Toxics Link
for a toxics-free world

An Insight of
Mercury-Free Products
In India

A report by Toxics Link
Supported by Zero Mercury Working Group

About Toxics Link

Toxics Link is an Indian environmental research and advocacy organization set up in 1996, engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by this problem. Toxics Link's Mission Statement is "*Working together for environmental justice and freedom from toxics*". We have taken upon ourselves to collect and share both information about the sources and danger of poisons in our environment and bodies, and information about clean and sustainable alternatives for India and the rest of the world.

About EEB

The European Environmental Bureau is the largest network of environmental citizen's organizations in Europe. It currently consists of around 160 member organizations in more than 35 countries (all EU Member States plus some accession and neighboring countries), including a growing number of European networks, and representing some 30 million individual members and supporters.

About ZMWG

Zero Mercury Working Group (ZMWG) is an international coalition of over 110 public interest environmental and non-governmental organizations, from more than 55 countries around the world, formed in 2005 by the European Environmental Bureau and the Mercury Policy Project. ZMWG strives for zero supply, demand, and emissions of mercury from all anthropogenic sources, with the goal of reducing mercury in the global environment to a minimum. The mission is to advocate and support the adoption and implementation of a legally binding instrument which contains mandatory obligations to eliminate, where feasible, and otherwise minimize, the global supply and trade of mercury, the global demand for mercury, anthropogenic releases of mercury to the environment, and human and wildlife exposure to mercury.

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List of Abbreviations:

BAT	Best Available techniques
BEP	Best Environmental Practices
BIS	Bureau of Indian Standards
CAS	Chemical Abstracts Service
CAGR	Compound Annual Growth Rate
CFL	Compact Fluorescent Lamp
CoP	Conference of the Parties
DGFT	Directorate General of Foreign Trade
DGHS	Directorate General of Health Services
DPCC	Delhi Pollution Control Committee
MoHFW	Ministry of Health and Family Welfare
NEP	National Environmental Policy
SPCB	State Pollution Control Board
NGO	Non- Government Organization
SC	Stockholm Convention
US EPA	United States Environmental Protection Agency
UNEP	United Nations Environment Programme
WHO	World Health Organisation

UNITS OF CONCENTRATION

mg/kg	Milligram(s) per kilogram. Corresponds to parts per million (ppm) by mass
µg /kg	Microgram(s) per kilogram. Corresponds to parts per billion (ppb) by mass
ng/kg	Nanogram(s) per kilogram. Corresponds to parts per trillion (ppt) by mass

Executive Summary

Mercury is a highly toxic heavy metal and poses a global threat to human health & the environment. The **Minamata Convention** was adopted in 2013 for global action to get rid of this metal and to minimize the adverse impact on the environment & human health. As of now 131 countries have ratified the Minamata convention.

India ratified the treaty on 18th June 2018, the Mercury Initial Assessment (MIA) project was formally launched in India in December 2018 to assess and inventorize the status of mercury use, emissions and supply, to look at the legislative and institutional gaps in the country and to raise awareness.

To supplement the above project Toxics Link has undertaken a project in collaboration with its international partners, the European Environmental Bureau (EEB) and the Zero Mercury Working Group (ZMWG), to get an overview of the availability of alternatives to mercury-free products or convention compliant products in India. The report has been developed based on the inputs from various stakeholders, field survey, detailed semi-structured interviews and secondary research analysis.

The preliminary data collected using the interview schedule in various markets of Delhi, Mumbai and Ambala shows that demand of the mercury-free products (for Thermometer, Sphygmomanometer, Manometer, Barometer, Dental filling, LEDs etc.) is gradually increasing though more than 50% of the demand of the LEDs is fulfilled by import and majorly by China.

The analysis of the import data as well as information from suppliers and retailers indicated the preference of customers is shifting to digital thermometers and infrared thermometers that are considered more accurate and easier to use. Several government-supported programs have initiated shift from CFLs to LED lights, going beyond the Minamata Convention requirements. The LED market will grow to Rs 21.6k cr by 2020, making the LED market ~60% of the total lighting industry in 2020 (ELCOMA Vision Doc, 2020).

Similarly, there has been a gradual shift in the use of mercury dental fillings in the country. The analysis of data and interview with the dentists shows that the reduced cost discrepancies, increased life & stability of alternate fillings and awareness among the people about mercury toxicity has been the reason for the resulted shift in the use of mercury-free alternatives.

During the survey it has been found that the awareness among consumers as well as manufacturers & retailers on Minamata Convention is very low. Hardly 8% of the interviewees know about the Convention and the Indian position on it. However, the study shows that the country is ready for a transition towards mercury-free alternatives, as products are already available in the market. There is also a need for clear labeling of mercury-added products as 54% interviewees mentioned that there is no label on the products or warning about the possible health hazards.

It is recommended that the government should focus towards additional investigations and consultations, creation and up-gradation of a database of mercury-free products, raising benefits & availability of mercury-free products, capacity building, stringent regulations and measures to engage relevant stakeholders. Further based on the assessment the government can develop a roadmap to phase out the mercury products as per the provisions of the Minamata convention.

Background of the Project

1.1. Background

Mercury (Hg), which is a global contaminant to the environment, has been one of global concern due to its toxic nature, trans-boundary movement and its capacity to bio-accumulate and bio-magnify. The Minamata Convention on mercury was adopted in 2013 to phase out this metal globally and to minimize the adverse impact on the environment and human health. As of May 2021, 128 countries have signed the treaty and 131 countries have ratified the Minamata Convention. India has ratified the treaty on 18 June 2018. We have however sought five years extension to comply with the mercury-added products of the Article 4 of Paragraph 1.

After India's ratification, the Mercury Initial Assessment project was formally launched in India in December 2018. The project was aimed to assess and create an inventory on the status of mercury-use, emissions and supply in India that will help the Government of India to develop a suitable strategy to comply with the provisions of the Minamata Convention. The project has been carried out by multiple agencies from the government institutions as well as private entities.

However, the MIA has not taken into consideration the mercury-free alternative products. Hence in the present study attempt has been made to get an overview of the mercury-free or convention compliant alternative (Annex-A) products in India.

Toxics link initiated this project with mapping of the relevant stakholders to set up a Project Support Group (PSG) in collaboration with its international partners, the European Environmental Bureau (EEB) and the Zero Mercury Working Group (ZMWG) .The first meeting of Project Support Group was held with relevant stakeholders in Delhi on 9th October 2018. Based on the inputs of the stakholders the study was designed to get the desired data on the availabilty of mercury-free or convention-compliant products in the country. Sets of questionnaires were framed for each stakeholder to gather data on available alternatives, cost of the alternatives and an overview of shift to the alternatives in India.

The survey was conducted in Delhi, Mumbai and Ambala. Delhi and Mumbai are known as trading hubs for the healthcare products and lighting industries in the country. Ambala city is a well-known manufacturing hub for non-medical measuring instruments/devices.Furthermore dentists in Delhi were also interviewed using the semi-structured interview method to get an overview on the usage of alternatives in the dental sector.

1.2. Objectives

The present study has the following objectives:

- To get an overview of the status of availability of mercury-free/convention compliant products in the country
- To get the economics of mercury-free/convention compliant products (thermometers, sphygmomanometer and measuring instruments) with respect to the mercury containing products
- To collate information on the import and export of mercury free/convention-compliant products

Research methodology

2.1 Study Approach

The study was initiated with the desk review to get the secondary information on the mercury and mercury-free/ convention compliant products in the country. The information which was collected from the desk reviews and some bit of primary information was presented in an inception workshop of the Project Support Group. The PSG meeting helped to identify the relevant stakeholders who were approached to obtain data on convention-compliant products.

Questionnaires were framed for each stakeholder and were administered through the **semi-structured interview method** and **personal interviews. The stakeholders for this study were importers, manufacturers, wholesalers and retailers. The study covered wide range of the industries including lamps, medical devices, dentists and button cell battery industries.**

2.2 Methodology

The study design adopted for the research was exploratory in nature because of the availability of limited number of such studies. Though there were studies on mercury in products, the cost of such convention-compliant products or import/export data of mercury-added products and raw mercury has either not been well researched or documented in the Indian context.

To carry out this study, Mixed **Method** is used, wherein both quantitative and qualitative method of data collection is employed to gather information. The tools used for primary and secondary research to ascertain data on mercury in products are:

(1) **Secondary Data Review** (2) **Survey of stakeholders** such as importers, retailers, manufacturers and users of relevant products as per the semi-structured interview method (3) **Field studies.**

Secondary sources were extensively used during the research and based on the secondary data analysis tools of data collection were prepared. Reports on Mercury in Products from the ZMWG projects in Mauritius, Kenya, Government of India, and the website of the Ministry of Commerce & Industry, export & import data on mercury products and also the web was lengthily used to find out the cost of Mercury-containing and Mercury-free products.

2.3 Scope and Sampling

The scope of the study was the sites which either had manufacturing units of mercury products or had retailers, wholesalers etc. After a thorough review the three sites-Delhi, Mumbai and Ambala were selected for the study. A total of 61 respondents were interviewed during the survey apart from 6 dentists. The detailed breakup of the samples is in Table 1.

Table 1 Sample size and area of data collection

State	No of respondents interviewed	Area selected for data collection
Ambala	Manufacturer/Industry– 7 Wholesaler – 8 Retailers- 3 Consumer- 4	Anaj Mandi, Timber Market, Shiv Kutir mandir market, Punjabi Mohalla, Industrial Estate
Delhi	Wholesaler – 12 Retailers- 3 Consumer - 4 Industry – 1	Bhagirath Place, Chandini Chowk, Dariya-ganj market
Mumbai	Wholesaler – 12 Retailers- 3 Consumer - 4	Princess Street, Santa Cruz West, Crawford Road, Dahisar East
Total	61	

Figure 1 Site for Mercury in Products

2.4 Locale of the study area

The areas selected for the research study were in **Delhi** (Bhagirath Place, Chandni Chowk), **Ambala (**Anaj Mandi, Timber Market, Shiv Kutir mandir market, Punjabi Mohalla, Industrial Estate**)**, and **Mumbai (**Princess street market, Santa Cruz market etc.**)** Delhi and Mumbai are the significant trading hubs for the healthcare products and lighting industries for the country while Ambala is a well known manufacturing hub for non-medical measuring instruments/devices. Further, dentists were also interviewed using the semi-structured interview schedule to get an overview about the usage of alternatives in the dental sector. Dentists from SGT University, **Gurugram** and private practitioners from **Delhi** and other dentists were interviewed to get an overview about the cost, alternatives in the dental sector. Lastly, representatives from the Lighting Industry were also interviewed using a semi-structured interview schedule for the research.

2.5 Analysis of data

The secondary data reviewed for the study was analyzed based on content analysis and the data were analyzed based on themes which emerged out of objectives of the research. For the primary data excel was used for the data analysis and narratives from the interviews were drawn to support the argument.

2.6 Limitations of the study

- Participation from the industry associations was not encouraging even after calls/emails directed at them number of times.
- As India is a vast country it was difficult to get data from each region
- Limited alternative product information available in the public domain.

Findings and Analysis

3.1 Research Data

The Mercury-added products included in Annex-A Part-I and Part-II of Article 4 of the Minamata Convention were included in this study. List of products included for the research study are:

1. Thermometer
2. Barometers
3. Sphygmomanometers
4. Manometer etc.
5. Button cell battery
6. CFL and LED light etc.
7. Dental Amalgam

The secondary data reviewed for the study was analyzed based on content analysis and the data was analyzed based on themes which emerged out of objectives of the research. For the primary data excel used for the analysis of data and narratives from the interviews were drawn to support the argument.

3.2 Mercury-Free medical measuring devices

3.2.1. Clinical Thermometer

There is no precise data available on the market size of clinical thermometers in India; rather comprehensive secondary sources are being reviewed to provide an estimate of the market size

In India there is high demand for clinical thermometers, however mostly the demand is met through import. India imports more than half a million thermometers every year for domestic consumption (Toxics Link, 2014[1]). Most importantly unlike other products, there is clear demarcation for the digital thermometer in HS code.

Testimony of Hicks : A Leading Thermometer Manufacturer in India

The survey reflected that there is large penetration of mercury-free digital thermometers in the market. The import figure substantiates that there is a gradual shift taking place for the digital thermometer.Though the cost of digital thermometer is bit higher but the price has come down during these years. The retailers also stated that the demand for digital thermometers have gone up. Most importantly there are many players in the market who are selling the digital thermometers.

In another development when we contacted Hicks one of the most well-known brands in mercury thermometers revealed that they are not able to procure mercury thermometers from China.

Table 2. Cost of Mercury-Free & Mercury-containing medical devices in India (Based on Field Data from Delhi, Mumbai and Ambala from wholesalers/retailers)

Commodity	Cost of Mercury-containing (in INR)	Cost of Mercury-Free (in INR)
Thermometer	40 – 100	Digital Thermometers 90 – 200 [2]

As asserted by the retailers and wholesalers, "*Though there are many brands which are easily available in the market, these brands are sold with different names as mostly these products are manufactured in China,*" they further added that, "*As you can see the same mercury-added thermometers are sold with two different names (e.g. SMIC Gold and RJ Gold). However, the cost of these thermometers are same* (As expressed by retailers from Mumbai)[3].

1 Toxics Link (2014) *Mercury free India Right Choices*. The information is retrieved from http://toxicslink.org/docs/Mercury-Free-India.pdf
2 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.
3 Field notes from Mumbai conducted on 29th January 2019.

Table 3. Cost of some leading mercury-containing Thermometer brands

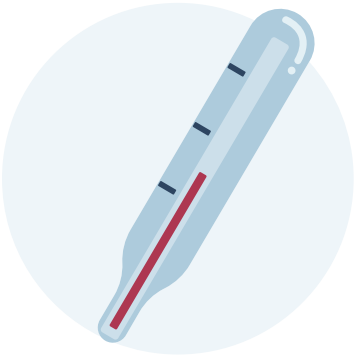
Name of the Manufacturer (Mercury-Containing Thermometer)	Cost (in INR)
1. Paramount Thermometer	70
2. Doctor Maharana	30-40
3. Medigold (Indian brand)	70[4]

Table 4. Cost of some leading digital Thermometer brands (based on market survey data from wholesalers/retailers):

Name of the Manufacturer (Digital Thermometer)	Cost (in INR)
1. Intas Thermometer	220
2. Dr. Morepen limited	150-190
3. Hicks International Thermometer	220
4. Solomon Infrared Thermometer	1800
5. MeeMeeDigital Forehead Thermometer (Baby Thermometer)	150- 350
6. Euro Gold	100
7. Diamond Thermometer	1500
8. Pagoda Thermometer	1200
9. Mestech Thermometer	300
10. Jibson	130
11. Arrow	70
12. Easycare	100
13. Bio-tech, Anubhav, Omron, Meditech thermometers	50- 60[5]

3.2.1.1 Demand pattern of Mercury-Free Alternatives

The survey gives a fair assumption on the various factors in shifting the mercury-free thermometers in India. Some of the factors responsible for shifting to mercury-free thermometers are:



- **Presence of Alternatives:** The survey has reflected that digital thermometers are prevalent in metro cities though in small towns the mercury thermometers are still available.
- **Cost difference:** The survey has showed that cost of mercury-free digital thermometers is 2 times higher than their mercury-containing counterparts. However cheaper digital thermometers are also available in the market.
- **Growth in the private healthcare sector:** Large private players like Apollo, Max and other such high-end hospitals are promoting mercury-free products and only keeping these products to get certified as mercury-free.
- **Promotion by retail giants**: In the survey it has been found that that the retail giants like Reliance Wellness, Religare Wellness etc. are actively involved in promoting safe products which are good for health.
- **Government's Role:** In India some state government and central government institutions have issued notice to procure mercury-free products for the hospitals under the respective jurisdictions[6].

4 The costs of these medical devices were found based on the Field work done in Mumbai, Ambala, and New Delhi.
5 The costs of these medical devices were found based on the Field work done in Mumbai, Ambala, and New Delhi.
6 http://toxicslink.org/?q=content/intervention-3

Table 5. Available Indian Clinical Thermometers brands

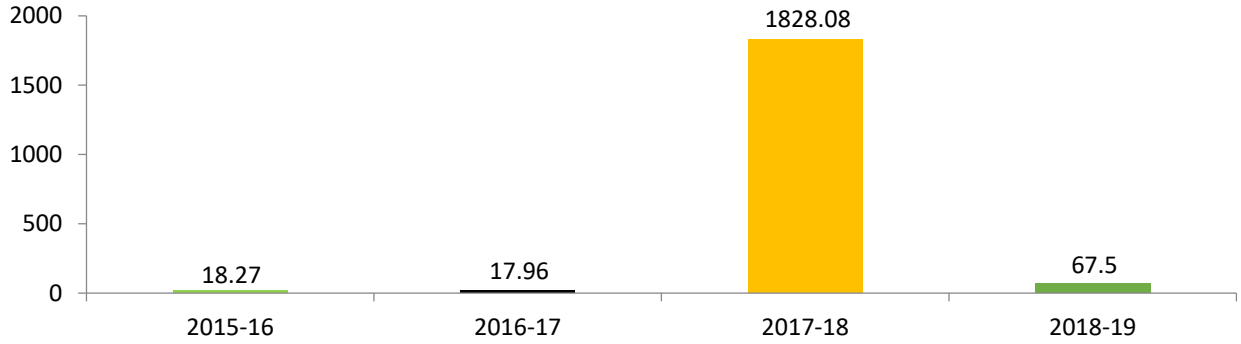
Clinical Thermometers	
• Lafco India Scientific Industries • Labsoul India • KV Scientific Instruments • HL Scientific Industries • Raj Thermometers • Swastik Thermometer Co. • Dr. Morpen Thermometer • Velcha Thermometers • Intasetc • Hicks India	• Diamond Thermometer • Bio-Plus • 9M Thermometers • Anubhav Thermometers • Omron Thermometer • Meditech • Arrow • Medigold • Pagoda Thermometer[7]

In India there are many brands selling clinical thermometers which are both mercury-free as well as digital. During the interaction with the respective sales and marketing executives it was found that "Diamond, Sara healthcare, Optoelectronics are manufacturing digital thermometers in India and other companies (like Hicks, Precision) are importing it from countries like China. While on the other hand the narratives of Manufacturers from Ambala shows that though there are local manufacturers present in Ambala, however, most of them either don't have their company registered or they don't label their products and they only outsourced these products to prominent leaders of medical instruments and labeled them with their names.

3.2.2 Sphygmomanometers/ Blood Pressure Instruments

The market size of BP instruments is approximately USD 200 million as per some of the reports which may not be absolute. Almost 80% of the demand is catered through imports. Quantity wise, India exported 18.27 thousand Sphygmomanometers in 2015-16, 17.96 thousand in (2016-17), 1,828.08 thousand in (2017-18) and 67.50 thousand in (2018-19) while around 1,800 thousand Sphygmomanometers were imported between 2016-2019[8]. The domestic demand for BP measuring instruments both mercury-added and mercury-free accounts for nearly 500,000 units every year. (Toxics Link, 2014)[1].

Figure 2. Export data of sphygmomanometer (quantities in thousands)[9]



3.2.2.1 Mercury-free Alternatives of Sphygmomanometers:

In the Indian market both mercury and non-mercury Sphygmomanometers are readily available. The non-mercury alternative sphygmomanometers available as alternatives to mercurial sphygmomanometers are aneroid and digital products. Digital products continue to drop in price and are fairly easy to handle. The two most common alternates to the mercury blood sphygmomanometer available in the Indian market are:

- **Aneroid**
- **Electronic**

7 These were the brands stated by the respondents from Ambala, Delhi and Mumbai.
8 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.
9 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.

Table 6. Cost comparison of Sphygmomanometers in India

Commodity	Cost of Mercury containing (in INR)	Cost of Mercury Free (in INR)
Sphygmomanometer	2350 Diamond Mercury-added Sphygmomanometer (Indian) –2000 Pagoda Mercury-added Sphygmomanometer (India) –1500-1600	450 – 5000

The data review shows inflated imports of BP instruments with both mercury-containing and digital sphygmomanometers being manufactured and imported from China, Taiwan, Russia and Korea[10]. The interviews conducted with the manufacturers and retailers from Ambala and Delhi expressed that mercury-free digital sphygmomanometers are mostly in demand as these products give more accurate results compared to the others. However, cost wise the Mercury-free products are comparatively more expensive than mercury-added products which has been a bottleneck for the shift towards mercury-free alternatives.[11]

Table 7. Cost of Digital Sphygmomanometer

Name of the Manufacturer (Digital Sphygmomanometer)		Cost (in INR)
1.	Diamond	1700 –2250
2.	Citizens Sphygmomanometer	1400
3.	Omron	1200
4.	Bio-Plus	1000 –1600
5.	Ozo-Check	1100
6.	Morphen	850 – 1150
7.	Pagoda	1600

3.2.2.2 Understanding the demand and Supply curve of Sphygmomanometers among Indian consumers

During the survey it came to light that mercury and aneroid sphygmomanometers are widely used because of their low price. When both units are in proper working order, they will give acceptable results. However, both require calibration checks at regular intervals (at least annually).

Disadvantages of Mercury sphygmomanometers are as follows:

- Mercury is a toxic substance that threatens humans and wildlife. As a result, spills require careful and costly cleanup.
- It requires excellent technique to read the meniscus of a mercury column. Even if both types are in good working order, the aneroid dial is easier and requires less effort to read than a mercury column.
- Maintenance of mercury devices is cumbersome. For accuracy, the mercury tube must be perfectly perpendicular in its unit and perfectly vertical to the ground. The more off-vertical the device is, the lower is its accuracy.
- Each mercury sphygmomanometer has a vent or filter allowing outside air to be drawn in. Without frequent filter replacement, the mercury column experiences lag. “Lag” is a delay in the mercury response, which may result in an inaccurate reading.
- Most hospitals calibrate the BP apparatus in-house. It’s done without any formal training on methods of calibration or the hazards of mercury. According to some experts the mercury vapor level in such calibration rooms is much higher than the permissible limit.

10 The costs of these products were found based on the field work done in Ambala, Delhi and Mumbai.
11 The costs of these products were found based on the field work done in Ambala, Delhi and Mumbai.

3.3 Overview

The study reflected that most mercury-free thermometers/sphygmomanometers are produced outside India and limited Indian companies produce about 600,000 mercury thermometers annually for domestic consumption (Toxics Link, 2014). However, most of the companies have their manufacturing hubs in China (as quoted by the manufacturers). This makes up roughly 40% of the Indian market and the rest of the demand is fulfilled through imports (Toxics Link, 2014). Most of the manufacturers in India are now importing thermometers mainly from China, USA, Japan, Singapore and UK to meet the Indian demand.

In case of BP instruments almost 90-95% of the market is catered through imports and Indian production is very minimal which does not meet the demand for BP instruments in the country. The instrument is imported from countries all over the world but a major proportion is imported from China, Singapore, USA and Japan. India imports nearly 20 thousand BP instruments every month.

3.3.1 Data from the field (Delhi):

As per the preliminary data collected using the interview schedule in various markets of Delhi (Bhagirath Place, Chandni Chowk etc.) the demand of the mercury-containing products in these markets(for Thermometers, Sphygmomanometers, Manometers, Barometers etc.) is between 15%-18%. As asserted by retailers from Bhagirathi Palace:

> *"Many of the private health organizations prefer using the digital measuring devices because they are easy to use, accurate and convenient. Therefore, we have focused on stocking the digital thermometers to meet the demand of the devices. However, some of the institutions like the government hospitals, research centres and schools are still using the mercury-added thermometers"* (field narratives from Delhi).

- The analysis of data shows that majority of the Mercury-free products (Thermometer, Sphygmomanometer, Barometer etc.) are being imported from China.
- The analysis shows that there is availability of Mercury-free products in Delhi. However, there is price difference of mercury-alternative products in comparison with mercury-containing products.
- Retailers from the Chandni Chowk asserted that, *"The recalibration of alternatives is an issue in India as majority of these products is manufactured outside India so it needs to recalibrate from the third party"*.
- Certification of mercury-containing products is a challenge in India. BIS has already brought Sphygmomanometers (Aneroid type) under certification as per IS 7652: 1988 though it is not mandatory. However, Digital Thermometers are not yet certified by BIS.

Thermometers: Import data as well as information from suppliers and retailers point to a shifting preference to digital thermometers and infrared thermometers that are considered more accurate and easier to use. Alcohol-based thermometers are also available as an alternative to mercury-based thermometers. In Delhi, the retailers asserted that *"Cost of the alternatives is comparatively more than the mercury-added thermometers because of which people from low and middle income groups prefer to buy the mercury-containing products. They believed that in order to address these bottlenecks it is vital that the manufacturing of thermometers and other measuring devices should be done in India so that overall cost of the products can be reduced (As expressed by retailers from Chandni Chowk).*

Sphygmomanometers: Data shows that the major alternate technology to sphygmomanometers available in the market is the digital one. However, the analysed data also shows that due to high price of the alternatives their demand is less among certain sections of the people.

As asserted by the retailers from Bhagirath Place, Delhi (biggest retail market for medical instruments): *"The higher demands of digital sphygmomanometers could be due to their schematic nature; however, on the other hand mercury-containing instruments are hard to be used and the exact information is predicted accurately by the practitioners only. On the other hand, the alternatives are more formulaic in nature. This could be one of the foremost reasons along with its ease of use for exponential demand of alternatives in the markets"*.

A wholesaler from Delhi added further that, "The demand for mercury-free products is more compared to *mercury-added products*. He said, *" If I sell 1 mercury-added product in a day then by that comparison 70-80 mercury-free products are sold on the same day*" (as asserted by retailer from Chandni Chowk). These clearly show that the demands for the mercury-free alternatives are higher among the people.

Another retailer from Bhagirath Place, Delhi informed that "*We stock at least 50-70 pieces of every product be it digital or mercury- containing (thermometers, sphygmomanometers, manometers, etc.). However, the demand for mercury-free alternatives among the customer has grown and he thinks that the higher demand could be due their ease of use, durability and less chances of mercury spillage etc*."

Consumer perspective:

Few consumers are also being surveyed during the study. 85% of consumers who were interviewed during the study were not aware about the Minamata Convention and the phase out dates of the mercury-added products. Also, there were major challenges that majority of the distributors/retailers interviewed especially of products such as batteries, lamps and switches admitted of not knowing the presence of mercury in these products. The general overview of the data shows that the consumers are not aware of the products which do or don't contain mercury. This therefore hampers consumer choice/or their preference when it comes to choosing such medical or other devices which have mercury presence in them and making an informed choice about the product ideal for their health and the environment. Thus the data shows that there is a burgeoning need for a consumers' sensitization program as most distributors/retailers do not educate their buyers and also they don't let them know about the alternatives to mercury products especially in areas where the low and middle income groups are considerably higher in numbers.

3.3.2 Data from Field (Mumbai):

The survey was conducted in Mumbai which is known as a trading hub for all these products. In Maharashtra the retailers said that in Mumbai large number of hospitals and people are using Digital Thermometers and miniscule numbers of people are using mercury-containing thermometers. Majority of shopkeepers during the survey were found to be selling digital thermometers (As per retailers from Maharashtra).

More than 80% of the retailers asserted that "*The demand for the mercury-free products is high in Mumbai as the people are comparatively more aware about the health impact of mercury"*. As per the data collected from the different markets of Mumbai, the retailers/wholesalers expressed that the demand for digital/alternatives of medical instruments are more among the consumers in Mumbai. One wholesaler asserted *"if I sell 100 pieces of mercury-containing thermometers in a week then by that comparison somewhere between 200 - 600 pieces of the digital thermometers are being sold"*. He further added that, *"Mumbai being a metro city can be one of the reasons for higher demand of mercury-free alternatives and it could also be due to awareness among consumers related to mercury being a toxic substance. Though the prices of alternatives are expensive there is still higher demand for mercury-free products among consumers*" (views were expressed by a retailer from Princess Street market).

However, going by what the retailers' experience, he mentioned that, "*In the rural parts of India including Maharashtra this not might be the scenario. He believed that in rural economies the demand for Mercury-containing thermometer or mercury-containing device per se is more than the urban centers and this demand pattern could be due to lack of awareness among consumers about the health impacts of mercury and also due to cost of its alternatives*" (views were expressed by a retailer from Crawford market)[12].

3.3.3 Data from Field (Ambala):

There are retailers and manufacturers of Thermometers, Sphygmomanometers, Barometers and Manometers in Ambala. They manufacture only mercury-containing products; most of their products are supplied to schools, colleges, labs and to local patients. The industry representatives expressed that they import mercury for products, "*Yes we do import mercury for production of Thermometer and other medical instruments. However, in a year we only import 5-10 kg of mercury as that much mercury suffices our need and day by day the price of mercury is increasing so*

12 Field notes from data collected from Mumbai on 29th January 2019.

we only order in small quantity, right now the cost of mercury is INR 8000/kg." (as expressed by a sales executive of Precision Surgical).

One manufacturer of mercury-containing products said that "A*ll the products that we manufacture contain mercury; none of the medical instruments can function without mercury. Mercury gives more accurate and reliable results compared to others, he further added that there is nothing such as mercury-free products in India as of now when it comes to medical instruments*".

Products from China in the Indian market[13]:

China is deeply penetrating the Indian market when it comes to medical devices. The retailers from Delhi, Mumbai and Ambala clearly asserted the presence and dominance of Chinese products in Indian markets and lack of indigenous manufacturers in India. They also asserted that there are Indian companies who import the products from China. In India approximately 50% medical devices are imported from China and it contributes to almost 45% of the total imports. Traders/ importers bring in mercury-added thermometers in India that costs them approx. 6-8 INR, which is further sold at a price of INR 30-50. The level of margin acts as a catalyst in the boom of trade from China.

In our study, we found that most of devices were from China. Even digital/mercury-free devices are directly imported from China because of their low price. According to retailers/wholesalers "*The Chinese products are cheaper to import thermometers/sphygmomanometers rather than manufacture them here in India. It costs around 100 INR to manufacture one mercury-free thermometer here in India, whereas it costs around 50-60 INR to get it imported from China*".

3.4 Barriers to current demand

Seven potential barriers have been identified for higher penetration of non-mercury products:

- Lack of Awareness
- Perception of accuracy
- Lack of concern for environment
- Price
- Force of habit

Regulation in the Country for Mercury in products:

Certification of Mercury Containing products is a challenge in India. BIS has already brought Sphygmomanometers (Aneroid type) under certification as per IS 7652: 1988 though it is not mandatory. However, Digital Thermometers are not yet certified by BIS. Therefore, mandatory certification may be paramount to shift to the mercury-free alternatives in faster pace.

3.5 Other measuring instruments (Glass Alcohol Thermometer, Barometer etc.)

The study also focused on the other measuring instruments.

Glass alcohol thermometers:

These thermometers use the same principle as mercury except that the mercury is replaced by red-colored alcohol. Alcohol-based thermometers are used by industries like marine shipping, HVAC, petrochemicals, oil and gas, wastewater and other industries.

13 Field notes from Mumbai

Table 8 Cost of Glass alcohol-based thermometers

Name of Thermometer	Cost (in *INR*)
Glass alcohol thermometers	50 –500[14]

Other types of Thermometers:

Most of the products which are mentioned below in table 7 are used in school and colleges, labs and for industrial purposes and these products are not used to measure the body temperature rather it is used for industrial purposes.

Table 9 Types of Thermometers manufactured in India

Name of the Thermometers	Mercury Free Products (Alcohol based/Digital/Others) Cost (*INR*)	Mercury containing Products Cost (*INR*)
Room Thermometers	30	NA
Wet and Dry Thermometers	70	NA
Minimum and Maximum Thermometers	700 (Digital)	80
Glass Thermometers	50 –500	50

Hydrometer:

A Hydrometer is an instrument which is used to measure the gravity (or relative density) of liquids; which is to measure the density of the liquid to the density of water. Hydrometers are usually made of glass and consist of a cylindrical stem and a bulb weighted with mercury or lead shot to make it float upright.

Table 10 Cost of Hydrometer

Commodity	Cost of Mercury- containing (in *INR*)	Cost of Mercury Free (in *INR*)
Hydrometer	200- 700	**Digital Hydrometer** (500 – 1500) HTC – 1 Brand (Made in India product) Hydrometer –450 **Analog Hydrometer** 950from JRM and Zeal brand 250 for Alcohol brand[15]

Manometer:

Manometers are any device that measure pressure. These are scientific instruments which are largely used to measure gas pressures relative to atmospheric pressure.

Table 11 Alternative Cost of Other measuring devices

Commodity	Cost of Mercury containing (in *INR*)	Cost of Mercury-Free (in *INR*)
Manometer	1,200 – 4500	Digital Manometer (. 7000 – 11500)[16]

Thermostat and Mercury pressure Gauge:

Thermostats are the units for recording temperature changes by keeping the temperature of a closed area substantially constant. These are used in any device or system that heats or cools to a given set point temperature, e.g. building heating, central heating, air conditioners.

Mercury Pressure Gauge are the instruments for measuring the condition of a fluid (liquid or gas) that is specified by the force that the fluid would exert, when at rest, on a unit area, such as pounds per square inch or Newton's per square Centimeters.

14 Data from field work.
15 Data from the field from Delhi and Mumbai.
16 Data from the field work in Mumbai conducted on 29th January 2019.

Table 12. Cost of Thermostat and Mercury Pressure Gauge

Commodity	Cost of Mercury containing (in *INR*)	Cost of Mercury Free (in *INR*)
Thermostat	120 – 250	Digital Thermostat (1,500 – 2,500)
Mercury Pressure gauge	500 – 1,200	Digital Pressure gauge (7,500 – 11,000)[17]

Barometer:

Barometer is used for determining the pressure of the atmosphere and hence for assisting in forecasting weather and for determining altitude. Barometer industries manufacture (BMI), the only manufacturers of Barometers in India as asserted by the Owner, "*We are the only barometer manufacturers in India. We make barometers which contain mercury and these products are sold to schools, colleges, exporters, labs and to some other clients as well. All of the products contain mercury, however, we don't put mercury in our products, we only make the barometers and then the mercury is put on demand of the respective buyers*". (As asserted by a manufacturer from Anaj Mandi, Ambala)[18]

When asked about the average sale of Barometers in a month, an average of 100-150 pieces of Barometers are manufactured by the industry which varies most of the time depending on the demand or order. Lastly, the manufacturer mentioned that the "*Mercury-added Barometers are easy to use and give more accurate results which is why most of the labs and people prefer to buy Mercury-added Barometers compared to others. While on the other hand mercury- containing products are cheaper in compare to mercury-free (Aneroid Barometer) products*[19]".

Table 13. Cost of Indian and imported Barometer

Name of the Barometer	Cost (in *INR*)
BMI (Indian)	4000 – 6000 (adding Mercury cost extra)
German brand Barometer (Baico and Fisher TFA)	7500
Barigo (German brand)	6000 3000
Chinese-Manufactured Barometer (Name unknown)	Aneroid Barometer(100 – 1100) Digital Barometer (3200 – 6500)[20]

The survey from Ambala reflected that none of the retailers/wholesalers/manufacturers in this city were aware about the Minamata Convention and they didn't know that the use of Mercury in these products will soon be banned.

One of the manufacturers asserted that "*Especially the small and medium enterprises asserted that banning the use of Mercury in Thermometers would cost their livelihood and they might have to change the livelihood entirely with the ban of mercury in medical devices in coming years*" (as asserted by Manufacturers from Ambala)[21].

Table 14. Brands available for Mercury and Mercury-free Barometer

Mercury containing Barometers	Aneroid Barometers
• Fitzer Instruments India • Precision Scientific Instruments Corp. • Bharat Scientific World • Radical Scientific Instruments Pvt. Ltd. • Rajiv Enterprises • Goyal Scientific &Optical Works	• Hiten Brothers • MJ Instruments • Nunes Instruments • Jain Laboratory Instruments Pvt. Ltd. • Kwality Micro Scientific[22]

17 Field data and secondary literature.
18 Field notes from Seva Kutir Mandir, Ambala conducted on 19th January 2019.
19 Field notes from SevaKutirMandir, Ambala conducted on 19th January 2019.
20 Data from the field and secondary literature.
21 Field notes from Ambala conducted on 19th January 2019.
22 Data from field work in Ambala, Delhi and Mumbai

3.6 Dental Amalgam

In recent years composites have largely replaced mercury fillings, the estimated annual use of mercury in this sector stands around 65 tons, where 49 tons gets into cavities and 16.2 tons is mostly thrown into the environment as non-contact amalgam, and ends up majorly in water bodies. The estimated annual mercury release due to removal or replacement of old fillings (contact amalgam) is 66 tons (Toxics Link, 2012[23]). Dental amalgam contains about 50% mercury, as well as other toxic metals such as tin, copper, nickel, palladium, etc. Worldwide, dental mercury has been recognized as an important source of mercury release into the environment[24].

It is also estimated that India would probably release approximately 1.4 tons of mercury during cremations, while 1 ton of mercury would be release into waste water due to leaching of mercury from the amalgam fillings of the Indian population annually.

3.6.1 Mercury usage in dental sector in India:

There has been a considerable shift in the use of dental fillings in the country, over the years people have moved away from mercury fillings to the composites, owing to the aesthetic reasons. The analysis of data and interview with the dentist shows that the reduced cost discrepancies between the two materials, increased life and stability of alternate fillings and awareness among the people about mercury toxicity has been the reason for the resulted shift in the use of mercury- free alternatives. However, there is much which needs to be done at the policy level to consolidate these achievements and bring consistency in the dental practices in the country.

Use of Amalgamators

As expressed by the dentist, the majority of big and reputed government and private colleges may have amalgamators, however the private clinics and other set-ups avoid investing on these as the cost of these amalgamators are very expensive. The analysis of data shows that approximately the cost of the Amalgamators is somewhere around *INR*20, 000-50,000.

Hand Mixing

The use of Hand mixing is still very much prevalent in India, primarily in case of private clinics it is dominantly used and also some dental practitioners expressed that even some of the private practitioners invariably charge patients comparatively more.

Use of Capsules

The analyzed data shows that the dental set-ups (including majority of dental colleges) are primarily using loose mercury and silver powder as the use of capsules becomes expensive and leads to more wastage.

Use of Trap:

The data from the dentist shows that the use of dental traps is very uncommon in India even in the private clinics. The reason for less use of traps couldn't be accessed through the survey.

23 http://toxicslink.org/docs/Mercury_in_Our_Mouth.pdf

24 EEB (2007) – "Mercury in dental use: environmental implications for the European Union," European Environmental Bureau (EEB), Brussels.

3.6.2 Cost of Dental Amalgam:

The analysis of data shows the change in this respect and most of the doctors asserted that there is change in use of dental fillings in the country. The difference is shrinking over the years to 1.5 times and this is mainly due to the drop in (alternative) material cost and also due to drop in time that they take to do alternate filings (with practice doing both the fillings take almost equal time).

a) As asserted by the doctors the cost of composites was more because the material cost is high and they are mostly imported.

b) Others expressed that the cost of mercury has gone considerably high and thus using mercury amalgam is becoming a costly affair, thus making both options at par.

3.6.3 Cost of Silver Amalgam fillings-

i. INR 80-100 (in Dental Colleges)- As the colleges have to offer subsidized rates to patients.

ii. INR 500 for Class I dental practitioners and up to INR 1200 for Class II (private practitioners)

3.6.4 Cost of Alternative Fillings-

i. (Colleges) - INR 150 for Class 1 dental practitioners and up to INR 300 for Class II or complex cases

ii. (Private Practice) - INR 800 - INR 1100 for Class 1 dental practitioner and up to INR 2500 for dental practitioners for complicated ones.

The depicted cost of fillings is for Delhi however the cost of the dental filling may vary from place to place in India.

Table 15. Cost of Dental Filling in India (Delhi)

Type of products	Cost in INR
Material cost- Silver bottle (30 gms)	1700
Mercury bottle (225gms)	1400
GIC- type I	2500
Composites- (One kit)	5600[25]

3.6.5 Personal Interviews with Dentists on Dental Amalgam (Delhi):

The market survey shows the varied picture about the use of dental amalgam in India and its availability and market demand. In Indian markets the use of dental products is not as developed as other developed countries. The surveys show that there are few manufacturers of dental products and 90% of total demand of the dental products are being fulfilled by the domestic producers and markets and rest is fulfilled by the foreign producers which are largely either imported from US or Germany.

The analysis of the data shows that more than "*40% of the patients (in urban areas) and almost 75% of the patients (in rural areas) don't have knowledge about the use of mercury in Dental amalgam*. He further added that "*low awareness could be because the dentist with small clinics inform the patients only about the financial cost of the Dental amalgam which is comparatively higher than the Mercury fillings rather than informing them about the health impact of Mercury*" (As asserted by a doctor from SGT Dental College, Gurugram)

From the analysis of data following could be reason of prevalent use of mercury filling in India:

1. The cost of the silver fillings is more than Mercury filling; this could be the reason for the use of mercury fillings.
2. Lack of expertise to do silver fillings
3. Lack of awareness among patients about the health impact of mercury-based fillings
4. Chair Time (number of hours/time spent with patients) Less time is spent for mercury filling than silver filling, if the doctor spends more time with one patient their income is reduced.

25 Field data from Dentist from Delhi.

3.7 Button Cell battery

In the market study conducted in New Delhi (Jungpura and Kalkaji) markets we couldn't find mercury-containing button cell batteries. The interviewed retailers asserted, "They no longer *sell mercury-containing button cell battery; it used to be available before but now most of the shops sell mercury-free battery as the cost of both the batteries is almost the same*" (as per retailers from Kalkaji). In these markets mostly Alkaline and Lithium button cell batteries were available. The previous study of Toxics link[26] also reiterated that in India there is no inventory on the use of mercury in button cell batteries in India. What emerged during the discussions with end-users in India was that mercury-free button cell batteries are used in key application areas, such as watches, hearing aids, healthcare instruments, children's toys, etc. The cell batteries are mainly composed of common materials—steel, zinc and manganese - that do not pose any health or environmental risk in normal use or disposal.

Table 16. Cost of Button cell battery

Battery purchased from	Cost (IN INR)	Battery Types
Jungpura	60	Cost of Button Cell battery (364a)
Kalkaji	80	Cost of Button Cell battery (626a)[27]

3.8 Mercury Lamps vs. Alternatives

The Indian lighting industry has seen a robust growth of 59%, growing from Rs. 8,500 Cr in 2010 to Rs 13,500 Cr in 2013. This has been majorly driven by the move from GLS (incandescent) lamps to CFLs and more recently due to the LEDs - Several government initiatives supported this transition, including use of CFLs in government offices, providing consumers with CFLs through DSM schemes, free lamps to Below Poverty Line (BPL) houses and the programme is supported by ongoing government initiatives to promote LED lighting as well as changing consumer preferences (ELCOMA vision doc, 2020). The LED market will grow to INR 21.6k Cr by 2020, an exponential growth of 41% Compound Annual Growth Rate (CAGR) from INR 1,925 Cr in 2013, making the LED market ~60% of the total lighting industry (INR 37.6k Cr) in 2020. The government has decided to change all street lights and lights in public spaces to LED lights, and initiated making all LED specifications mandatory; notifications to commercial buildings to change existing down lights exclusively to LED are in progress (ELCOMA vision doc, 2020). All existing government schemes to distribute CFL are being modified with LED lamp distribution. However, data shows that mercury-containing tube lights still have a large market share though there is a sharp decline of the CFL use in the country (ELCOMA vision doc, 2020[28]).

In spite of the LEDs having the potential to replace CFLs, there are certain hindrances to switch to the mercury-free alterative lamps and these are:

- Consumers perception towards lighting
- Limited testing capacity for LED lighting
- Heavy dependence on imports for electronic components and LED chips, as well as end products
- Large volumes of low quality imports

Table 17. Cost of CFL, LED and its alternatives

Commodity	Cost of Mercury containing (in INR	Cost of Mercury Free (in INR)
High Pressure Mercury Vapor Lamps (Power around 250W)	150 – 250	Price NA
CFL (6- 10 watt)	90 – 180	LED lights (100-4000)
Mercury Vapour lamps (power around 250w)	150 – 250	LED (50 – 200)[29]

26 Mercury free India; Right Choice by Toxics Link
27 Field data collected from Delhi.
28 http://www.elcomaindia.com/wp-content/uploads/ELCOMA-Vision-2020.pdf
29 Field data.

Testimony from lamp industry

One-to-one discussion was conducted with the Mr. Rishi Chawla of Philips India to get an understanding of the market of mercury-free products. He asserted that "Lighting industry bodies like ELCOMA are carrying out an initiative of collecting the used CFL bulbs/ LED bulbs for safe disposal of bulbs from Alaknanda, G.K 2 and few other locations and also they carry out awareness generation programmes along with the Residential Welfare Associations to educate people about the health impacts of mercury-containing bulbs/lights. He further added that ELCOMA wants to tie up with 200 RWA for safe disposal of old CFL bulbs in the future".

He added that reducing the amount of mercury is not a challenge; however if we reduced the amount of mercury, then the technology which is used to manufacture the bulbs increases the cost marginally as well compared to the other brands as they are not adhering to the convention while manufacturing the products.

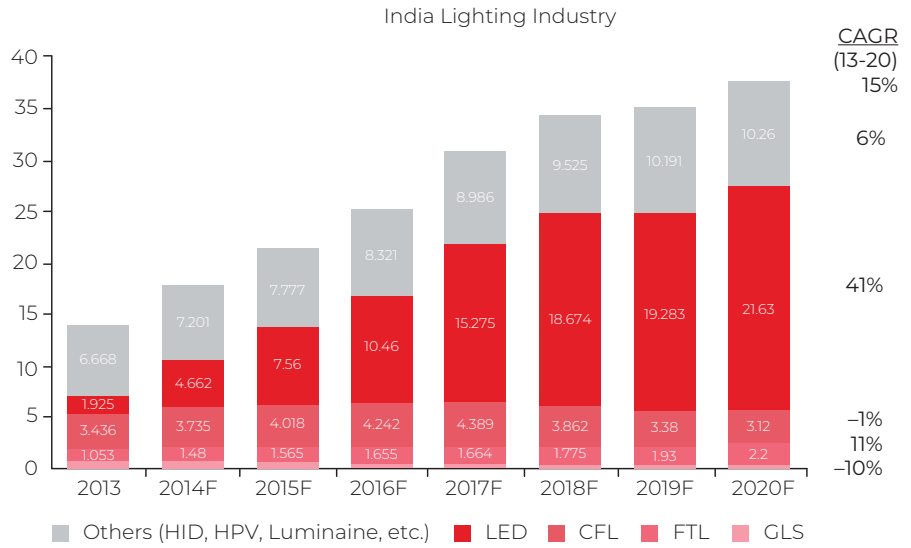
He explained that the reduction of mercury led to increase in price of the products by 20 paisa – 30 paisa (cents) in one bulb. The cost of LED bulbs manufactured by them is INR 10 – INR 20 more expensive from the CFL bulbs which are available in the market.

He also added that there is huge demand of Mercury-containing tube lights in rural India as the lights are combatively cheaper than LED and in rural areas the people's income is lower, hence affording the lights is a challenge for them.

He also added that LED lights are the cheapest in India than any other parts of world and also due to the higher demand in the Indian markets; this is also a reason why a lot of Chinese LED companies have entered the Indian subcontinent in the last decade for LED and CFL. He also added that as there is high demand of LED in India and that is why it is important to bring LED lights in the preview of e-waste regulation in India.

Under the Energy efficient Street Lighting Policy (ESL) of Bureau of Energy the demand for rural electrification using LED lights and its demand has gone high. He added before we used to sell the LED bulbs for INR **90** but after the ESL scheme the cost of the light has gone down to INR **45** and which is why the demand of the products has also gone high[30].

According to Mr. Amal Sengupta of ELCOMA, there is a rapid shift happening to LEDs from mercury lamps and hopefully the mercury lamps will be history in India soon.

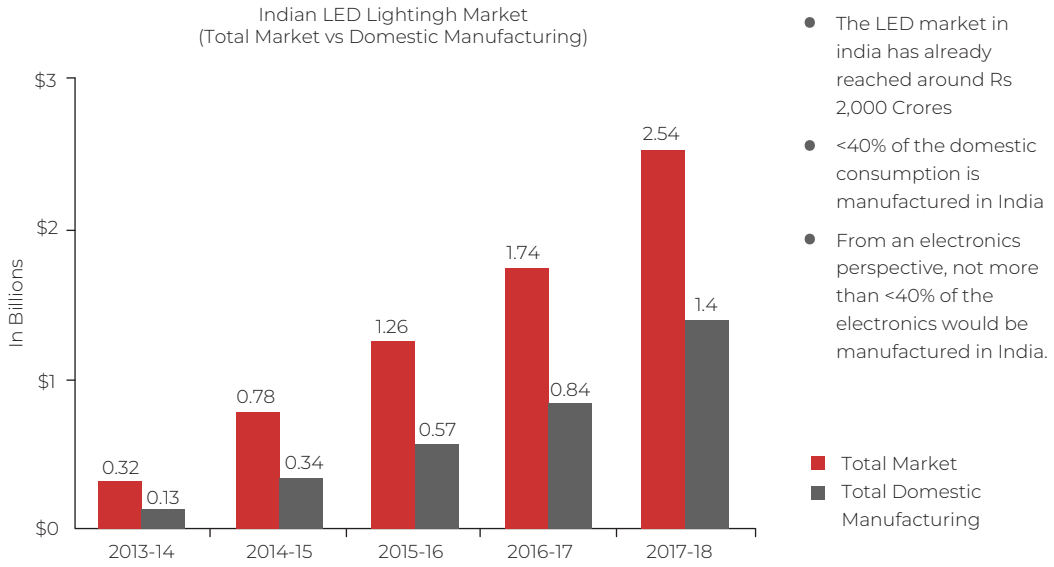


# GLS (Million)	780	760	620	600	578	560	510	480
# FTL (Million)	234	269	301	331	320	355	386	400
# CFL (Million)	453	498	558	606	627	568	520	480

(Source: ELCOMA Vision Document 2020)

30 Narratives of the meeting held on 29th June 2019 with representative from Phillip India.

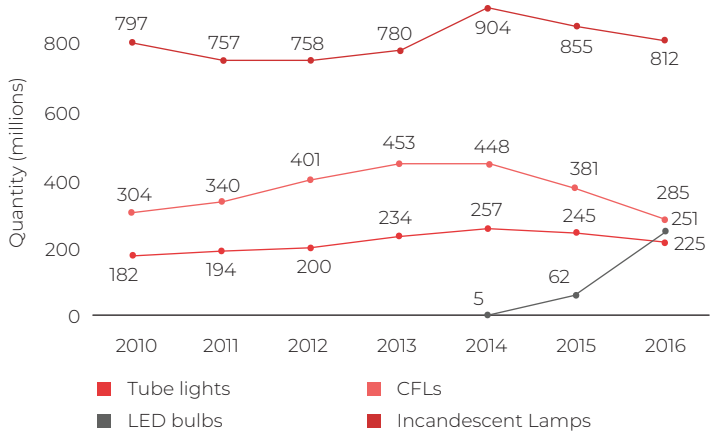
The data from Electric Lamp and Component Manufacturers (ELCOMA) shows that over the years the market size of LED lamps market has grown exponentially and its market size is more than CFL, FTL and GLS light in India. Currently LED has 21.63% market size in the lighting industry (ELCOMA), however, going by the data and the personnel interview this is also evident that mostly in the Tier I and Tier II cities there has been gradual decline in the use of the GLS and FTL lamps, however, in Tier III and Tier IV cities the rates for use of GLS lamps are considerably high. During the field visit conducted in Ambala and Dausa (for different studies) it was observed that a large section of people are still using these lights and the cost of LED lamps emerged out to be one of the major factors which push the people to opt for GLS lamps in these cities in particular. Also, one of the major reasons asserted by the people are that "*GLS lights comparatively look better which is why we use it and especially on our farms lands we would use these lights as they are brighter and comparatively cheaper than the LED lamps*".



Note: Total Market (TM) from ELCOMA; Total Domestic Manufacturing (TDM) extrapolated from ELCOMA data assuming the same proportion of TDM to TM as per IESA-F&S report, 2014

(Source: ELCOMA Vision Document 2020)

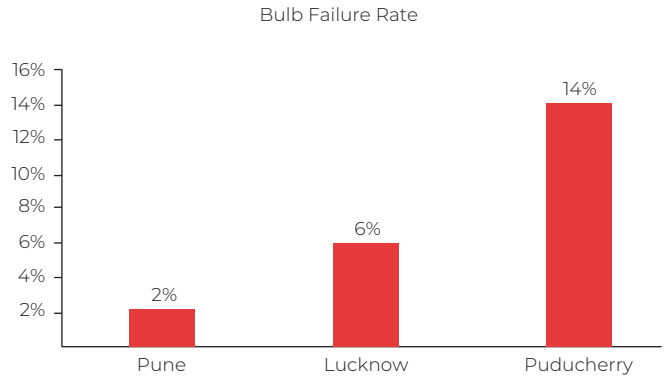
The data also shows that the LED market in India has already reached around Rs 2000 crore and by 2017-18 the total market size was 2.54 billion out which 1.4 billion which is almost half the market share is captured by the domestic manufacturers in India. However, there has been Chinese penetration in LED sectors in last few years as there has been growing demand among consumers due to comparatively less price than others manufacturers. The data also depicts that not more than 40% of LED or lighting products are being manufactured in India and most of the demand of the lighting industry has been fulfilled by imports.



(Source: ELCOMA Vision Document 2020)

Further there are also studies which have shown the failure of the CFLs/Tube light etc which have discouraged consumers from using the LED bulbs comparatively in Tier I and Tier II cities. However, on the other hand in less

developed economies like in Tier III and IV cities people are still using CFLs/Tube lights/incandescent lamps due to cost etc. However, over the years the percentage of use of CFLs/Tube lights etc. has reduced and use of LED has grown and the shift from CFLs/Tube light to LED might take few more years and this can be accomplished with a sensitization programme among people about the mercury. Also there is need of public-private partnership in these areas in order to reduce the cost of such products and proliferation of its use.



(Source: ELCOMA Vision Document 2020)

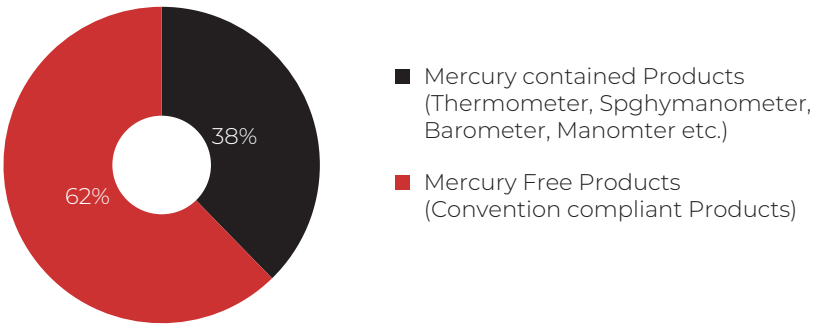
The above data depicts the bulb failure rates of CFL/GSL etc. It shows that in Tier II cities like Pune, Lucknow and Puducherry there been growing failure rate of bulbs which is leading to more and more demand of LED lights in the markets.

3.9 Overview of the Data collected:

The analyzed data shows that there has been growing demand of mercury-free products. However, there is considerable cost difference between the mercury-free products (Thermometers, Sphygmomanometers, Barometers, and Manometers) and their alternatives. This is why nearly one-third of the respondents are still using Mercury-containing products. On the other hand, this has been debated and discussed that most of the mercury-containing products should have labels for clear demarcation of mercury in these and also a statutory warning about the health impacts.

The data collected from the field shows that more than half (i.e. 63%) of the mercury-containing products didn't have any labels and also due to lack of certification mechanism for these products it has been difficult to regulate the use of the mercury in medical devices. One of the significant issues that emerged out of the study is that there is low level of awareness among respondents about the use of mercury in medical and other devices and about the Minamata Convention as well. On the other hand, the government machineries should focus more on awareness generation as at the country level very limited initiative has been taking place about the mercury use and its impediments in particular. Also, there is need of a multi-stakeholder platform in the country to disseminate the information about the mercury and in order to shift from using mercury products in particular. The details of the survey are discussed below:

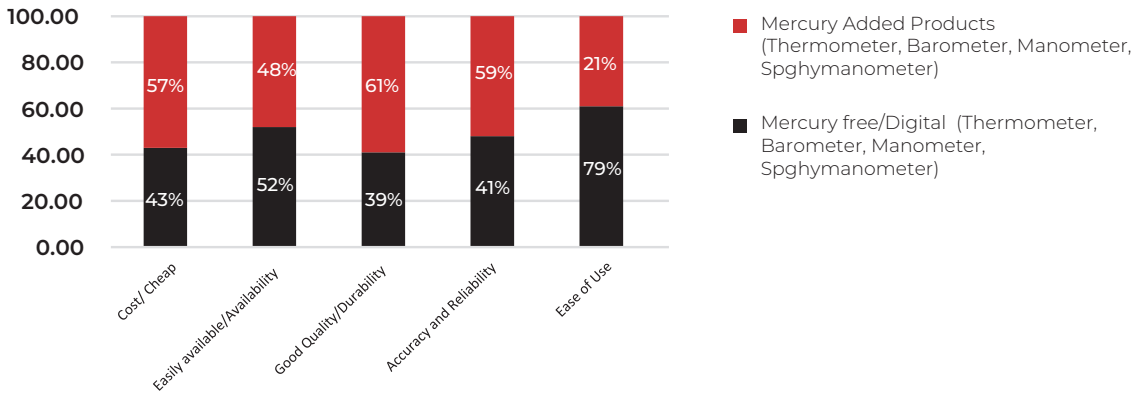
Figure 3. Products More in Demand (as per Wholesaler/Retailers/Manufacturer



The analysis of data shows that 38% of the respondents asserted that among the Mercury-contained products (whether it is thermometer, Sphygmomanometer, Barometer, Manometer) the demand for such products is comparatively less compared to Mercury-free or digital products. As asserted by retailers from Ambala, *"If we sell 1 mercury-free thermometer then compared to that 10 digital thermometers are sold in the market (Agar hum 1 mercury wala thermometer bechte hai uske mukable 10 digital thermometer bikta hai)*. The overall analysis of data shows more demand of Mercury-free products. However, some of the respondents also mentioned that the cost of mercury-free or digital products were more which is why a large section of lower middle class income groups still prefer to buy mercury-containing products.

The analysis of data shows that approximately 62% of the customers prefer to buy Mercury- added products compared to the mercury-free ones. As asserted by retailers, *"Digital Thermometer, Sphygmomanometer or for that matter any other digital products are comparatively more expensive than the mercury-added products; if a mercury-containing thermometer is for INR 40-50 then the cost of digital thermometer would be at least INR 100, that is the reason mercury-containing products are more in use or demand compared to the others (As asserted by a leading thermometer manufacturer from Ambala)"*.

Figure 4.Criteria for buying products (as per Wholesaler/Retailers/Manufacturer

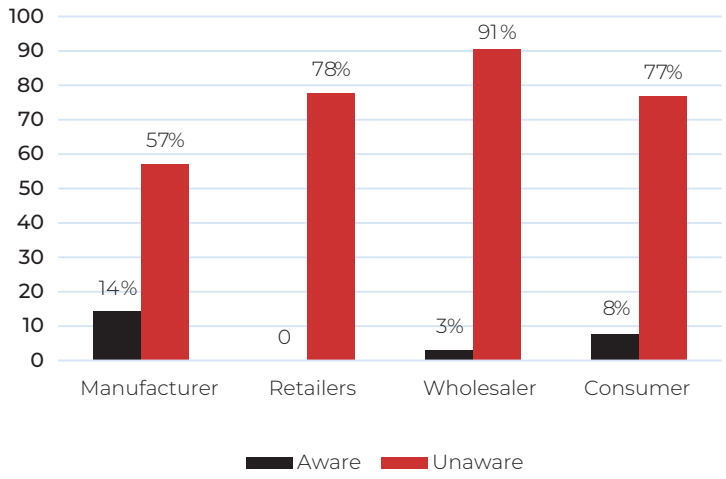


The analysis of data shows that there has been the growing demand of mercury-free products/ alternatives in the market as 61% of the respondents asserted that the higher demand of mercury- free products are due to various factors like their durability, accuracy and reliability in results and ease of use of these products compared to the mercury-added products. While on the other hand 39% of the respondents asserted for having cost differentiation of the mercury-free products/alternatives is more compared to mercury-containing products. So the respondents had their own presumption that this could be the reason of demand of the mercury-containing products primarily in Tier II and Tier III cities.

While on the other hand, the mercury-free products are comparatively more easily available in comparison to mercury-added products. 52% of the respondents asserted that the alternatives of mercury-containing products are easily available while on the other hand 48% mentioned that mercury-containing products are more readily available in the markets.

41% of the interviewees mentioned that mercury-free products give more accurate results. However, some of them mentioned that they had to get the devices recalibrated sometimes for more accurate and precise results. While on the other hand, 59% of the respondents mentioned that mercury-added products give accurate results. However, in order to use these products one has to know how they can be used in comparison to electronics/alternatives of mercury-added products.

Figure 5. Awareness about Minamata Convention



The above data shows a low level of awareness among the people about Minamata Convention as there was no initiative/programme being undertaken by the state. Out of the total manufacturers only 14% were aware about Minamata Convention and rest were either unaware or they didn't know about the Minamata disease or about the Convention per se.

If we look at retailers this ratio is even worse as none (0%) of the retailers from the three locations were found to be aware about the convention. They are also not aware of the hazardous impact of mercury on human health. As one of the retailers mentioned from Ambala, *'We don't know that mercury is harmful for human health, but as now we were told about the Minamata Disease and its impact on the community, I can see we are aware about the health impact associated with the use of Mercury. However, we don't have any other choice but to continue working with this chemical even after knowing as our livelihood is dependent on manufacturing such products and if we don't do it we won't be able to feed our family'*. The data shows that 78% of the retailers were unaware about the use of mercury on products.

The awareness among the wholesalers was the highest amongst the entire category as 91% of the respondents asserted that they didn't know about the Minamata Convention or the disease, they had never heard about this before. This shows that few stakeholders are aware of the ratification of the Minamata convention and the possible impacts. Only 3% of the respondents which is merely 1 respondent out of everyone mentioned that he had heard about the Minamata disease as well as about the Convention. He mentioned, "*Though I knew that India has signed the Convention I am unaware that the cut-off date for phasing out most of the mercury-containing products is 2025. Now I would be careful in buying these products. Also, he added that with the penetration of Chinese companies in the India sub-continent he believes that it would be difficult for the country to completely phase out the mercury containing products from use and sale*" (As expressed by a wholesaler from Mumbai).

Lastly the majority of consumers (i.e. 77% of the respondents) who were interviewed didn't know about the Minamata Convention and out of the total only 8% knew about the Minamata Convention or had heard about when it was signed, through newspapers and social media, however, they don't know about the Convention or its ratification per se.

The analysis of data shows that 68% of the consumers mentioned that most of the products don't have any label about the mercury or a statutory warning on it, and most of the products are manufactured (Thermometer, Sphygmomanometer etc.) in China. Hence these products don't have a label or any information about the presence of mercury or the associated health hazards. Though some of the products purchased from the market had Indian Standard certification from BIS which in a way regulates the use of mercury or any other hazardous chemical in such products.

Figure 6. Labels on Products about use of Mercury

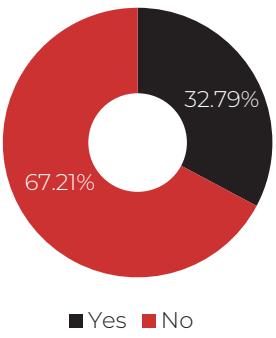
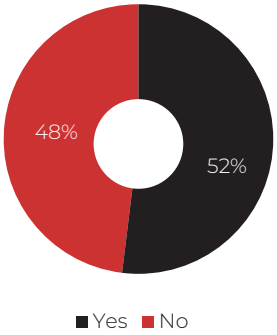
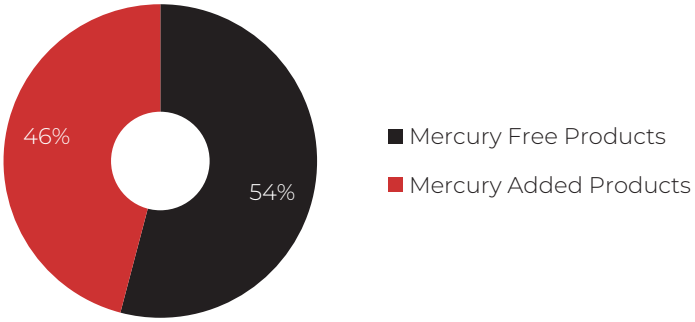


Figure 7. Awareness on Mercury as a Toxics Substance



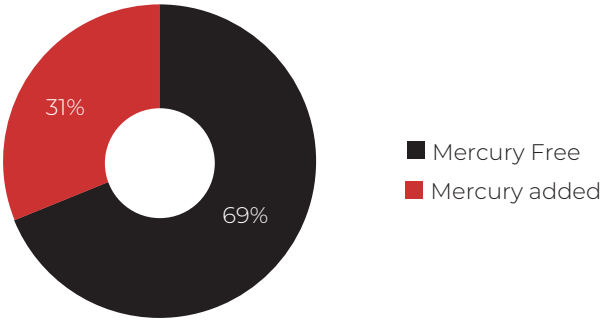
The analysis of data shows that 52% of the respondents expressed that they know that mercury is a toxic substance and while on the other hand 48% of respondents didn't know that mercury is a toxic substance. The data shows the low levels of awareness among respondents from three different locations and most of them asserted that, there is no awareness camp or programme run by the government to inform them about the health impact of toxic substances.

Figure 8. Availability of Mercury-Free/Mercury-containing Products.



The data shows that availability of mercury-free products is comparatively more than the mercury-added products. 54% of the respondents reported that Mercury-free products are more easily available. However, as the cost of the mercury-free products is more, therefore their demand is comparatively less than the others. 46% of the respondents mentioned that mercury-containing products are easily available in the markets.

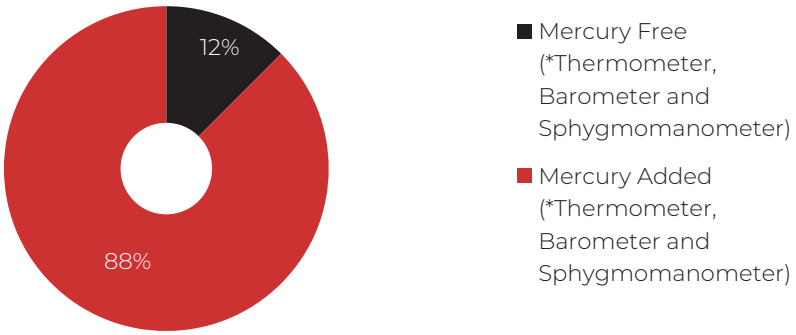
Figure 9. Durability of Products



The data shows that 69% of the respondents (traders/ retailers and wholesalers) asserted that mercury-free products are more durable compared to mercury-added products and also there are chances of mercury leaking from mercury-added products. On the other hand, 31% of respondents had a different view that mercury-added products are more durable compared to the others.

The data collected from three locations of India shows that manufacturing of mercury-added products are more in the country compared to the mercury-free products. 88% manufacture mercury-added products in India and 12% manufacturers produce mercury-free products. *"The mercury-added products are mostly calibrated or assembled in India but these products are mostly manufactured in China"* (As per a thermometer manufacturer from Ambala)[31].

Figure 10. Do the manufacturers produce mercury-free/mercury-added products

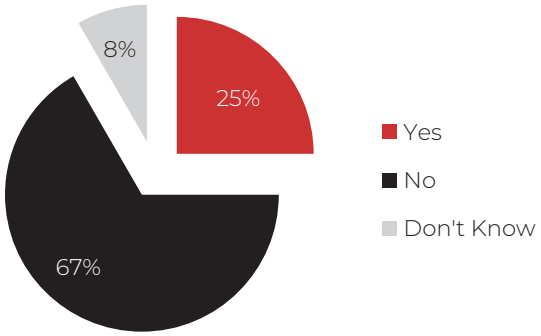


31 Field notes from Ambala

Consumer perspective on Mercury-free alternatives:

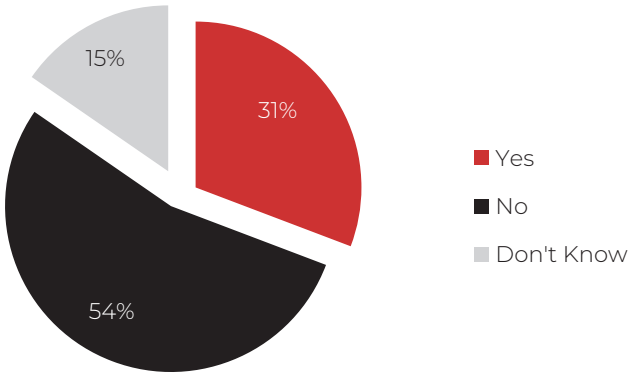
The analysis of data shows that there is low level of awareness among consumers about the use of mercury in various products. 67% of the customers mentioned that they didn't know about mercury being used in medical and non-medical devices (Thermometers, Sphygmomanometers, Manometers, Hygrometers, and Lamps etc).The low awareness among the consumers could be due to the absence of labels on products. However, only 25%customers asserted that they knew about the presence of Mercury in these products. The data clearly shows the lack of awareness among the consumers about the presence of mercury in different devices. Lastly 8% of the consumers mentioned that they don't know whether mercury is used in such products or not.

Figure 11. Consumer Awareness about use of mercury in products (Medical and Non-medical devices)



More than half of the respondents i.e. 54% mentioned that there is no label on the products or warning about the possible health hazards.

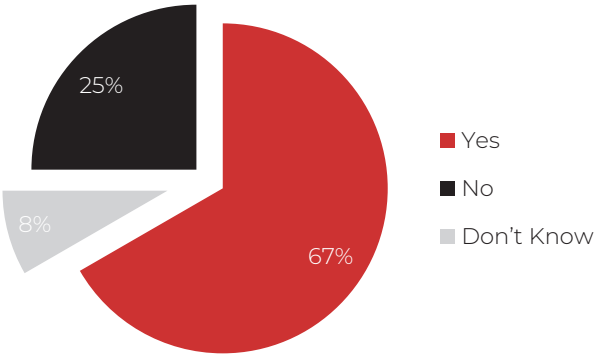
Figure 12. Are there labels on Products about use of Mercury



by consumers from Ambala). 31% of the respondents mentioned that there are labels on the products. "*The products which are branded do have information about the presence of mercury in them. As most of the products are being imported from China or other countries these products don't have any labels in them*" (As asserted by consumers from Mumbai). 15% of the respondents mentioned that they don't know whether the products have labels or not as they don't check these on the products. It could be due to the economic status of the consumers as majority of the respondents, who asserted they don't know, belong to low income groups or marginalized communities. "*We don't check for any labels on the products as the products which we could afford (mostly thermometers) are those which are cheap compared to others, so we don' care whether it has labels or not*" (As stated by a resident from Ambala).

One of the customers asserted that, "*As mostly mercury containing products are cheaper we don't bother to check labels in it, but as most of the mercury-containing products like thermometers, manometers etc. are being manufactured mostly in China, the products don't contain any labels; however, there are Indian standard certifications which is present in the products but these certificates don't give a clear idea about the amount of mercury being used on such products and also the consumers are mostly unaware about the presence of mercury in such products due to the lack of labels.*" He further added that "*It is vital that all the medical and non-medical devices which are manufactured either in India or anywhere else need to have labels in them*" (As asserted

Figure 13. Mercury as a Toxic chemical



The data shows that 67% of the consumers asserted mercury is a toxic chemical and they knew about the health impacts associated with it, and a few respondents 8% (i.e. 1 out of 12) said that they didn't know about mercury being a toxic chemical. Lastly 25% of the respondents said that they know about mercury though they denied knowing about its toxicity and its impact on human health and the environment.

Challenges in shifting to the alternatives & The Way Forward

4.1 Challenges for Shifting to alternatives:

In Health Care Devices:

- Lack of good quality of mercury-alternative products in the market at an affordable cost is one of the factors for the demand of mercury-containing products
- Lack of standardization for the alternate and no mechanism to monitor the medical devices imported from China and other countries.
- Financial implications/cost of alternatives has been one of the challenging factors for shifting to mercury-free alternatives.

Dental Amalgam:

- Cost differentiation between mercury filling and alternate dental fillings pose a threat towards shifting towards mercury-free alternates.
- Lack of training or orientation on opting for alternate filling from mercury filling
- Lack of coordination among the stakeholders is a key for shifting towards mercury- free alternatives.

Alternative to mercury Lamps

- Quality of the alternative LED products due to cheap import to India
- Perception of the people towards LED
- Cost factor in mainly rural areas

Other devices:

- Lack of information and awareness about the impact of Minamata Convention on the industry
- About mercury toxicity and its human and environmental impacts.

The way forward

This study was an indication on the overall status of the mercury-free alternative products in India. It was found that in some of the sectors like health care and lamps, India has made considerable progress in shifting to the alternative products. However, the cost and quality of the products are the major concerns for India considering the wide diversity of the socio-economic class of people living in the country. Further information on the health hazards of mercury is low among the consumers, traders, manufacturers and the workers as well.

Another important aspect of the study is that the domestic demand for mercury and mercury-free products are largely met with the import from China. Incidentally the study also reflected that with the ban on export of mercury products from China, business is getting affected particularly of health care instruments like thermometer and sphygmomanometer. This also reflects the lack of foresight on part of the Indian healthcare industry as well as policymakers that may have impacted the healthcare system in India. Nevertheless, there are industries which are manufacturing mercury-free products in India and with suitable policy and government handholding India can become a manufacturing hub for the mercury-free products.

Therefore, it's the right time for the government to assess the current scenario and act accordingly to make it a mercury-free country and also emerge as a manufacturing hub for mercury-free products. Perhaps the present study can help to move in this direction.

Some of the recommendations from this study are:

1. There is considerable progress in India on shifting towards the mercury-free products
2. India has the ability to achieve the target of convention compliant mercury-free products before 2025
3. Pricing is playing a role in consumers choice for mercury-free products
4. India's dependency on import of mercury-free products from China is a major concern but this may work in the country's favor in moving towards mercury-free products faster, given that China will stop exporting mercury-added products by end of 2020
5. India has to develop suitable policy and handholding to the industry to emerge as a manufacturing hub for mercury-free products
6. Apart from awareness generation, promulgation of regulations are key to make India mercury-free

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ANNEXURE

Annexure-I Import and Export of Pure/Elementary Mercury from India

HS Code (28054000)	Import (Quantity in Thousands)	Highest Importing countries (the names are in descending order in terms of the quantity)	Export (Quantity in Thousands)	Highest Importing countries (the names are in descending order in terms of the quantity)
2011-12	75.92 tons	USA, Japan, Turkey	42.00	Singapore, Sudan, Sri Lanka
2012-13	53.84 tons	USA, Japan,Mexico	33.30	Papua New Guinea, Spain, Sudan
2013-14	36.22 tons	Japan. USA, Switzerland	42.50	UAE, Sri Lanka, Kenya
2014-15	36.23 tons	Japan, Netherlands, Ukraine	3.83	Kenya, Bangladesh, Myanmar
2015-16	70.90 tons	Singapore, Japan, Indonesia	27.32	Myanmar, Sri Lanka, Bangladesh
2016-17	82.80 tons	Japan, Indonesia, Italy	17.00	Unspecified, Guyana, Spain
2017-18	43.08 tons	Thailand, Japan, Spain	6.90	Kenya, Togo, Turkey
2018-19	32.91 tons	UAE, Vietnam, Thailand	18.08	Bolivia, Guyana, Kenya32

Annexure-II Highest amount of /Elementary Mercury Importing Countries to India

Importing Countries	Quantity (In KGs)
USA, Japan, Turkey	75.92 , 44.07, 15.52
USA. Japan, Mexico, Finland	53.84, 38.40, 16.41, 14.49
Japan, USA, Switzerland, Netherland	36.22, 29.56, 27.58, 20.70
Japan, Ukraine, Netherland	36.23, 13.80, 20.70
Japan, Singapore, Mexico, USA	70.90, 67.97, 22.25 , 12.79
Japan, Indonesia, Italy, Thailand	82.80, 66.81, 46.90, 43.13
Thailand, Japan	43.08, 38.50,
UAE, Turkey, Thailand 33	32.91, 31.05, 26.21

32 The information is retrieved from http://commerce-app.gov.in/eidb/Icomcnt.asp. accessed on 05th December 2018.
33 The information is retrieved from http://commerce-app.gov.in/eidb/Icomcnt.asp. accessed on 11th June 2019.

Annexure-III Export of Mercury free device containing from India (Quantity in Thousand)

S.No:	Commodity	HS Code	2015-16	2016-17	2017-18	2018-19
1	Hydrometers (Mercury-Containing)	90258010	7.29	20.79	26.25	432.86
2	Clinical Thermometer	90251110	75.57	27.41	96.71	60.19
3	Barometer	90258020	1.01	0.34	1.60	0.91
4	Digital Thermometer	90251910	113.99	72.72	142.30	146.40
5	Manometer	90262000	1004.64	972.29	2,165.45	2.732.48
6	CFL	85393110	8,079.31	18,503.47	23,418.79	549.06
7	Linear Fluoroscent lamps	94054090	1,651.26	2,916.40	5,333.84	4,929.74
8	High Pressure Mercury Vapor Lamps	85393210	26.47	1.76	76.89	4.42
9	Sphygmomanometer	90189011	18.27	17.96	1,828.08	67.50
10.	Dental Amalgam (OTHER INSTRUMENTS AND APPLIANCES,USED IN DENTAL SCIENCE)	90184900	3061.49	3984.97	3905.22	7537.44 34
11.	OTHER LIGHTING FITTINGS FROM LIGHTING PUBLIC SPACE	94051090	2,190.03	2,922.72	4,775.97	2,092.79
12.	OTHER ELECTRIC LAMPS AND LIGHTING FITTINGS	94054090	1,651.26	2,916.40	5,333.84	4,929.74

34 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.

Annexure-IV Export of Mercury free device containing from India (Quantity in Thousands)

S. No:	Commodity	HS Code	2015-16	2016-17	2017-18	2018-19
1	Hydrometers (Mercury-containing)	90258010	Canada (0.84) Singapore (0.50)	Canada (0.27) Cameron (0.27)	Canada (0.09) Germany (10.06)	Denmark (412.04) Brazil (8.67)
2	Clinical Thermometer	90251110	Ghana (25.00) Kenya (7.00)	Cambodia (8.00) Mynamar (4.90)	Bangladesh (55.09) USA (12.48)	Tazania (24.21) Nepal (15.54)
3	Barometer	90258020	Bangladesh (0.70) Zimbabwe (0.11)	Ethiopia (0.12) Kenya (0.05)	Sri Lanka (0.90) Egypt (0.20)	Nigeria (0.31) Pakistan (0.12)
4	Digital Thermometer	90251910	USA (44.85) Sierra Leone (12.11)	Ethiopia (16.61) USA (12.26)	Ethiopia (47.37) USA (28.13)	Nepal (38.33) Sri Lanka (19.32)
5	Manometer	90262000	USA (301.26) UAE (138.70)	USA (339.61) UAE (152.63)	USA (779.01) Thailand (308.72)	USA (945.08) Thailand (363.55)
6	CFL	85393110	France (4013.36) Egypt (1,381.04)	France (5,219.57) UAE (4,701.13)	Malaysia (5,307.63) UAE (4,682.04)	Malaysia (3,314.45) Bangladesh (490.15)
7	Linear Fluoroscent lamps	94054090	Bangladesh (392.62) France (278.17)	France (606.04) Nepal (361.64)	Tanzania (1,619.09) Saudi Arab (1,063.48)	China (1,338.08) Nepal (624.30)
8	High Pressure Mercury Vapor Lamps	85393210	UK (13.20) USA (2.10)	Sri lanka (0.63) USA (0.62)	Nepal (50.00) Sri Lanka (23.76)	Sri Lanka (3.12) Nepal (0.90)
9	Sphygmomanometer	90189011	Bangladesh (2.64) UK (2.55)	Sri Lanka (2.82) UAE (1.82)	USA (1,775.25) Dominic REP (9.50)	MOZAMBIQUE (11.70) Bhutan (8.78)
10.	Dental Amalgam (Other instruments and appliances, used in dental science)	90184900	Germany (1,404.66) UK (677.38)	UK (1,327.48) Colombia (958.29)	UK (1,935.90) Colombia (695.76)	Colombia (3,111.59) UK (2,345.38) 35
11.	Other Lighting Fittings From Lighting Public Space	94051090	Germany (542.06) USA (276.59)	Germany (531.16) UK (378.97)	Saudi Arab (1,421.73) Qatar (1,201.95)	Nepal (323.61) USA (321.22)
12.	Other Electric Lamp sand Lighting Fittings	94054090	Bangladesh (392.62) France (278.17)	France (606.04) Nepal (361.64)	Tanzania (1,619.09) Saudi Arab (1,063.48)	China (1,338.08) Nepal (624.30)

35 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.

Annexure-V Import of Mercury-containing and Alternatives to India (Quantity in Thousands)

S. No:	Commodity	HS Code	2015-16	2016-17	2017-18	2018-19
1	Hydrometer	90258010	13.10	13.29	571.22	37.48
2	Clinical Thermometer	90251110	1,545.49	2,666.20	1,839.35	1,937.55
3	Barometer	90258020	0.29	0.24	0.86	1.45
4	Digital Thermometer	90251910	6,055.64	7,206.82	8,935.01	12,411.37
5	Manometer	90262000	3,815.64	4,331.58	5,674.41	9,011.34
6	CFL	85393110	6,722.07	3,284.22	2,390.40	2,672.51
7	Linear Fluoroscent lamps	94054090	140,891.63	184,117.34	470,369.22	648,423.38
8	High Pressure Mercury Vapor Lamps	85393210	141.64	31.67	118.62	113.24
9	Sphygmomanometer	90189011	1,789.75	1,805.52	1,624.01	2,396.59
10	Dental Amalgam (OTHR INSTRUMENTS AND APPLIANCES,USED IN DENT SCIENCE)	90184900	3,478.31	8,085.38	12,795.42	31,035.6036
11.	Other Lighting Fittings FR LghtngPublcSP	94051090	124,505.73	81,909.47	92,759.39	68,629.24
12.	Other Electric Lamps and Lighting Fittings	94054090	140,891.63	184,117.34	470,369.22	648,423.38

36 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.

Annexure-VI Highest Importing countries of Mercury containing and Free Devices to India (Quantity in Thousands)

S. No:	Commodity	HS Code	2015-16	2016-17	2017-18	2018-19
1	Hydrometer	90258010	Germany (3.85) China (1.99)	Germany (6.67) China (3.33)	China (563.19) Germany (5.41)	Germany (28.21) China (6.61)
2	Clinical Thermometer	90251110	China (1,535.29) Singapore (10.13)	China (2,630.12) Italy (13.20)	China (1,723.14) Chile (100.00)	China (1,936.51) Hong Kong (1.00)
3	Barometer	90258020	Germany (0.10) China (0.08)	Germany (0.13) Hong Kong (0.08)	UAE (0.52) Germany (0.14)	UAE (0.88) Thailand (0.25)
4	Digital Thermometer	90251910	China (5,754.40) Singapore (215.32)	China (6,795.51) Singapore (383.47)	China (8,615.27) Singapore (210.88)	China (11,669.86) Singapore (552.87)
5	Manometer	90262000	China (1,906.86) Germany (446.49)	China (1,983.51) Germany (822.38)	China (3,216.33) Germany (999.82)	China (5,526.36) Germany (890.21)
6	CFL	85393110	China (6,489.07) Germany (125.34)	China (3,002.08) Germany (180.10)	China (2,233.12) Poland (97.65)	China (1,838.67) Poland (737.65)
7	linear Fluoroscent lamps	94054090	China (134,952.97) Korea (3,676.88)	China (176,621.34) Korea (180.10)	China (460,921.31) Korea (4,626.21)	China (619,482.13) Hong Kong (16,890.05)
8	High Pressure Mercury Vapor Lamps	85393210	China (139.68) UK (1.21)	China (31.41) Singapore (0.13)	China (116.37) USA (2.03)	China (112.41) Japan (0.28)
9	Sphygmomanometer	90189011	China (757.18) VIETNAM (643.60)	China (1,152.21) VIETNAM (528.87)	China (1,468.00) VIETNAM (657.64)	China (1,604.17) VIETNAM (386.76)
10	Dental Amalgam (Othr Instrmnt sand Aplncs, USD in DNTL SCINCE)	90184900	China (1,135.30) Switzerland (589.91)	China (3,941.85) Switzerland (577.13)	China (6,127.21) VIETNAM (2,673.44)	China (18,163.62) VIETNAM (3,477.40)37
11.	Other Lighting Fittings FrLghtng Publc SP	94051090	China (123,425.55) Korea RP (373.10)	China (81,159.19) Hong Kong (254.44)	China (91,735.66) Thailand (418.69)	China (67,307.21) Hong Kong (804.95)
12.	Other Electric Lampsand Lighting Fittings	94054090	China (134,952.97) Korea RP (3,676.88)	China (176,621.34) Korea RP (4,704.04)	China (460,921.31) Korea RP (4,626.21)	China (619,482.13) Korea RP (8,327.97)

37 The information is retrieved from https://commerce-app.gov.in/eidb/Default.asp accessed on 11th June 2019.

Annex VII
Pictures from the Field:

Figure 14. Medical Instrument retailer store in Bhagirath Place (Delhi)

Figure 15. Sphygmomanometer sold in Ambala

Figure 16. Retailer/wholesaler hub for Medical Devices (Ambala)

Figure 17. Barometer manufacturer at BMI (Ambala)

Figure 18. Barometer manufactured at Ambala

Figure 19. Mercury-containing Thermometer manufactured in Ambala

Figure 20. Making of Mercury-containing Thermometers in Ambala

Figure 21. Max & Min. Thermometers purchased from Delhi

Figure 22. Clinical Thermometers purchased from Mumbai

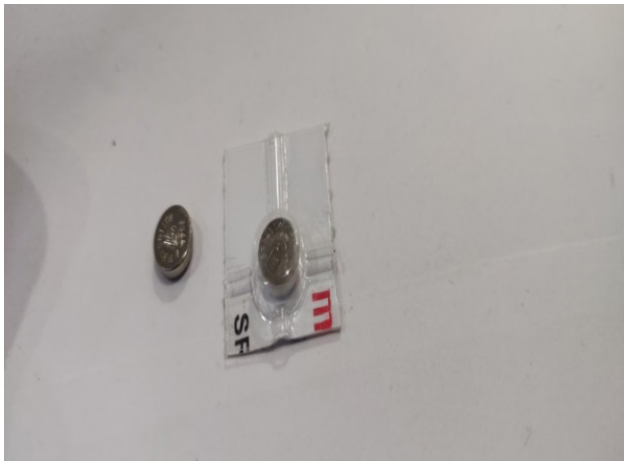
Figure 23. Thermometers (Mercury- containing) purchased from Mumbai

Figure 24. Thermometers (mercury-containing) purchased from Mumbai

Figure 25. Figure 26 Thermometers (mercury-containing) purchased from Mumbai

Figure 26. Indian manufactured thermometers purchased from Delhi

Figure 27. Mercury-Free button cell battery purchased from Delhi



Annex VIII
Questionnaire:

Clinical Thermometer (manufacturer):

1. What type of clinical thermometers do you manufacture?
   a. Mercury-Containing
   b. Mercury-Free

2. What is the Source of Products:
   a. Manufacture [ ]
   b. Acquire locally [ ]
   c. Import [ ]
   d. Any other (specify)

3. What is the nature of activities of your organization:
   a. Imports for own use [ ]
   b. Import and distribute [ ]
   c. Retail sales [ ]
   d. After-sales services [ ]
   e. Others Please Specify

4. Are there mercury-free thermometers available in the market?
   a. Yes
   b. No
   c. Don't

   If yes, cost of mercury-free thermometers _____ (in Rs)

   cost of mercury-added thermometers _____ (in Rs)

5. If yes, why mercury-containing thermometers are used though there are alternative available? (State the reason)

6. Do you import mercury for production?
   a. Yes
   b. No
   c. Don't know

   If yes, how much quantity of Mercury is used in production? (intonnes)

7. Do you have stock/supply of Mercury-added thermometers?
   a. Yes
   b. No

   If yes, how much mercury-added thermometers stock/supply do you have?

Product	Source/Origin	Quantities (2013 - 2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

8. Is there a problem with the availability of mercury-free thermometers?

   a. Yes b. No c. Don't Know

   If yes, explain?

   _____

   _____

9. Are there any obstacles/prohibitions /challenges faced by you to import or use mercury-free products?

   a. Yes b. No

   If yes, explain?

   _____

   _____

10. Are there any obstacles/prohibitions /challenges faced by you to shift from mercury- added products to mercury-free products?

    a. Yes b. No

    If yes, explain?

    _____

    _____

Barometer (manufacturer):

1. What type of barometer do you manufacture?

   a. Mercury-containing b. Mercury-free

2. What is the Source of the products:

   a. Manufacture [ ] c. Import [ ]

   b. Acquire locally [ ] d. Any other (specify)

   _____

   _____

3. What is the nature of activities of your organization:

   a. Imports for own use [ ] d. After-sales services [ ]

   b. Import and distribute [ ] e. Other (specify)

   c. Retail sales [ ]

   _____

   _____

4. Are there mercury-free barometers available in the market?

   a. Yes b. No c. Don't know

   If yes, what is cost of mercury-free barometer _____ (in Rs)

   What is cost of mercury-added barometer _____ (in Rs)

5. If yes, why mercury-containing barometers are used though there are alternatives available? (State the reason)

   _____

   _____

6. Do you import mercury for production?
   a. Yes ‘ b. No c. Don’t know
   If yes, how much quantity of Mercury is used in production? (intonnes)

7. Do you have stock/supply of Mercury-added barometers?
   a. Yes b. No
   If yes, how much mercury added barometers stock/supply do you have?

Product	Source/Origin	Quantities (2013 - 2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

8. Is there a problem with the availability of mercury-free barometers?
   a. Yes b. No c. Don’t Know
   If yes, explain?

9. Are there any obstacles/prohibitions /challenges faced by you to import or use mercury-free products?
   a. Yes b. No
   If yes, explain?

10. Are there any obstacles/prohibitions /challenges faced by you to shift from mercury- added products to mercury-free products?
    a. Yes b. No
    If yes, explain?

Sphygmomanometers

1. What type of sphygmomanometers do you manufacture?
   a. Mercury Containing b. Mercury Free

2. What is the Source of Products:
   a. Manufacture [ ] c. Import [ ]
   b. Acquire locally [ ] d. Any other (specify)

3. What is the nature of activities of your organization:
   a. Imports for own use [ ]
   b. Import and distribute [ ]
   c. Retail sales [ ]
   d. After-sales services [ ]
   e. other (specify)

4. Are there mercury-free sphygmomanometers available in the market?
   a. Yes b. No c. Don't
   If yes, cost of mercury-free sphygmomanometers _____ (in Rs)
   Cost of mercury-added sphygmomanometers _____ (in Rs)

5. If yes, why mercury-containing sphygmomanometers are used though there are alternatives available? (State the reason)

6. Do you import mercury for production?
   a. Yes b. No c. Don't know
   If yes, how much quantity of Mercury is used in production? (intonnes)

7. Do you have stock/supply of Mercury-added sphygmomanometers?
   a. Yes b. No

8. If yes, how much mercury-added sphygmomanometers stock/supply do you have?

Product	Source/Origin	Quantities (2013 - 2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

9. Is there a problem with the availability of mercury-free sphygmomanometers?
   a. Yes b. No c. Don't Know
   If yes, explain?

10. Are there any obstacles/prohibitions /challenges faced by you to import or use mercury-free products?
   a. Yes b. No
   If yes, explain?

11. Are there any obstacles/prohibitions /challenges faced by you to shift from mercury added products to mercury-free products?

    a. Yes b. No

    If yes, explain?

    _____

    _____

Manometers

1. What type of manometers do you manufacture?

    a. Mercury-Containing b. Mercury-Free

2. What is the Source of Products:

    a. Manufacture [ ] c. Import [ ]

    b. Acquire locally [ ] d. any other (specify)

    _____

    _____

3. What is the nature of activities of your organization:

    a. Imports for own use [ ] d. After-sales services [ ]

    b. Import and distribute [ ] e. others (specifies)

    c. Retail sales [ ]

    _____

    _____

4. Are there mercury-free manometers available in the market?

    a. Yes b. No c. Don't

    If yes, cost of mercury-free manometers _____ (in Rs)

    Cost of mercury-added manometers _____ (in Rs)

5. If yes, why mercury-containing manometers are used though there are alternatives available? (State the reason)

    _____

    _____

6. Do you import mercury for production?

    a. Yes b. No c. Don't know

    If yes, how much quantity of Mercury is used in production? (intonnes)

    _____

    _____

7. Do you have stock/supply of Mercury-added manometers?
   a. Yes b. No
   If yes, how much mercury added manometers stock/supply do you have?

Product	Source/Origin	Quantities (2013 - 2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

8. Is there a problem with the availability of mercury-free manometers?
   a. Yes b. No c. Don't Know
   If yes, explain?

9. Are there any obstacles/prohibitions /challenges faced by you to import or use mercury-free products?
   a. Yes b. No
   If yes, explain?

10. Are there any obstacles/prohibitions /challenges faced by you to shift from mercury- added products to mercury-free products?
    a. Yes b. No
    If yes, explain?

Hygrometers:

1. What type of hygrometers do you manufacture?
   a. Mercury-Containing b. Mercury-Free

2. What is the Source of Products:
   a. Manufacture [ ]
   b. Acquire locally [ ]
   c. Import [ ]
   d. any other (specify)

3. What is the nature of activities of your organization:
   a. Imports for own use [ ]
   b. Import and distribute [ ]
   c. Retail sales [ ]
   d. After-sales services [ ]
   e. f. Others (specify)

4. Are there mercury-free hygrometers available in the market?

   a. Yes b. No c. Don't

   If yes, cost of mercury-free hygrometers _____ (in Rs)

   Cost of mercury-added hygrometers _____ (in Rs)

5. If yes, why mercury-containing hygrometers are used though there are alternatives available? (State the reason)

6. Do you import mercury for production?

   a. Yes b. No c. Don't know

   If yes, how much quantity of Mercury is used in production? (intonnes)

7. Do you have stock/supply of Mercury-added hygrometers?

   a. Yes b. No

   If yes, how much mercury-added hygrometers stock/supply do you have?

Product	Source/Origin	Quantities (2013 - 2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

8. Is there a problem with the availability of mercury-free hygrometers?

   a. Yes b. No c. Don't Know

   If yes, explain?

9. Are there any obstacles/prohibitions /challenges faced by you to import or use mercury-free products?

   a. Yes b. No

   If yes, explain?

10. Are there any obstacles/prohibitions /challenges faced by you to shift from mercury- added products to mercury-free products?

    a. Yes b. No

    If yes, explain?

Question to Customers:

1. Is there information/label on the products about use of mercury (e.g. on the packaging)
   a. Yes b. No
2. Is the mercury-containing or the mercury-free alternative more difficult to get?
   a. Yes b. No
   (If yes, which one?)

   _____

   _____
3. Are there any problems with the mercury-free alternatives (e.g. lower durability, lower efficiency or containing other toxic substances)?

   _____

   _____
4. Are you aware that the mercury is a toxic substance?
   a. Yes b. No

Questionnaires for Manufacturers/Suppliers/Lighting Industry

Profile of the Industry/Company

1. Name of the Industry/Company:
2. Address :
3. Contact Details (Phone, Fax, email):
4. Contact Person Name:

Preliminary Information

1. What are the Product types used/manufacture or supply:
   a. Thermometers [ ]
   b. Sphygmomanometers [ ]
   c. Lamps [ ]
   d. Switches and relays [ ]
   e. Manometer [ ]
   f. Batteries [ ]
   g. Biocides [ ]
   h. Topical antiseptics [ ]
   i. Others please (specify)

   _____

   _____
2. What is the Source of your Products:
   a. Self Manufacture [ ]
   b. Acquired locally [ ]
   c. Import [ ]
   d. any other

   _____

   _____
3. What is the nature of activities of your organization:
   a. Imports for own use [ ]
   b. Import and distribute [ ]
   c. Retail sales [ ]
   d. After-sales services [ ]
   e. Others Please Specify

   _____

   _____

4. Do you import mercury for production?

   a. Yes b. No c. Don't know

   If yes, how much quantity of Mercury is used in production? (intonnes)

5. What types of products are more in demand?

   a. Mercury-contained Products b. Mercury-free Products

Awareness about Minamata Convention

1. Are you aware about the Minamata Convention which prohibits the use of mercury from products?

   a. Yes b. No c. Don't Know

2. Are mercury or mercury-contained products toxic to human health?

   a. Yes b. No c. Don't know

Information on Mercury-Free/Mercury-Added Products

1. What Mercury-added products do you stock/supply (List)

Product	Source/Origin	Quantities (2016/2017/2018)	Main Market Segment Supplied (e.g. schools, private hospital, government facilities, private companies, others etc)

Notes

2. Are there any available alternatives for mercury-added products that are mercury-free?

   a. Yes b. No c. Don't know

   If yes, please describe.

Product	Source/Origin	Quantities (2015 - 2018)	Main Market segment where it was supplied

Notes

3. What is the inform choices you make between mercury added and mercury free/convention compliant products (focus on Costs, Availability, Quality, Consumer preference/sales)

Criteria	Name of the Product	
	Mercury-Free /	Mercury-Added
Cost		
Availability		
Demand		
Built Quality/Durability		
Ease of use		
Accuracy and Reliability of results		
After sale service/Technical Assistance from manufacturer/ original supplier		

Notes

4. In case repairs and/or calibrations (as stated above) are arranged by your company, please specify whether these are done locally or abroad

5. Is there any difference between Mercury-added and Mercury-free/Convention compliant devices in this regard (e.g. easiness, time needed)?

   a. Yes b. No c. Don't Know

   If yes, what is the difference?

6. What types of products are more in demand in the market?

   a. Mercury-free products b. Mercury-containing products

   Are there any obstacles/prohibitions/challenges to importing mercury-free/convention compliant products?

Lighting Industry

1. Are you aware about the BIS standards on the issue of mercury on Lamps?

   a. Yes b. No c. Don't know

   1a. If yes, does your company comply with the BIS norms on Mercury use in LED lights?

   a. Yes b. No c. Don't know

   1b. If no, state the reason for non-compliance? (explain)

2. Are there any obstacles/challenges faced by the organization in order to eliminate the use of mercury from products?

   a. Yes b. No

   2a. If no, what are the challenges? (Explain)

3. Are there any steps being taken for the disposal/recycling of the mercury-containing lamps waste?

   a. Yes b. No

   3a. If yes, what are the steps (how it is disposed/recycled) explain?

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