal facilities, establishment of hazardous substance handling facilities, and recovery or incineration of waste.

Under the draft Waste Management (Hazardous Waste) Rules⁹², mercury waste is categorized as a hazardous waste stream. Generators of more than a certain amount of hazardous waste must register, and the hazardous waste must be treated at authorized facilities.

Current Practices

In general, mercury waste generated from households is mixed with other municipal solid waste, and is collected as municipal solid waste for disposal at landfills. Some industries and organizations, however, use waste contractors who collect, crush, encapsulate and dispose of encapsulated lamp waste in landfills.

Amalgam waste is mixed with other waste, washed down sinks or sent to hospitals for disposal by incineration. Waste contractors collect, treat and dispose of laboratory waste containing mercury. Waste containing mercury generated from health facilities is discharged into the drains or collected by waste contractors who treat and dispose of the waste through incineration or in landfills.

Sources

Meeting on Environmentally Sound Management of Mercury Wastes organized by the Basel Convention Regional Centre for the Caribbean, Port-of-Spain, Trinidad and Tobago, 18 January 2017

National Hazardous Waste Inventory (2004-2008), Government of the Republic of Trinidad & Tobago, March 2010

Regulatory framework and mercury waste management in Trinidad and Tobago



Lamp waste storage pending disposal
© Basel Convention Regional Centre for the Caribbean Region



United States of America

The United States Environmental Protection Agency implements a comprehensive waste management system that is designed to control and safely manage hazardous waste from its point of generation to its final disposal (so-called cradle-to-grave management).

Legislative and Regulatory Framework

The Resource Conservation and Recovery Act⁹³ gives the Environmental Protection Agency the legal authority to control management of both hazardous and non-hazardous waste. The Environmental Protection Agency sets minimum national standards for hazardous waste, including criteria for classification of waste as hazardous, transport restrictions, and treatment and disposal with permitting. Mercury waste is subject to the act's hazardous waste management requirements. Waste can be classified as hazardous either through a listing, or if the waste exhibits a characteristic of hazardous waste. Mercury wastes listed as hazardous include surplus elemental mercury, mercury wastes from mercury cell process production of chlorine, and mercury-bearing vinyl chloride monomer wastes. Waste leaching 0.2 mg/l or more mercury when tested using the toxicity characteristic leaching procedure is also classified as hazardous.

Mercury waste containing 260 mg/kg or more total mercury must be sent for thermal retorting for mercury recovery, while lower concentration mercury waste can be stabilized and landfilled. Hazardous waste landfills are required to have double liner systems and leachate collection to prevent groundwater contamination.

Current Practices

Generators determine whether their waste is hazardous, and may store hazardous waste for a limited time on site. Authorized shippers transport waste for treatment and disposal, and shipments are accompanied by a manifest used to track the waste and ensure proper handling.

Surplus elemental mercury – resulting from a ban on the export of elemental mercury and from mercury recovered from waste – is currently stored as waste at hazardous waste management facilities. Under current regulations, high-concentration mercury waste cannot go to landfills for disposal.

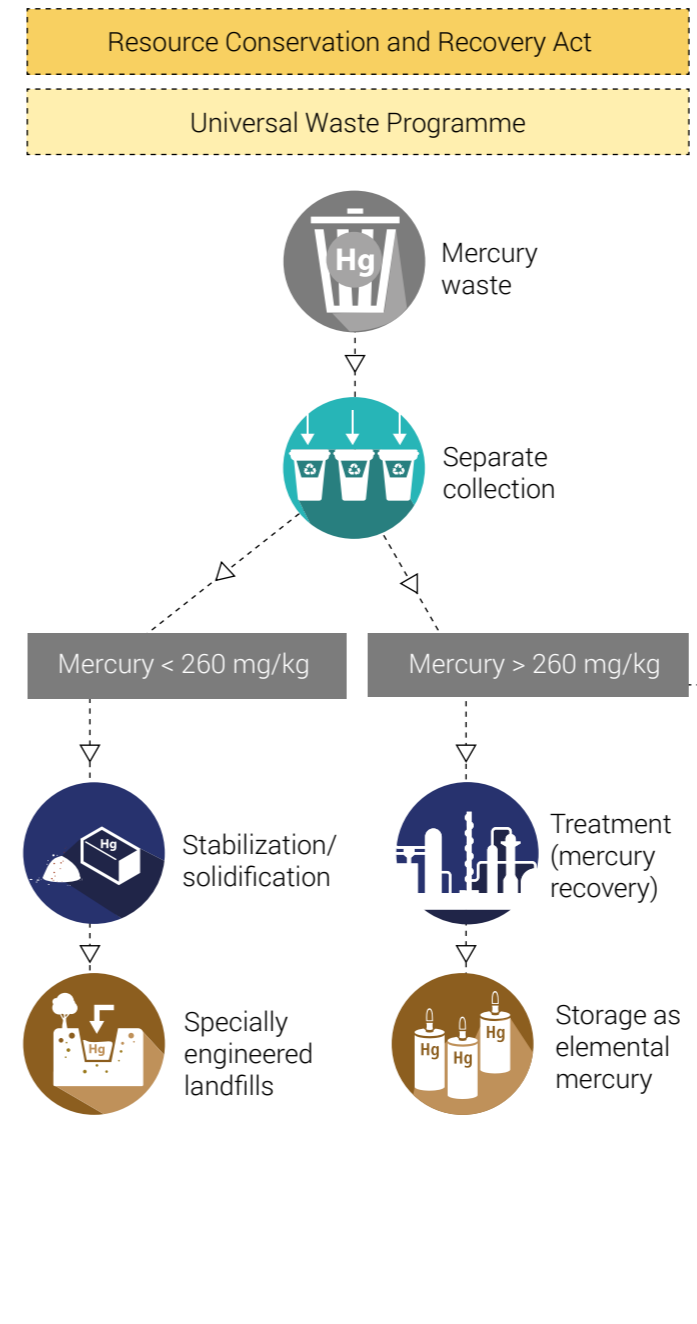
The Universal Waste Program streamlines hazardous waste management for end-of-life mercury-containing devices and lamps. These wastes are ultimately subject to separate collection, mercury recovery (and storage), or treatment and disposal.

Some surplus mercury is stabilized as mercury sulphide and exported to Canada for final disposal under a bilateral agreement meeting the requirements of the Basel Convention. Recent legislation bans the export of a number of mercury compounds as of January 1, 2020, except to a member country of the Organisation for Economic Co-operation and Development for treatment and/or final disposal.

Source

Presentations by representatives from the United States Environmental Protection Agency, Association of Lighting and Mercury Recyclers, and Headwater LLC at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

Regulatory framework and mercury waste management in the United States of America



Uruguay

Uruguay has a limited capacity to combat its growing waste management issues despite a series of significant improvements in solid waste management over the last decade. The infrastructure for the treatment of solid industrial wastes is inadequate, and the practices for waste minimization and for valuing wastes are in the early stages of development. An engineered landfill initiated operations in 2015 in the capital Montevideo, and receives hazardous waste from industry. The country is developing a life cycle approach to mercury waste management.

Legislative and Regulatory Framework

The National Environmental Directorate is developing a waste law in collaboration with several government institutions, academia and civil society. The Ministry of Housing, Land Planning and Environment acts as the administrative arm of the National Directorate for the Environment.

The General Law for Environmental Protection (2000)⁹⁴ declares that promoting sustainable environmental development is a basic duty of the State. Articles 20 and 21 cover the management of chemicals and waste. The Ministry of Housing, Land Planning and Environment is responsible for determining the applicable standards for environmental protection.

Other relevant laws include the Law on Transboundary Movement of Hazardous Wastes (1999) and the Law for Packaging and Package Waste (2004)⁹⁵. The Decree on Industrial Waste (2013)⁹⁶ regulates waste management within the industrial sector. A general waste law and a management decree on mercury-containing lamps are under discussion.



Source

Meetings at the National Environmental Directorate of Uruguay, and Basel and Stockholm Convention Regional Centre in Uruguay, 30 November - 2 December 2016

Current Practices

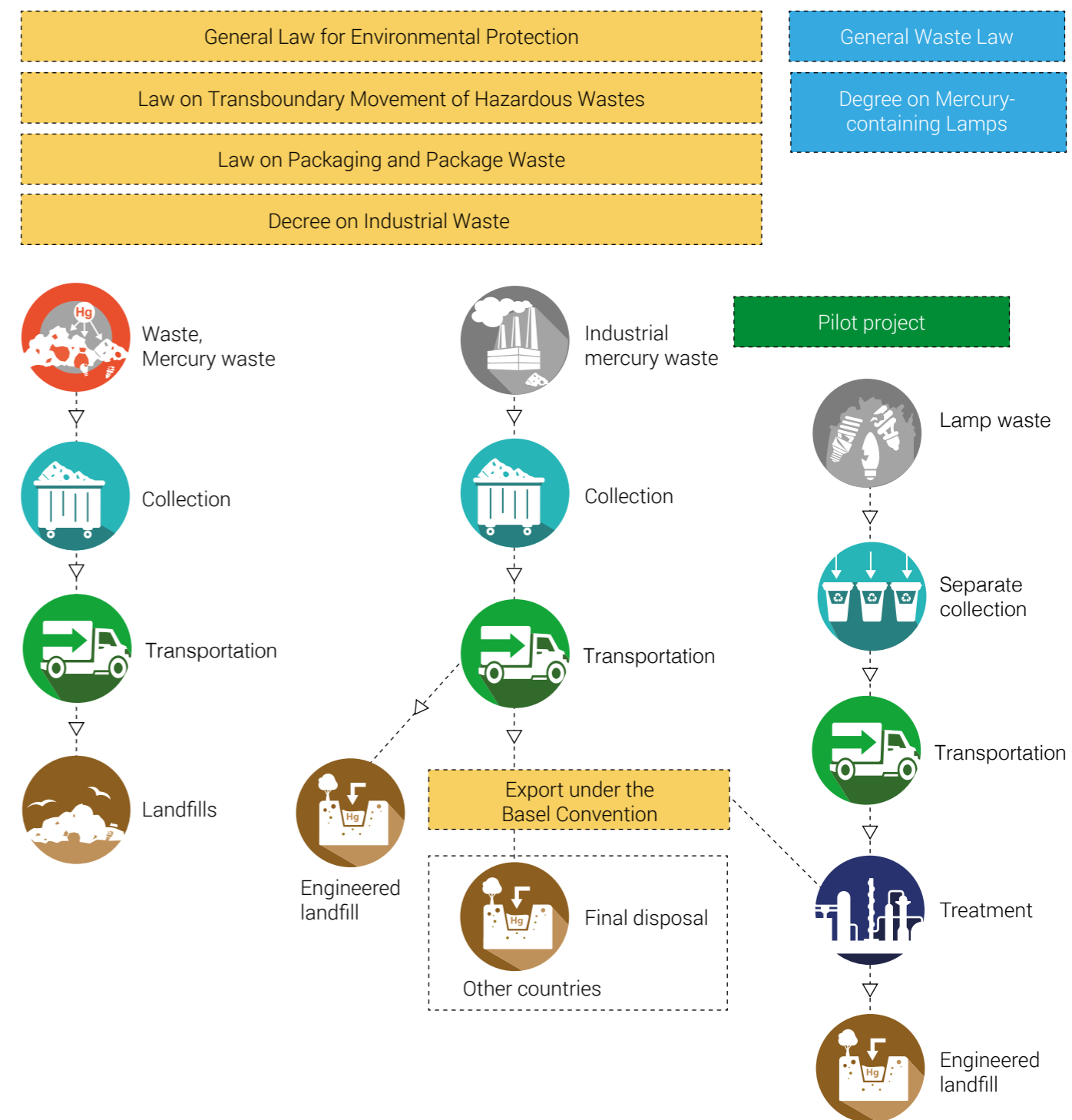
Household mercury waste is mixed with other wastes at the source and collected and transported for disposal in landfills as a responsibility of municipalities.

A pilot project on the collection and treatment of domestic mercury lamps has been taking place since 2016, and includes lamp collection points throughout the country. The few facilities authorized to treat mercury-containing lamps can send their waste for disposal at the engineered land-

fill, depending on the mercury concentration of the waste. Mercury waste that exceeds mercury concentration limits is exported in accordance with the Basel Convention.

A national mercury project funded by the Global Environment Facility and co-financed by the Ministry of Housing, Land Planning and Environment and other national institutions is making efforts to develop mercury waste treatment facilities that could be operational by 2018.

Regulatory framework and mercury waste management in Uruguay



Zambia

The Zambia Environmental Management Agency is responsible for the regulatory framework, and local authorities are responsible for the implementation of waste management. Waste practices directly relate to local socioeconomic activities, including disposal of all wastes in landfills, recovery of recyclable materials at the landfill sites and resources sold on domestic markets.

Legislative and Regulatory Framework

The Environmental Management Act (2011)⁹⁷ prohibits the collection, transport, sorting, recovery, treatment, storage and disposal of waste in a manner that results in an adverse effect. The Environmental Management (Licensing) Regulations (2013)⁹⁸ require those involved in waste management to obtain a waste management licence. Similarly, those involved in hazardous waste management have to obtain a hazardous waste management licence.

The National Solid Waste Management Strategy of 2004⁹⁹ proposes integrated approaches to solid waste management. The objectives of the strategy are to minimize waste generation; to maximize the efficiency of waste collection; to reduce the volume of waste for disposal; to maximize the economic value of waste; and to develop and adopt environmentally sound treatment and disposal practices.

In the absence of mercury waste regulations, mercury waste is managed under the existing legislative and regulatory framework.

Current Practices

Household mercury waste is mixed with municipal solid waste. Community-based organizations and private waste contractors collect and transport municipal solid waste for disposal at landfills.

Licensed collectors and transporters take waste, including mercury waste, generated by industrial, commercial and other sectors, for disposal at landfills. At the landfill sites, waste pickers collect recyclables.

The Demand Side Management Initiative is replacing incandescent lamps with fluorescent lamps for energy savings, and will be developing a new programme to collect and treat fluorescent lamps for final disposal.

Sources

Meeting at the Zambia Environmental Management Agency, 24 November 2016

Meeting at ZESCO Limited, 24 November 2016



Recovery of recyclables at a landfill site © UN Environment

Regulatory framework and mercury waste management in Zambia



Underground Disposal Facilities in Germany



Disposal chamber for mercury-contaminated wastes in the underground facility
© K+S Entsorgung GmbH

Underground waste disposal facilities in potash or rock salt mines are designed to hold toxic, water soluble and dangerous waste in a manner that is safe and assures the sustainable isolation of the waste from the biosphere. Germany has three underground disposal facilities that can accept mercury waste for permanent storage. The waste is placed at a depth of 700-800 metres and permanently sealed off from the environment by means of geological and artificial barriers. The mine areas are protected by 50-100 metres of salt beneath a 10-metre clay layer and 200-metre bunter stone layer.

The permits necessary for the operation of the underground disposal facility are issued according to European and German waste legislation, and require a long-term safety analysis for each specific mine. The analysis must demonstrate that the underground waste disposal facility remains isolated from the biosphere from inception to postoperational maintenance.

The underground waste disposal facilities have implemented a quality management system (International Organization for Standardization 9001) and hold a German certificate approving the disposal facilities as complying with German regulations. The audits, which are conducted by external experts, cover all work processes at the underground waste disposal facility, and review the training and expertise of the staff.

Sources

Meeting at K+S Entsorgung GmbH, Herfa-Neurode, Germany, 13 March 2017

Report on Isolating Mercury Waste From the Biosphere in Salt Mines, J. Steinbach, F. Bretthauer, F. X. Spachtholz, K+S Entsorgung GmbH, April 2017

Mercury Waste Management Facility in Moscow



Container for transportation of mercury
©Mercom Ltd

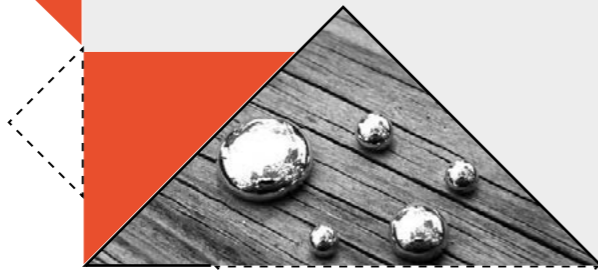
A mercury waste management facility located in Moscow operates under a licence issued by the Federal Service for Supervision of Natural Resources. The facility collects, transports, treats and disposes of mercury wastes originating anywhere across the entire territory of the Russian Federation. The comprehensive mercury waste management service includes recovery of mercury from secondary mercury sources and waste and treatment of fluorescent lamps and mercury-containing devices. The facility also develops and introduces technologies for processing of mercury-containing waste, handles the collection, packaging, transportation and disposal of waste containing mercury, and remediates sites contaminated with mercury.

The facility serves 400-600 organizations, schools and hospitals for the collection and disposal of mercury-containing waste, and treats 300,000-600,000 lamps, 8-10 tonnes of thermometers and other devices, and up to 20 tonnes of solid waste containing mercury per year. The facility produces 5-20 tonnes of commodity mercury per year from waste, mainly for the needs of the chemical and electric industries of Russia. Between 1992 and 2015, the facility manufactured and sold 253 tonnes of commodity mercury.

Source

Meeting at the Moscow Office of the United Nations Environment Programme, Russian Federation, 29 August 2016
Mercom Ltd., www.mercom-1.ru

Chapter 3



Selected Mercury Waste Data



Selected Mercury Waste Data

Understanding the current status of mercury waste management and planning for the environmentally sound management of mercury waste appropriate to the current status and capacity of each country requires a certain amount and quality of data. Unfortunately, the fact-finding missions, the project meeting and the desk studies found only limited data, presented here in summary fashion.

The principles, concepts and definitions of mercury waste thresholds vary among countries. Some thresholds are set by leaching test results, and some are set by weight. In both cases, the purpose of the threshold is to establish the level of mercury that requires a regulatory response. The graphics display the data available at the time of this report.

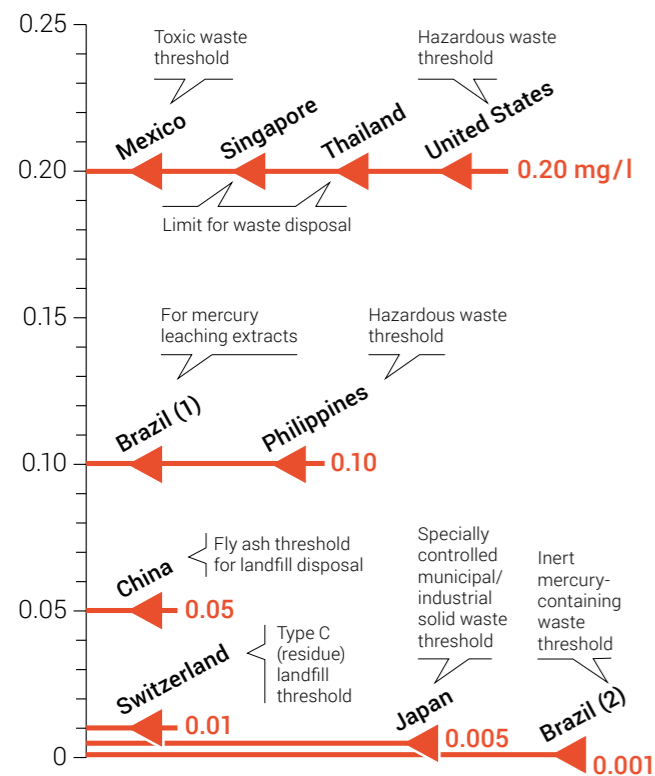
The amount of lighting equipment waste collected from households in the member states of the European Union – estimated at about 18,000 tonnes in 2014 – has increased over the past decade. The graphic displays country-by-country data available at the time of this report.

Mercury waste threshold levels

Sources: Compilation of Information on the Use of Mercury Waste Thresholds. UNEP (DTIE)/Hg/INC.7/19 (2015); Fact-finding missions in 2016-2017 for the Global Mercury Waste Assessment.

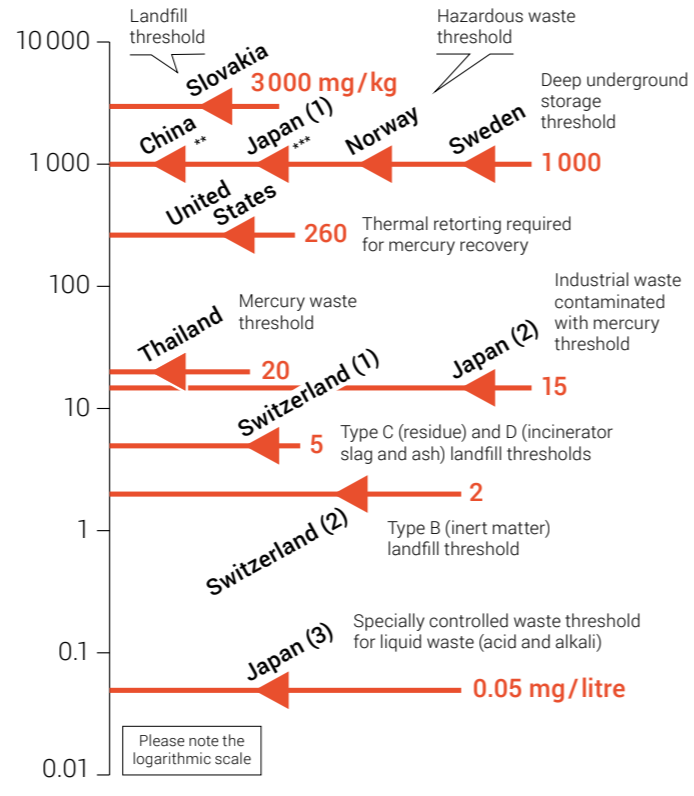
By leaching test

Milligrams of mercury per litre

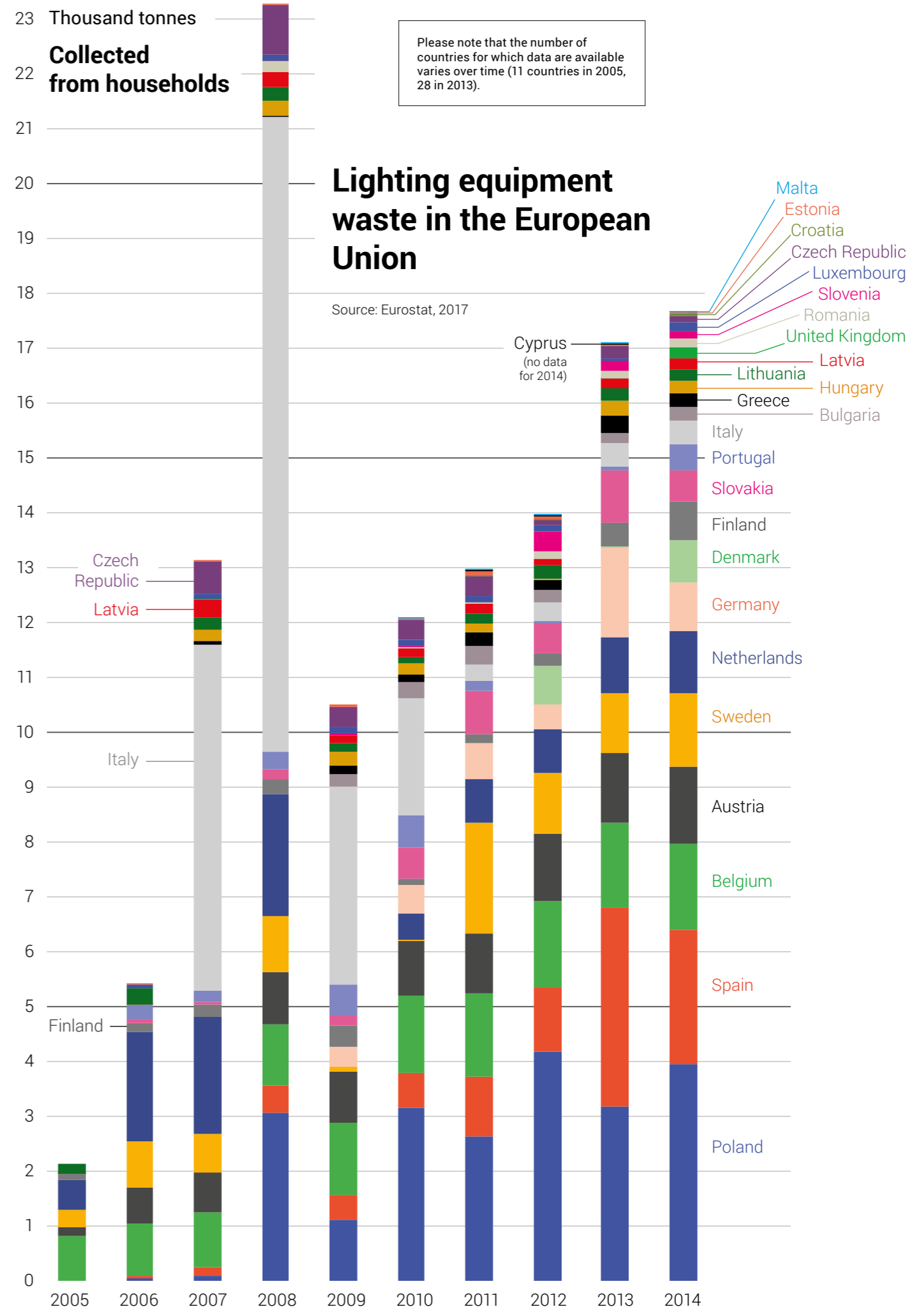


By weight

Milligrams of mercury per kilogram*



* milligrams per litre for Japan (3); ** for hazardous wastes containing mercuric iodide, thiocyanate mercury, mercuric chloride, mercuric cyanide and mercury nitrate; *** for wastes subject to trade restrictions under the Basel Convention and for recyclable materials containing mercury



Please note that the number of countries for which data are available varies over time (11 countries in 2005, 28 in 2013).

Lighting equipment waste in the European Union

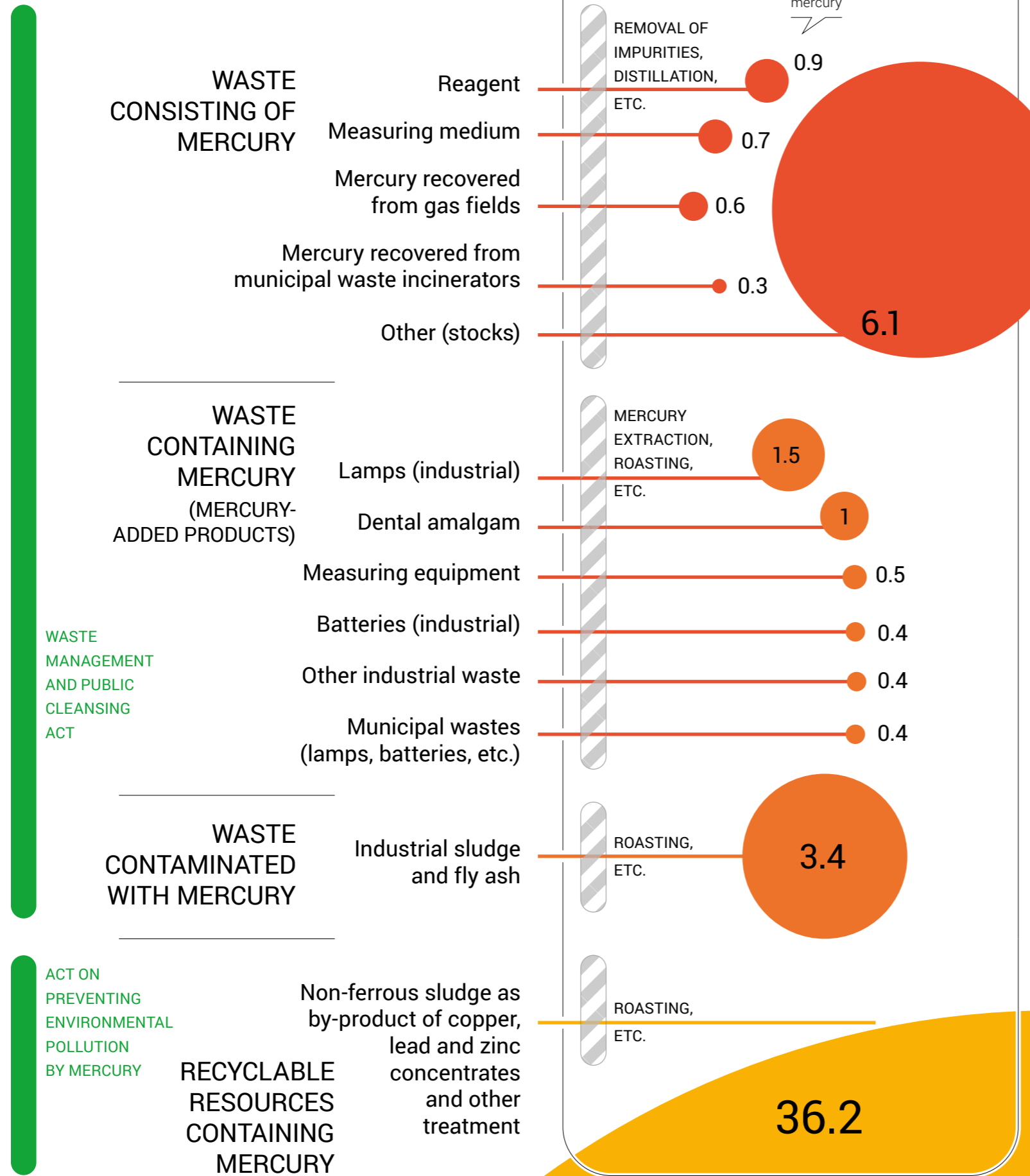
Source: Eurostat, 2017

Cyprus (no data for 2014)

Flow of mercury in wastes in Japan (FY2010)

Source: Presentation by a representative from Japan at the Project Meeting on Environmentally Sound Management of Mercury Waste, 15-16 November 2016, Bangkok, Thailand

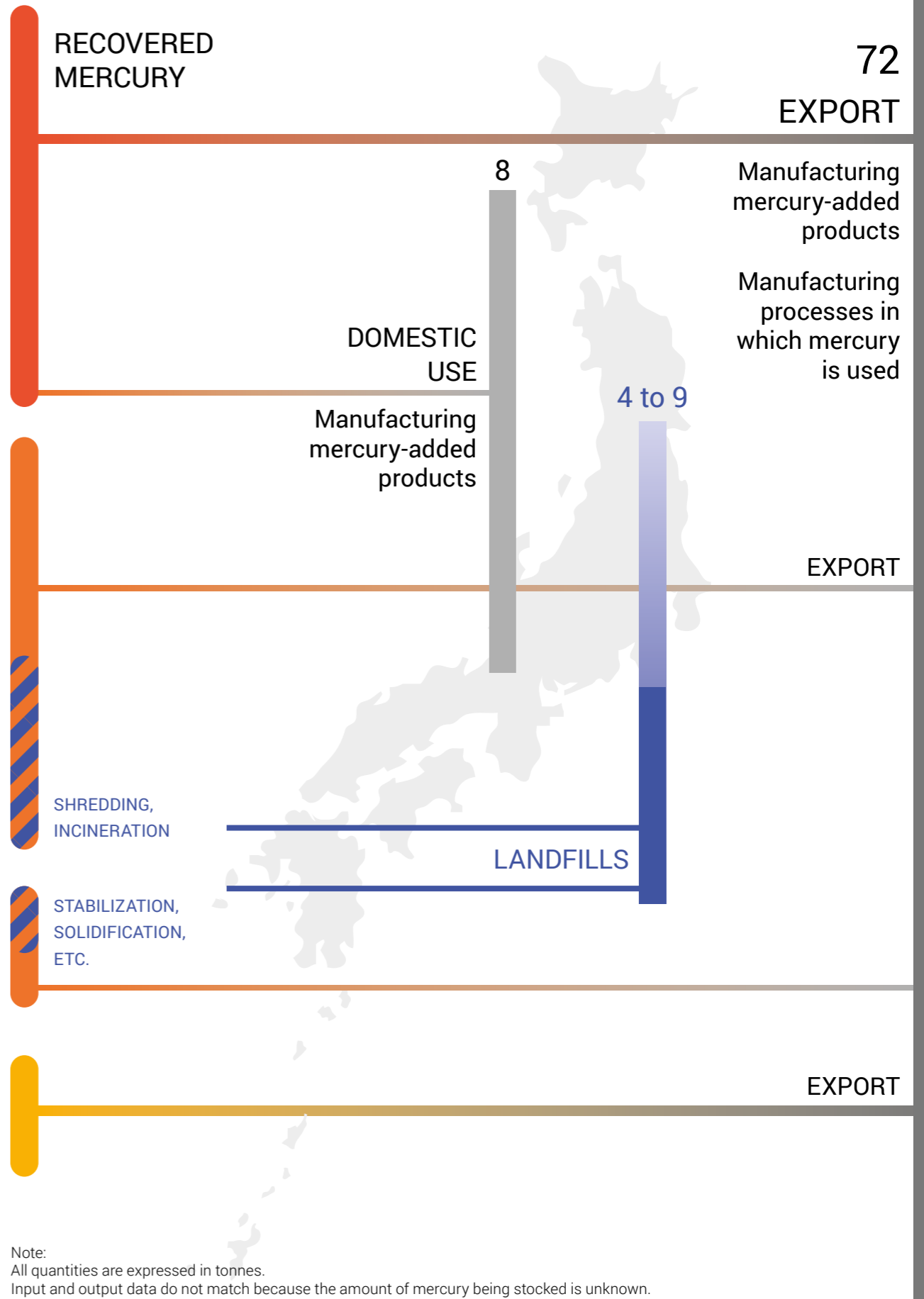
TOTAL RECOVERED MERCURY: 52 TONNES + α



WASTE MANAGEMENT AND PUBLIC CLEANSING ACT

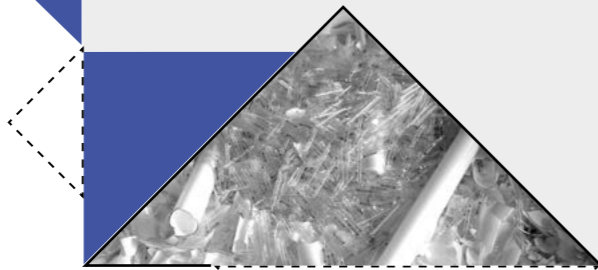
ACT ON PREVENTING ENVIRONMENTAL POLLUTION BY MERCURY

In Japan, the total quantity of mercury recovered from waste in 2010 was estimated at 16 tonnes. Additional 36 tonnes was recovered from recyclable resources containing mercury. The graphic displays mercury waste flows of the different waste streams – wastes consisting of mercury, containing mercury or contaminated with mercury. It also shows the flow of recyclable resources containing mercury, such as non-ferrous sludge.



Note: All quantities are expressed in tonnes. Input and output data do not match because the amount of mercury being stocked is unknown.

Chapter 4



Findings and Recommendations



Findings and Recommendations

The data relating to mercury waste, such as inventories, thresholds and mercury concentrations in municipal and hazardous wastes, were limited or did not exist, and the amount of mercury in waste at the global level remains unclear.

One important finding, however, is clear: The gap between the provisions of the Minamata Convention and the current mercury waste management practices is wide.

For many of the countries in this assessment, the fundamental challenge is waste management itself. For the most part, these countries manage mercury waste as part of municipal or industrial waste, and dispose of it as mixed waste in landfills or at open dumping sites. Some countries have no mechanism for the separate collection of wastes, except for recyclables, and some have no formal waste collection system, no formal disposal site, and little or no awareness of waste management. Several of the countries in the study identify mercury waste in their regulatory frameworks, but do not have the capacity to implement the mercury provisions.

Some of the countries that implement waste management do not have specific control measures for mercury waste but manage it as part of hazardous waste. The challenge of separate collection of mercury waste, in particular household mercury wastes, remains. Some countries do collect fluorescent lamps separately from other waste, but have no final disposal option within their borders. In these cases, the countries need to store the waste in country until they find final disposal options, including the export to another country under the Basel Convention.

Some countries have already started, or plan to start, the decommissioning of mercury-based chlor-alkali facilities in order to comply with the Minamata Convention.

Among the countries with artisanal and small-scale gold mining, mercury-contaminated sites are common. Artisanal and small-scale gold mining sites are usually scattered across remote areas, and the scope of sites contaminated with mercury is difficult to assess.

Available Technology and Equipment

This assessment finds that only a limited number of the countries surveyed have the advanced technology and equipment to manage mercury waste according to the Basel Convention guidelines, while others lack the technology and equipment to manage mercury waste in an environmentally sound way. Some simpler technologies and equipment for mercury waste treatment and pre-treatment, such as lamp crushers, are available in the countries that cannot afford more advanced approaches, and the assessment finds that these countries are managing mercury waste within their capacity.

Final Disposal Options

As an element, mercury cannot be destroyed, and mercury and many mercury compounds are highly mobile in the environment. Mercury can evaporate to the air, can be transformed into highly bioaccumulative forms and can be soluble and contaminate water resources. Some mercury compounds, however, have much lower mobility than others, and among the least mobile, in terms of water solubility and volatile release is mercury sulphide.

The options for disposal of mercury waste under the Basel Convention Technical Guidelines are final disposal of stabilized and solidified mercury in a specially engineered landfill or permanent storage of stabilized and solidified mercury in a secure underground storage facility that uses storage vessels specifically designed for the purpose. Only a few countries have the technology and equipment for the solidification and stabilization of mercury, and only a limited number of appropriate final disposal facilities are available around the world. Countries without facilities of their own can export mercury waste for the purpose of environmentally sound disposal.

The Way Forward

The dramatic decline in the demand for mercury in products and industrial uses over the last several years is expected to continue, and virtually all mercury contained in products and used in industries will become mercury waste. Dealing with the vast amounts of mercury from the decommissioning of chlor-alkali facilities is the immediate challenge. A further challenge is how to manage waste containing, or contaminated with, trace amounts of mercury and mercury compounds. Implementation of the Minamata Convention takes a life cycle approach to mercury waste management – minimizing or phasing out the use of mercury in products and industries while providing for the environmentally sound management of mercury waste.

Since mercury waste is a part of hazardous and solid waste, the integration of mercury waste management into existing or new hazardous and/or solid waste management systems is necessary. In the meantime, countries can identify an immediate option for mercury waste management appropriate to their capacities, available technologies and practical options. Even the countries that face serious challenges to the development of advanced systems need to improve their current practices and to develop options for moving towards the environmentally sound management of mercury waste.

The results of mercury waste management programmes and projects implemented by intergovernmental organizations, national governments, non-governmental organizations, industries and local communities can inform the development of a mercury waste management system appropriate for each situation. In cases of limited capacity, Parties to the Minamata Convention should first develop environmentally sound collection and interim storage pending possible export for treatment and disposal.

The strategy should take a life cycle approach, and should provide for protection of human health, in particular of those who are potentially most vulnerable to the effects, including women and children. Establishing mercury-containing waste exposure pathways to women and children is difficult, however, and future research should proactively aim to fill in the gaps that are missing between gender and mercury waste health effects.

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