

**CREATING NETWORKS AND INFORMATION
FOR MERCURY POLICY
IN
INDIA AND EUROPE**

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I. Project Proposal

The gaps and strategy

Though Mercury happens to be the most potent and toxic contaminant across the globe it is very rarely seen and understood in its correct perspective. One of the important reasons behind this happens to be lack of information and awareness on the issue, which leads to non-engagement by all the stakeholders.

Toxics Link's aim is to encourage the industry and governments (both here and internationally) to tackle the issue of mercury pollution more seriously through strong public awareness among all the stakeholders (government, industry, community), and through mercury reduction strategies, which are specific and implemented.

In India there are several gaps

- a) Lack of adequate understanding of the issue and recognition of the problem.
- b) Lack of coordinated NGO and civil society work in the issue
- c) Inadequate data and documentation on the ground, of environmental and health impacts.
- d) Inadequate data on trade and imports and linkages with international trade
- e) Need to link with European and other international emerging strategies on mercury.

Addressing the Gap

- a) Beyond the work Toxics Link has already carried out, it plans to address the above gaps. Toxics Link is holding a national multistakeholder workshop on Mercury in Delhi on the 6th and 7th of April, 2005.
- b) It proposes to hold a civil society workshop on the 5th of April, both to help raise a common strategy as well as to enable participation in the larger meeting. The proposal is to form a network of groups concerned about or working on the issue of mercury in India.
- c) Through the involvement of civil society we will jointly help address some of the gaps especially of the gaps of documentation on the ground including photographic documentation. The network will also be encouraged to send letters to the EC as needed to strengthen the civil society stance at the Commission level as needed. Advocacy would also be done nationally in India as well. The outcomes and report of the meeting, as well as the grassroots data generated will be circulated through our existing channels widely to raise the issue jointly.
- d) Toxics Link plans to generate from secondary sources data, which is trade related and if possible of sectoral use in India. For this Toxics Link will hire a short term consultant, and also see if there is data already available in the network which could add to the information. Some more data would be generated on the trade of mercury. There are Govt agencies that monitor the trade data for India. These agencies would be contacted



and data would be collected from them. This detailed data would help in more information and help in the campaign.

- e) Toxics Link has been participating in the work being done in Europe on mercury. It participated in 2004, as part of the BAN-Hg Working Group, in a European Commission meeting on mercury, besides being part of an international team invited by EEB to participate in the UNEP Governing Council meeting in Nairobi, in February 2005

We plan to participate in the EEB held meeting at Madrid in April 22/23rd 2005, and also for future work or advocacy work in Brussels if so needed.

Organising NGO meeting

Toxics Link proposes to organize a one-day meeting on 5th April 2005 to bring together the NGOs, individuals, civil society organizations and grass root activists to discuss the issues of mercury. It will provide a great opportunity for all the grassroots level groups to understand the impacts of Mercury and its global implication.

- Organize and form network of groups engaged on mercury issues.
- To disseminate information on mercury
- Survey and collection of grassroots and trade data on mercury usage
- Pressure Group for Europe and India

List of expected participants:

1. Center for Science and Environment-Atanu Sarkar
2. Palni Hill Conservation Council -Navroz Mody
3. Paryavaran Suraksha Samiti-Michael, Rohit
4. DISHA-Sasanka Dev
5. Dr R C Srivastava
6. Peoples Science Institute- Rijit Sengupta
7. CHINTAN- Bharati Chaturvedi
8. JANHIT- Anil Rana
9. Consumer VOICE
10. CUTS-Vijay Singh
11. Dr J K Grover
12. Hazards Centre- Dunu Roy
13. MAMTA- Prashant Pastore
14. Dr. T K Joshi. Centre for Occupational Health
15. PRASAR-Azad
16. ECO FRIENDS Kanpur- Rakesh Jaiswal
17. P Madhavan
18. Centre for Environment Communication- Pranjal
19. Banwasi Sewa Ashram-Ragini Ben



Expected Deliverables:

- a) Creating a Mercury Network in India for advocacy in India and Europe
- b) Generating and documenting grassroots information and practices (see below)
- c) Generating trade related data
- d) Participating with EEB for work on EU mercury policy

Suggested outputs for the NGO grants:

1. a consolidated report with various ground level perspectives of mercury contamination and impacts.
2. A network to jointly advocate nationally and internationally to prevent impacts in India, including through international trade flows.

The Report to be compiled by Toxics Link in association with other groups can contain:

1. Photo Documentation of Chlor Alkali Plants contamination and their surroundings
2. Documentation of any reported health impacts on local communities and workers.
3. Documentation of conditions of manufacture of items like mercury thermometers.
4. Documentation of conditions of disposal of mercury containing waste.
5. Local awareness meetings with communities.
6. Other suggestions that will come up during the meeting.

The studies would be worked out in partnership with Toxics Link, where Toxics Link expertise in Mercury would be there to guide them through the study.

2. Also A NGO resolution would be prepared and sent out to various bodies including Govt Of India, UNEP, EU etc.



II. Detailed description of the actions

A. Creating a Mercury Network in India

Toxics Link in India has been involved both at the global and the national level in working on the issues of mercury. It participated in the UNEP Global Mercury Assessment, which has been sanctioned by the UNEP Governing Council. We also published the first *National Mercury Assessment for India* (on www.toxicslink.org) and have been participating in international meetings on this issue, in association with a global NGO coalition on Mercury.

We have been successful in highlighting the issue in both national and international media, generating interest among the government on this issue. Toxics Link also engaged in a survey of Mercury in Healthcare sector and published a report on it, which was very widely circulated, and it also generated interest amongst vast cross-sections of the society.

The report was also responsible for questions being raised in the Indian parliament on the issue of Mercury in Healthcare sector. There have also been physical changes at the grassroots level and a few hospitals in Delhi are exploring the alternatives and changing over to Digital Thermometers in place of Mercury Thermometers.

The report published by Toxics Link has catalyzed debate on the subject but it is presumed that the debate is localized at present to a limited audience. The awareness of general public on this issue is also limited and their understanding of the impact of Mercury contamination and its hazard is very peripheral.

Internationally as Southern Representative of the BAN – Hg Working Group, Toxics Link has participated in:

- a) UNEP Global mercury Assessment Meeting in Geneva, 2003
- b) EC meeting on Mercury, Brussels, 2004
- c) UNEP GC meeting, Nairobi, February, 2005

B. The NGO Meet

Toxics Link organized a one-day meeting on 5th April 2005 to bring together the NGOs, individuals, civil society organizations and grass root activists to discuss the issues related to mercury and provide platform to discuss how to demand management mission forward. The meeting provided a great opportunity for all the grassroots level groups to understand the impacts of mercury on their life and surroundings and its global implication.

The main outcomes of the meeting were:

- Formation of a network of groups engaged on mercury issues.
- Plans to generate and disseminate more information on mercury
- Survey and collection of more data on mercury usage
- Act as Pressure Group for Europe and India



NGO Statement on Mercury

On May 5th, 2005

- Recognizing that mercury has severe local and global impacts on human health and the environment,
- That its use is fully replaceable by safer and viable alternatives already in commercial use
- That little attention has been paid to mercury health and environmental impacts and use in India,

We wish to voice our concern that:

1. Globally mercury is being phased out from developed countries in the European Union, the US, and others, and it is finding its way towards developing countries like India,
2. That demand for mercury is not abating, infact it is rising in various major and minor use,
3. That subsequently India is becoming a hot spot for mercury contamination,
4. That those impacted most are the poor communities and workers in factories and industries,
5. That India has not amply recognized the problem of mercury as a toxic, and lags behind even amongst developing and other Asian countries including China.

The demand

Internationally

1. Mercury being phased out in developed counties including in the European Union be locally contained and not be put back on the recycling market.
2. India demand mercury free clean processes, products and technologies for overseas investments.

In India

1. All major uses of mercury in industry like Chlor Alkali are phased out immediately as per the existing. Government of India policy, which is not being implemented, as well by tightening norms as per best international norms.
2. That mercury so phased out be contained in long term storage and be strictly regulated, not put back in to use through trade.
3. That mercury-contaminated sites be immediately remedied as per existing Hazardous Waste Laws in the country with full industry responsibility.
4. That special efforts be made to alleviate communities and workers who have suffered mercury exposure
5. That the fish eating population of the country be warned of the levels of mercury in the fish through fish advisories
6. That other uses of mercury like in health care be phased out,
7. Those facilities be created for safe collection and recycling of mercury form products like florescent tubes.
8. Those proper guidelines be drawn for collection and containment of mercury containing batteries and their production ultimately stopped.
9. That proper standard be devised for mercury emission to air.
10. Safety measures for Mercury in Schools, Colleges and Laboratories
11. Mandatory training for handlers of mercury in hospitals and laboratories

Require Data

1. Full inventorization for mercury in all uses.
2. Mercury hotspots and the most impacted areas be mapped out and the levels of mercury existing there documented and made public



India as well. The outcomes and report of the meeting, as well as the grassroots data generated will be circulated through our existing channels widely to raise the issue jointly.

C. Generating and documenting grassroots information and practices

Toxics Link supported three different kinds of activities to generate information and data on mercury with the involvement of the partner organizations. The studies carried out in partnership with Toxics Link, where Toxics Link expertise on the issue of Mercury guided them through.

The Studies were

S. No.	Projects	Objectives	Outcomes
1	An Assessment of the Mercury Usage and Risks Involved in the Laboratories of Schools and Colleges of Kolkata	Assess the needs and locations of mercury use in our schools and colleges. Study regular usage patterns and action taken in case of accidental spillage will be studied. Help develop mercury consciousness in schools and colleges towards safe and restricted use of mercury.	Document on existing practices on demand and handling of mercury in the laboratories of schools and colleges.
2	Informal Sector Trade In Mercury: The Case Of Delhi Understanding Some Basic Fundamentals	To study the trade of mercury in the waste markets of Delhi. To trace the extent of mercury trade chain.	Knowledge about the informal mercury trading chain Perspectives about the informal sector on mercury trade. An understanding about whether or not it is feasible to undertake a larger study in the area
3	Photo documentation of status, impacts of a chlor alkali plant on environment and the community residing in the proximity	To document the impacts on community To document the impacts on environment To understand the perspectives of the workers as well as the community.	A photo document on the mercury status, impacts around the chlor alkali plants.

The details of the studies are:



Study Report I

Title: An Assessment of the Mercury Usage and Risks Involved: In the Laboratories of Schools and Colleges of Kolkata.

Study Conducted By: Direct Initiative for Social and Health Action (DISHA)

Executive Summary: The survey reveals that liquid mercury, mercury compounds and mercury instruments can be procured by anyone from open market having a letterhead of any institution and mentioning a reason

There is no formal/statutory instruction either from the school boards or from the individual institutions regarding safe handling of mercury in the laboratories. In some institutions, the instructors give verbal caution but this entirely depends upon the initiative of the concerned instructor and his/her level of awareness on the issue and varies widely from person to person

At least 15% of the students were found to have played with liquid mercury and 46% take it on paper/table, 8% were even found to have smelled liquid mercury. In all the institutions, without exception, mercury compounds, after the experiments, are disposed of either in the general waste stream (if solid) or in the sink (if liquid). The institutions experience 1 to 3 spill occurrences in each year due to breaking of instruments. But accident registers are not maintained in any school. Instructors, lab-assistants and students seldom know the action to be taken in case of such spill occurrence. They try to collect the spilled mercury by sweeping and lifting them by paper/card board leaving every chance for a fraction to remain scattered on the ground in room temperature. 70% of the students vaguely know that mercury poses health risk but misconception regarding exact nature of ailments inflicted by mercury is predominant. 46% of them know that mercury causes skin disease if touched whereas only 8% know that it can cause harm to kidney and only 1% know that it causes food contamination. There has been no proposal from the instructors regarding substitution or reduction of use of mercury in laboratories

Background: Mercury is an elemental substance that once released into the environment, easily and rapidly changes forms to several organic and inorganic states that transfer from soil to air to water and back again.

The organic form of mercury, methylmercury, bio-accumulates in aquatic ecosystems to magnify concentrations in animal tissue in increasing degrees up to 10,000,000 times. Methylmercury, the most toxic form of mercury, can affect the reproductive efforts of top predators in aquatic environments such as loons, otters, mink, and panthers. The neurotoxic effects of high levels of methylmercury poisoning in humans has been established, and low-level doses of methylmercury consumption can potentially affect human health, especially that of a foetus.



Elemental mercury is a highly toxic substance, which can vaporize easily and cause both acute and chronic health effects including severe respiratory irritation and damage to the central nervous system.

Mercury is a bio-accumulative, persistent, toxic substance that threatens the health of humans and wildlife throughout the globe. Many environmental regulatory authorities including the USEPA, Environment Canada, the International Joint Commission, the Commission for Environmental Cooperation and many governments have identified mercury as one of the most critical pollutants for elimination and/or significant reduction. It is of grave concern that no such regulation exists in India.

Major problem of mercury contamination in the environment is caused by the Chlor-alkali industries. Paper, pulp, pesticide and fungicide industries are also responsible for mercury contamination. Electric and electronic apparatus and battery industries also use mercury in their production. Mercury is used as preservative for medicines. Mercury is also contained in thermometer, Blood Pressure monitor and many other instruments, which are used in hospitals, clinics, pathological laboratories and educational institutions.

Educational institutions potentially use a wide variety of mercury containing products. Elementary or secondary schools may have elemental mercury in their facility primarily for laboratory or science experiments, whereas colleges or universities may have mercury in a number of different settings. Students, instructors, lab-assistants, demonstrators all have a direct exposure risk to this deadly substance; while indirect exposure risks initiated by release of mercury in the environment (through accidents and/or bad practices) cover the whole of bio-sphere.

It is especially important to practice mercury sensitive precautionary measures as well as mercury reduction and substitution policies in our schools because children and developing adults are particularly susceptible to mercury's toxic effects.

Many of these students later engage in jobs where they have risk of direct mercury exposures. Sensitization in student life may help them to protect themselves and the environment in future. Those, who do not go into such jobs, if taught earlier, may also remain aware of the general problems regarding mercury and sensitize others to take precautionary measures in daily life.

Specific Objective: The objective of the project was to assess the status of handling mercury, mercury compounds and mercury instruments in the science laboratories in the institutions, the risks involved in the present practices and level of awareness among the students, teachers and laboratory assistants.

The study may contribute to the process of developing mercury consciousness in our society to bring about legislations and policies towards safe and restricted use of mercury.



Methodology:

1. 5 schools and 5 colleges with science faculty were selected for survey.
2. Data were collected through visiting schools and colleges, having interactions with college authorities and filling up of questionnaire sheets.
3. 3 sets of questionnaires were developed for students, laboratory instructors/demonstrators/assistants and institutional authorities through pre-testing.

The sample size was as follows: –

Name of Schools	Students	Teachers	Lab. Asst.
1. The Future Foundation School	41	2	2
2. Ultadanga United H.S. School	22	2	1
3. Metropolitan Institute	35	2	1
4. Scottish Church Collegiate School	74	2	1
5. Baghbazar Multipurpose Girls' High School	41	2	1
a. Name of Colleges			
1. Jogesh Chandra College	32	2	1
2. Ashutosh Chandra College	37	2	2
3. The Scottish Church College	35	2	1
4. Narendrapur Ramkrishna Mission College	45	2	1
5. Dinabandhu Andruze College	36	2	1
TOTAL	398	20	12

In schools, students of Class XII, having longer experience in laboratory activities, were surveyed. Similarly in colleges, students of final year of degree course were surveyed.

The total number of students, teachers and lab-assistants of these institutions coming in contact with mercury, mercury compounds and mercury instruments are as follows:

Table 1: No. of Students, Teachers & Lab-Assistants coming in contact with mercury/mercury instruments/mercury compounds per year

Sl. No.	Name of the Institution	Contact with mercury / year		
		Teacher	Lab Asstt.	Student
1	Scottish Church College	12	7	415
2	Dinabandhu Andrews College	4	2	170
3	Ashutosh College	8	6	320
4	Jogesh Chandra College	9	4	41
5	Narendrapur Ramkrishna Mission College	9	4	100



6	The Future Foundation School	7	3	180
7	Metropolitan Institution	3	2	60
8	Ultadanga United High School	6	2	46
9	The Scottish Church Collegiate School	5	2	150
10	Baghbazar Multipurpose Girls' High School	4	2	160
AVERAGE		6.7	3.4	164.2

Observations

Use: Elemental mercury is present in instruments like Thermometer, Barometer, Boyle's law apparatus, Calomel electrode in Potentiometer, pH meter, Pohl's commutator, Viscosity apparatus, Platinum electrode, Bume calorimeter, Manometer, Sphygmomanometer, Hygrometer etc. All these are not available in every laboratory. Depending upon the faculty of the institutions, these instruments are available as shown in Table 2.

Table 2: Main instruments found in the institutions

Sl. No.	Name of the Institution	Use of Mercury Instruments										
		Thermometer	Barometer	Potentiometer (Calomel electrode)	pH meter (Calomel electrode)	Jolly's apparatus	Boyle's law appartus	Pohl's commutator	Viscosity apparatus	Sphygmomanometer	Manometer	Hygrometer
1	Scottish Church College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
2	Dinabandhu Andrews College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
3	Ashutosh College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
4	Jogesh Chandra College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>						
5	Narendrapur Ramkrishna Mission College	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
6	The Future Foundation School	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
7	Metropolitan Institution	<input type="checkbox"/>	<input type="checkbox"/>									
8	Ultadanga United High School	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>		
9	The Scottish Church Collegiate School	<input type="checkbox"/>	<input type="checkbox"/>							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Baghbazar Multipurpose Girls' High School	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>					

Elemental mercury is kept in stock in the laboratories as most of these instruments require some replacement / addition of mercury. The stock is widely reused. Total stock in an institution varies



from 1.5 kg to 5 kg and purchase per year from 50 gm to 1.04 kg. Total stock of liquid mercury and purchase per year per institution are given in table 3.

Table 3:Mercury Stock and Purchase per year

Sl. No.	Name of the Institution	Mercury Stock (in Kg.)	Mercury purchase/ year (in Kg.)
1	Scottish Church College	4.5	0.2
2	Dinabandhu Andrews College	3	0.075
3	Ashutosh College	4	0.35
4	Jogesh Chandra College	2	0.1
5	Narendrapur Ramkrishna Mission College	1.5	0
6	The Future Foundation School	5	1.04
7	Metropolitan Institution	3.5	0.5
8	Ultadanga United High School	1.75	0.05
9	The Scottish Church Collegiate School	1.5	0.05
10	Baghbazar Multipurpose Girls' High School	3.7	0.15
AVERAGE		3.05	0.252

Mercury compounds, used in different experiments, are Mercuric chloride, Mercurous chloride, Mercuric oxide, Mercuric sulphide, Mercuric nitrate, Mercuric iodide, Mercuric bromide, Mercuric fluoride, Nessler's Reagent (Potassium mercuryiodide), Mercuric acetate $[Hg(OAc)_2]$, Ammonium mercuriothiocyanate, Deniz's reagent etc. Annual consumption of some commonly used mercury compounds in the institutions under survey are shown below:

Table 4: Yearly consumption of different mercury compounds in the sample institutions

Sl. No.	Name of the Institution	Mercury Compound (Yearly consumption) [In gram]						
		Mercurous chloride	Mercuric chloride	Mercuric sulphide	Mercuric nitrate	Mercuric oxide	Mercuric iodide	Nessler's reagent
1	Scottish Church College	25				25		
2	Dinabandhu Andrews College	200		250	150	100		
3	Ashutosh College	150	100			150		
4	Jogesh Chandra College	100	100			100		
5	Narendrapur Ramkrishna Mission College	25	25	25	25	25	25	25
6	The Future Foundation School		20			20		
7	Metropolitan Institution					25		
8	Ultadanga United High School	25				20		
9	The Scottish Church Collegiate School	25	25			25		
10	Baghbazar Multipurpose Girls' High School		50			30		
AVERAGE		79	53	138	88	52	25	25



Procurement

- Mercury element and compounds are procured from the market.
- No special permission or license is required for such purchase.
- Most of the schools and colleges maintain Procurement Registers.

To cross check the availability of mercury, a market survey was undertaken. It is confirmed that the shops do not have any formal restriction imposed by the government authorities regarding sell of mercury. But they have some self-imposed restrictions. They only sell to the institutions and medical establishments who tender written requisition under concerned institution's/establishment's letterhead mentioning the purpose of procuring mercury.

Table 5: Price range of mercury, mercury compounds and mercury instruments

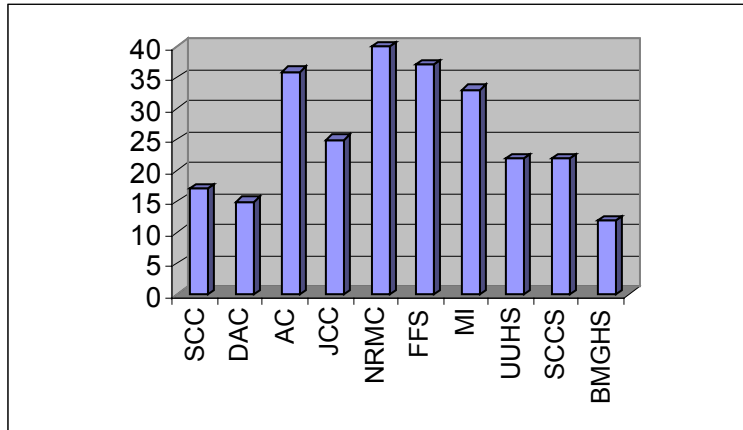
Liquid Mercury	
E-Mark	Rs. 7440 per Kg
Local	Rs. 2400 per Kg
<i>Some Mercury Compounds</i>	
Mercuric Chloride	Rs. 6000 per Kg
Mercurous Chloride	Rs. 8000 per Kg
Mercuric Sulphide	Rs. 6800 per Kg
Mercurous Nitrate	Rs. 15000 per Kg
Nessler's Reagent	
a) Ammonia	Rs. 1090 per litre
b) Serum	Rs. 1490 per litre
Deniz's Reagent	Rs. 1760 per litre
<i>Some Mercury Instruments</i>	
Thermometer	Rs. 45 to Rs. 95
Barometer	Rs. 4500 (with 750 – 850 gms. of Mercury)
PH meter	Rs. 5500
Potentiometer	Rs. 18000

Involvement of the Students with Mercury:

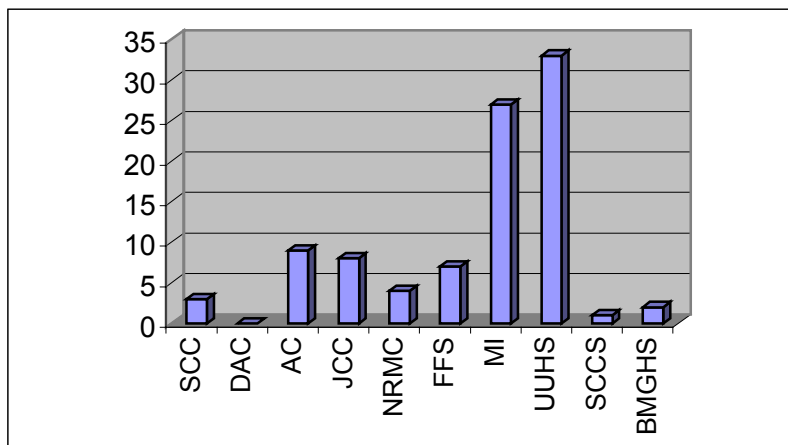
Students were asked regarding their involvement with mercury while doing experiments in laboratory. Interesting answers were received.



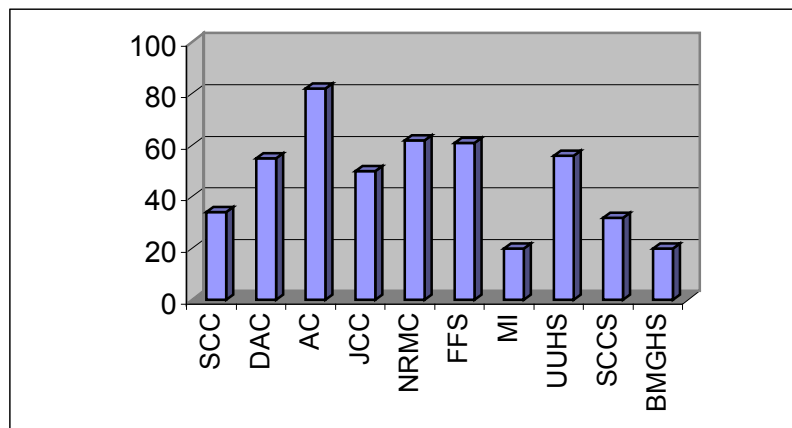
Percentage of students who touched liquid mercury



Percentage of students who took smell of liquid mercury

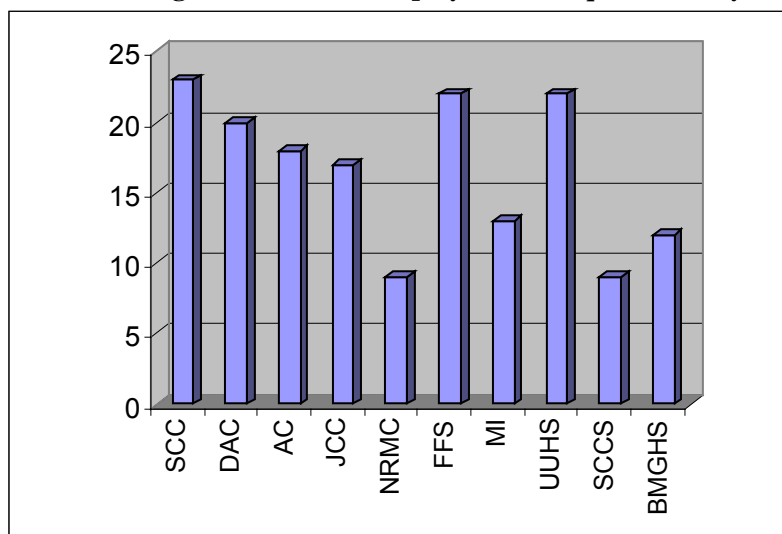


Percentage of students who took liquid mercury on paper/table





Percentage of students who played with liquid mercury



All the above charts are shown in table format in table 6.

Table 6: Percentage of students who touched, inhaled, took on paper/table and played with liquid mercury in the sample institutions

Sl. No.	Name of the Institution	% of Students			
		touched liquid mercury	taken smell of liquid mercury	taken liquid mercury in paper/ table	played with liquid mercury
1	Scottish Church College	17	3	34	23
2	Dinabandhu Andrews College	15	0	55	20
3	Ashutosh College	36	9	82	18
4	Jogesh Chandra College	25	8	50	17
5	Narendrapur Ramkrishna Mission College	40	4	62	9
6	The Future Foundation School	37	7	61	22
7	Metropolitan Institution	33	27	20	13
8	Ultadanga United High School	22	33	56	22
9	The Scottish Church Collegiate School	22	1	32	9
10	Baghbazar Multipurpose Girls' High School	12	2	20	12
Total		26	8	46	15

Disposal: In all the cases, without exception, mercury compounds, after use are disposed of either in the sink or in the dustbin and eventually goes to regular garbage stream.



Accidents: Occurrences of Mercury spillage are found to be happening at the rate of 1-3 times/year in each laboratory. Spillages are generally occurred due to breakage of instruments and during handling of Barometer, Boyle's law apparatus, Jolly's apparatus, Pohl's commutator and calomel electrode etc. There have been variations in the number of occurrences experienced by the students of the same institution. Table 7 gives the percentage of students who experienced mercury spill and also the percentage of students by no. of spills experienced. Instrument wise percentages of spill occurrences are given in table 8.

Table 7: Number of Spill occurrences experienced by the students

Sl. No.	Name of the Institution	% of Students seen any mercury spill in lab	% of Students seen mercury spill (per year)			
			Once	Twice	Thrice	More
1	Scottish Church College	14	9	6		
2	Dinabandhu Andrews College	50	25	25		
3	Ashutosh College	41	41			
4	Jogesh Chandra College	25	25			
5	Narendrapur Ramkrishna Mission College	53	31	7	2	13
6	The Future Foundation School	66	56	8	0	2
7	Metropolitan Institution	13	13			
8	Ultadanga United High School	56	34	11	0	11
9	The Scottish Church Collegiate School	36	27	7	0	2
10	Baghbazar Multipurpose Girls' High School	17	13	0	2	2
Total		37	28	6	1	2

Table 8: Percent of students experiencing Spill occurrences for mishandling / breakage of following instruments

Sl. No.	Name of the Institution	Mishandling/ Breakage of instrument					
		Thermometer	Barometer	Boyle's law apparatus	Jolly's apparatus	Pohl's commutator	Handling liquid mercury
1	Scottish Church College	6	6				3
2	Dinabandhu Andrews College	45			25		5
3	Ashutosh College	36					5
4	Jogesh Chandra College	10			8		8
5	Narendrapur Ramkrishna Mission College	23	2	2	7	22	38



6	The Future Foundation School	34	17	40			15
7	Metropolitan Institution	13					
8	Ultadanga United High School	52					12
9	The Scottish Church Collegiate School	22					16
10	Baghbazar Multipurpose Girls' High School	15					5
Total		25	3	2	4	3	12

Action taken in case of accidents: Spilled mercury is generally collected by paper/ card-board and then poured in the bottle of liquid mercury after cleaning. Any measure to evacuate the laboratory or prevent evaporation is not taken.

Accident Reporting: Accident Register is not maintained in the schools. In each case, the information had to be collected on the basis of memory of the authorities (including instructors and laboratory assistants) and students.

Restrictions: None of the schools or colleges provides any official notice or instruction to the students, teachers or lab-assistants regarding safe handling of mercury, mercury compounds, mercury instruments and mercury spill management. It absolutely depends upon the initiative of the respective teachers/instructors to caution the students in the matter and that too verbally. The substance and manner of caution vary from case to case. Instructions received by percentages of the students under survey in the respective institutions are given in the table 9.

Table 9: Instructions received by students (in percent)

Sl. No.	Name of the Institution	Don't touch	Don't smell	Wash hands after experiment	Use gloves	Use masks	Don't leave open	Don't dispose in sink	Don't dispose in waste
1	Scottish Church College			3					
2	Dinabandhu Andrews College	50	10	10					
3	Ashutosh College								
4	Jogesh Chandra College								
5	Narendrapur Ramkrishna Mission College	33	9	2					
6	The Future Foundation School	46	27					10	
7	Metropolitan Institution	7							
8	Ultadanga United High School	20		10					
9	The Scottish Church Collegiate School	8		1	3	3			
10	Baghbazar Multipurpose Girls' High School								



Perception: The survey intended to assess how many students are actually aware of the instruments and compounds related to mercury, which they handle. It is observed that many of the students are unaware of this.

Table 10: Percentage of students aware of the use of elemental mercury, mercury compounds and mercury instruments

Sl. No.	Name of the Institution	% of Students aware regarding use of		
		Elemental Mercury	Mercury Compounds	Mercury Instruments
1	Scottish Church College	71	94	97
2	Dinabandhu Andrews College	25	100	100
3	Ashutosh College	9	100	100
4	Jogesh Chandra College	8	100	100
5	Narendrapur Ramkrishna Mission College	67	64	93
6	The Future Foundation School	32	98	98
7	Metropolitan Institution	40	53	87
8	Ultadanga United High School	33	56	89
9	The Scottish Church Collegiate School	51	64	95
10	Baghbazar Multipurpose Girls' High School	65	95	100
TOTAL		42	81	82

It has been observed that most of the students, teachers and lab. asstts stated that mercury poses health risks.

Table 11: Percentage of students mentioning mercury poses health risk

Sl. No.	Name of the Institution	% of Students mentioning health risk from mercury		
		Yes	No	Don't know
1	Scottish Church College	74	0	26
2	Dinabandhu Andrews College	90	0	10
3	Ashutosh College	91	0	9
4	Jogesh Chandra College	67	0	33
5	Narendrapur Ramkrishna Mission College	71	0	29
6	The Future Foundation School	90	2	8
7	Metropolitan Institution	20	0	80
8	Ultadanga United High School	78	0	22
9	The Scottish Church Collegiate School	65	0	35
10	Baghbazar Multipurpose Girls' High School	56	0	44
Total		70	0	30

But they have a lot of misconceptions regarding the adverse health effects of mercury. A very common misconception has been that mercury cause skin disease if touched. Very few

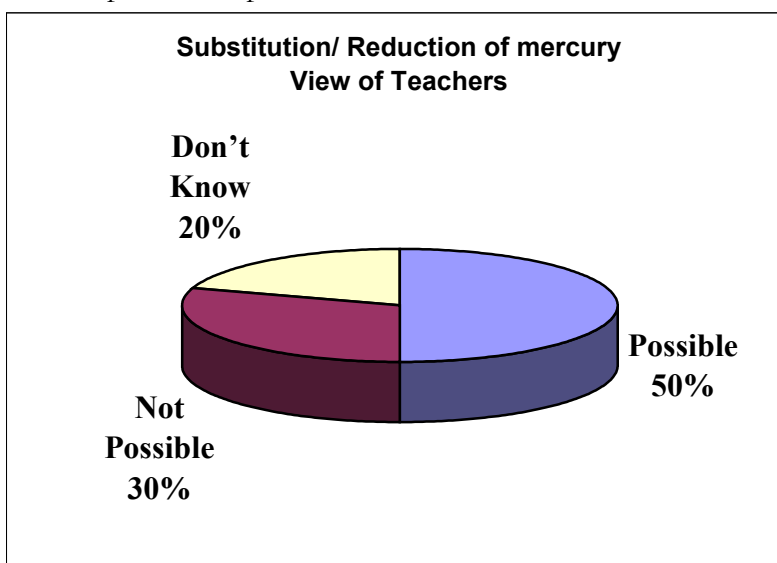


are aware of the risk of inhalation. But in case of identifying the health risks due to mercury pollution in the environment, a good number of correct answers were received.

Table 12: Different health risks from mercury as stated by Students

Sl. No.	Name of the Institution	Health risks from mercury								
		Skin diseases	Cancer	Nervous disorder/ Brain problem	Allergy	Kidney problem	Respiratory problem	Harmful to eye	Food poisoning	Metabolic problem
1	Scottish Church College	43	26	17		37	20	6		
2	Dinabandhu Andrews College	80	15		45				10	5
3	Ashutosh College	82	23	18			36			
4	Jogesh Chandra College	42								
5	Narendrapur Ramkrishna Mission College	20	29	2			4			
6	The Future Foundation School	55	15	25		20	6			
7	Metropolitan Institution	13								
8	Ultadanga United High School	45	25	5						
9	The Scottish Church Collegiate School	52	27	12	8	6				
10	Baghbazar Multipurpose Girls' High School	22			20					
Total		46	17	8	8	6	6	1	1	1

Substitution/ Reduction: Teachers were asked whether substitution or reduction of mercury is possible in the School/ College laboratories. 50% of them answered affirmatively, 30% of them stated it was not possible and 20% of them stated they don't know. The survey also collects suggestions from teachers regarding substitution or reduction of mercury in laboratories. Few of them proposed to remove the relevant part of mercury compounds from the syllabus of experimental portions.





Conclusions

- The easy and open market availability of a toxic element like mercury and its compounds is in itself a grave potential health hazard.
- The absence of safety instructions and practices in the laboratories of institutions regarding safe handling of mercury, mercury compounds, mercury instruments and mercury spills is criminal negligence of public health.
- Playing with, smelling and mishandling mercury and mercury compounds are posing grave health hazard to concerned persons and the neighbourhood.
- Very low level of mercury awareness among the teachers and students adds to the potential danger from mercury.

Recommendations

- India should have some central regulations / rules regarding procurement, use and handling of mercury like many other countries. Mercury must not be available in open market without any restriction.
- All sellers, purchasers and users of elementary mercury and mercury compounds should require to get authorization from concerned pollution control board under condition of compliance to necessary safety measures and record keeping.
- The school boards and university authorities need to issue circulars to all schools and colleges to maintain procurement registers, stock registers and accident reporting register for mercury, mercury compounds and mercury instruments. Violation of the instruction should lead to de-recognition of the concerned laboratory.
- All teachers, lab-assistants and students, who have to attend to the laboratories, must be served with a circular explaining the ill-effects of mercury, precautionary measures for handling mercury and do's and don'ts in case of accidents / spill occurrences.
- Such circular should also be displayed at a place in the laboratories so that it may be conspicuous to everybody.
- A tool kit with sulphur powder, special broom, and injection syringe / dropper, mask and protective gears must be available with every laboratory for mercury spill management.



Study Report II

Title: Informal Sector Trade In Mercury: The Case Of Delhi Understanding Some Basic Fundamentals

Study Conducted By: Chintan Environmental Research And Action Group, New Delhi

Executive Summary: Trade channels for handling Mercury do exist in the informal sector. However, given its rather specialized nature, both from a handling as well as usage perspective, it is not a widely practiced trade.

Awareness about Mercury within the waste-picker and recycling communities is very generic in nature, and there is insufficient knowledge about the product itself, about its handling, and about the possible health related consequences associated with the same.

It is also evident as a result of the study conducted that Hospitals are careless about Mercury handling and disposal, despite being fully aware of the possible consequences of their actions. As such, in the long term, visible and concerted efforts are called for to establish and enforce a safe mercury Handling and Disposal system/mechanism.

It is suggested that this study must be followed up with a more comprehensive exercise which goes in depth into existing/likely issues pertaining to Mercury handling, disposal and trade – this study must cover a larger geographical area, a larger and scientifically determined sample size comprising different elements of the distribution chain as well as a variety of intermediate as well as end users of the product. The time period involved would be 6-8 months depending on the exact nature of the activity being finally considered.

For the immediate future, there is an urgent need to disseminate information about Mercury at different levels in the collection, manufacturing/value addition, and consumption chain – a series of awareness camps to spread awareness about the product, its properties, and its safe handling.

Background: He had a crooked, fleeting light in his eyes, like that of mercury¹...

The presence of Mercury in the informal recycling sector in India is not unlike the crooked, fleeting light that writer-philosopher Primo Levi mentions. It is scarcely ever seen, and most descriptions of this are based on hearsay and just a few glimpses amidst a lifetime of waste picking.

This study was undertaken to better understand Mercury as it flows through the informal recycling sector. In order to do this, the study tracked down those who directly dealt with

¹ Primo Levi : The Periodic Table



Mercury and discussed various aspects of Mercury handling with them. Some of them were known to us, others were just cold calls. We asked ourselves and the waste recyclers :

But what really takes place here? What is the process? And the impetus for it?

We know that Mercury is toxic. So do the many traders from the informal sector who deal with it. Even within the informal sector, there is a hierarchy of materials based on their conditions: ganda, or dirty and saaf, or clean. This is true in the case of Mercury too. Although they have little knowledge about the specific toxicological attributes of Mercury, there is a sense that it is incorrect, in some legal way, to pick it up or deal with it. Moreover, there is also a clear understanding of Mercury within the sector : many know what it is, what it looks like and other physical attributes, and can recall whether or not they have ever found it or traded in it. In fact, a Chintan study undertaken in 2003 indicated that 6% of children and 16% of male adults were able to clearly recall having traded in mercury.² Ironically, most of them also thought that hospital waste caused only some minor breathlessness and did not link up the two.

Despite this venal combination of unsafe and possibly dirty, the informal sector finds a means of making this metal into a profitable venture, albeit erratically. Clearly then, when people risk their health and productivity to enhance their livelihoods, it is rather simplistic to frame the process as toxic or environmentally damaging without also taking the context of work into account.

Chintan has a fairly intimate knowledge of the informal sector. Moreover, given the significant, well documented, and ongoing work being carried out by the organization in the area of waste management, mostly with the active involvement of the waste-picker community itself, it enjoys a great degree of credibility as well, both within as well as outside the sector. Chintan was thus felt to be well suited to carry out an exercise of this nature.

This is only a short, preliminary study that seeks to pose some questions and address some of these issues in collaboration with the informal sector. The larger objective is to understand how extremely hazardous chemicals like Mercury can be removed from the production, waste and recycling stream all together. This study is likely to raise more questions than provide answers. Chintan believes that that itself is a useful first step if we are to seek the right to clean and safe work for everyone.

Methodology: The study was carried out over a 3-month period between June and August 2005, in different parts of Delhi and its suburbs. While a fairly large number of respondents were covered, credible information was obtained from about 20 respondents covering different elements of the waste handling and recycling chain, including some users as well. The study was largely subjective in nature at this stage, with respondents being taken through a checklist of points to be covered. The process was to initially speak with such persons whom we already knew as Mercury traders and seek their collaboration. Most of the interviews were in the form of a discussion that extended beyond the scope of the study, as

² Wasting Away. A study of the Health Status of Delhi's Wastepickers. Chintan 2003



dictated by the interests of the individual. This final report does not contain names to protect the identity of the persons. It was summarized in Hindi and shared during meetings with persons from the informal sector to get their feedback on the data and the analysis.

Limitations: While the survey does provide the preliminary information and understanding called for as per its objective, the responses cannot be considered statistically significant, from a sample size perspective, or from a geographical coverage perspective. A more detailed survey is certainly called for in order to build upon this study and validate the preliminary findings as well as gain further knowledge enabling a deeper understanding of the facts, the issues involved, and possible interventions called for.

Note on the informal sector: The informal sector of recycling works like a pyramid [Figure 1]. The first layer comprises wastepickers, who work at the lowest level of the recycling chain. As their name suggests, they pick up waste from areas where it lies discarded.

They comprises of several hundred thousand men, women and children in urban pockets who mine garbage heaps and bins for recyclable wastes like plastics, paper and metals. At the second layer come the small middlemen, often poor themselves, who buy waste from the rag pickers. They in turn sell the waste to the third layer, comprising large buyers who own huge godowns and deal in specific materials. Finally, at the top, devouring all the labor and materials from below are the actual recyclers themselves. Most of the city interacts with the first and the second layer, whose labor actually propels recycling in India. These are also the repositories of knowledge and information about waste at the local level, and have no inhibitions – caste-based or otherwise – about handling waste.

Salient Observation:

I. The Trade at Various Levels

Wastepickers and Small Junk Dealers:

- Wastepickers are not significant players in the recycling of mercury or its trade. Mercury is never a found item, so to say. It is bought, even by wastepickers, in small quantities informally. Often, it is bought from hospitals through an informal trade in the metal. A few junk dealers explained that they bought a mass of assorted waste that included mercury. Purchasing unsegregated waste in bulk is a strategy that is uncommon, but does take place. It usually works to the advantage of the buyer, who only buys such waste whose individual components can be sold at a profit. However, small junk dealers were seen to be much more important players in the trade, as the trade flow begins with them.
- Of the 8 respondents studied amongst the waste-picker and small kabaris/ junk dealer community, only one was found to be carrying some mercury in the premises



(in this case, 1 kg in a plastic bottle) at the time of the survey. A second junk dealer told us that he usually traded in mercury, but did not have mercury on that day, or even, on subsequent days in the next fortnight when we visited him. However, in the past, he has shown Chintan samples of Mercury as he receives them. At the time of writing this report, he has informed us that he has appx. 100 gms of Mercury. However, this cannot be ascertained. The quantities shown to us has been between 5-20 grams (as estimated by him, in the absence of any appropriate instruments) kept in various glass bottles. In general, the predominant feedback was that Mercury was either not an item of interest, given its erratic availability and specific channels of trade. Moreover, the players at this level informed us that it was used for only specialized, selective applications and this narrow path reduced its attractiveness.

- In general, waste-wickers/small junk dealers are not seen to be crucial traders in Mercury. Trading, when it does happen, is very rare, and in small quantities. For procure larger quantities, markets in Tilak Bazaar, Khari Bawli, Chandni Chowk, etc., were pointed out, while in some cases, foreign countries (China), chemical factories and hospitals were also mentioned as sources of Mercury.
- On being asked about the rates for purchase of Mercury, the majority of respondents mentioned that they did not purchase it in the first instance, since they had no use for it, and it had no consistent buyers down the line either. In the case of 3 respondents who had purchased Mercury, the rates indicated ranged from Rs. 300/ per kg to Rs. 1000/- per kg.
- The inconsistency in prices could be attributed to three factors. Firstly, to the clandestine and informal nature of the trade, which results in a secrecy and lack of widespread awareness of the prices of mercury. As a result, mercury prices cannot be compared to previous prices, current prices, or final prices at the user level. This therefore allows a wide swing in the prices, based as they are on individual judgment, guesstimates and negotiation with little context.
- Secondly, data from other users/traders suggest that there is an import of Mercury from China, as well as larger quantities from bulk sources. The import of waste into India has been seen, again and again, to lower domestic prices for the same material. It is possible that this is also valid for Mercury pricing, making it erratic. Apart from this, since imported mercury is available in larger quantities and even more readily, the end users/larger traders, who are willing to pay higher prices for it.
- Thirdly, during conversations across the chain, there was a reference to ganda and saaf, or dirty and clean mercury respectively. Drawing a parallel from the fate of other materials classified as ganda and saaf in the informal sector, it is inferred that the perceived purity and quality also impacts the price.



- The quantities involved at this level were nominal – the 8 respondents had between themselves, traded in less than 5 kgs of the metal during the last 2 months. However, in terms of health and environmental impact, these are significant quantities.
- Margins on re-sale of this Mercury are in the range of 20-25% in all cases however. Possibly traders are unaware of the real value of the commodity and tend to sell it at a margin in relation to the price that they procured it for.

The Next Level of Buyers

- Chintan interviewed the next level of buyers in the informal Mercury sector to understand the trade at this level. Three fairly large buyers (traders) of Mercury were interviewed as a part of the study.
- The feedback was unanimous that the trade has been on the decline over the last 2 years. The import of Mercury and the simultaneous reduction of the scope of the Sunday Bazaar could be cited as reasons for this.
- The Sunday Kabari Bazaar in most cases, and occasionally Khari Baoli and the chemicals market were indicated as the selling locations, though in all cases, it was pointed out that buyers of the Mercury could not be specifically traced/identified. It appears from conversations that those in need of Mercury go to the Sunday Bazaar and locate the sellers of the week. This trade could have been further disrupted on account of the brutal clamp down on the Sunday Bazaar three years ago and its new hours from 4 am to 8 am, along with a cramped and smaller space.
- The rate at which they were found to be procuring Mercury was fairly uniform at about Rs. 1250/- to Rs. 1400/- per kg. Invariably, waste-pickers or kabaris were not mentioned as important sources of the metal by these larger buyers/traders, and they preferred to obtain their requirements either through established chemical/pharma Companies or through imports. It was not possible to understand the nature, scale of production or names of these pharma companies.
- The metal is stored in heavy iron containers or in thick plastic jars at this level.
- Buyers were generally seen to be quality conscious as far their procurement is concerned. Mercury extracted from Shingram Stone was mentioned as being amongst the purest forms available in the market.
- The buyers were generally not concerned with the identity of the person(s)/organization(s) that they sold it further to, as long as they were making reasonable margins on their transactions. Selling prices indicated ranged from Rs. 1500/- per kg to Rs. 4500/- per kg.



- In two cases, the buyer bought from both the informal trade and from importers. The countries names were the United States, Canada and China. None of these buyers were engaged in waste trading full time, and each of them owned a shop selling chemicals, groceries etc.

End Users

It was difficult to find end users who directly used mercury and who were willing to engage in any conversation. Although about 6 people were interviewed, only 2 of them proved to be directly relevant to the study.

One of them was a jeweler and the other ran a pharmacy, or an enterprise that manufactured indigenous medicines.

- The purchasing price was between Rs.700-Rs.1000 per kilo, but these were rough estimates given by the interviewees. They did not divulge the actual or precise price.
- Both these persons buy mercury on a monthly basis from Tilak Bazar, the chemicals market in Delhi and one of them also looks for mercury in the Sunday Bazaar.

II. Uses of Mercury

- Uses for the mercury as mentioned were varied, ranging from heavy machinery, pharma applications (thermometers and BP gauges), in local goldsmiths, to ayurvedic medicines, industrial applications and making holy sculptures. In fact, interviews suggest that mercury is used widely for religious purposes, particularly Shivlings. Other remarks suggest that some sadhus may also be trading in Mercury in far flung areas.
- One of the applications included making ‘para’ tablets used for storage of grains and pulses. Some respondents believed that Mercury would kill bacteria that would otherwise contaminate food. This is clearly one chain that leads to direct poisoning, from trading to end-use.

III. Handling, Safety and Awareness

- Mercury is generally stored in plastic bottles. There is a general awareness that it is a harmful, toxic substance that needs to be handled with care. However, there was no specific knowledge about the product impacts the human body and how it needs to be handled/treated. In one particular case, it was described as a harmful substance since it usually came from hospital waste and could hence be a carrier of diseases.
- All the persons interviewed accurately described how Mercury broke into pellets when it fell down. They also described how it was picked up: by using a stiff piece



of paper. One person clearly said that it was imperative to wear gloves while handling it, since touching it with one's bare hands was very dangerous. Purity was judged in various ways: if iron floated on top of mercury in water, if it was bought from a well known source or if it was imported from a developed part of the world.

- At the level of the wastepickers/small junk dealers, the conditions of work per se are poor. Godams or areas where Mercury is stored are freely accessible to children as well as others. Given the cramped space, it is also seen that cooking, heating (in the winter), resting, occasionally rearing children etc. are all undertaken in close proximity to the stored Mercury. Besides this, the number of women, men and children seen in the godowns where mercury was found or is usually traded, at the time of this discussion, ranged from 3 to 32. Hence, it is possible for Mercury contamination and poisoning to take place amongst a large number of persons.
- The jeweler seemed to feel that handling of Mercury would have no harmful effect on workers handling the same, as long as they washed their hands properly after use.
- Awareness about Mercury as a tradable commodity was seen everywhere. However, awareness about the sources of Mercury was low. Many persons thought it could be available from households, who would sell it and yet others said that it was likely to be found the dustbins. Others accurately described it as originating from hospitals. This indicates that it is important to identify and enable the sector to learn about the sources of Mercury if they are to protect themselves from it.

Summary And Conclusions

This survey was a first attempt towards arriving at an understanding of the level of trade in Mercury at the waste-picker level in the city's waste management system.

In its limited form, the study attempted to determine the level of awareness about Mercury amongst waste recyclers, its handling in the normal course of their work, and to understand the distribution chain for the product, in case such a chain does exist. It was expected that this study would feed into, and lead to other, more exhaustive studies to examine the mercury trade channels and practices in general, and to examine the need for appropriate interventions from the environmental as well safety/health perspectives.

The study reveals that while trade channels do exist in the informal sector, trade in mercury is not a widely practiced one. In fact, the limited level of trade that does exist has been on a steady decline over the last few years. On the other hand, traders dealing with the metal in larger quantities prefer using formal channels - either large companies, or imports.

It also emerged from the study that even the limited awareness about Mercury was very generic in nature, and with inadequate safeguards with regard to its storage, handling and disposal, it does pose a potential health threat to the informal recycling community. In particular, the practice of hospitals disposing of Mercury waste in an irresponsible manner



needs to be checked. Moreover, an awareness campaign with regard to safe handling and storage of Mercury amongst the waste-picker community is also called for.

A more detailed, widespread study would help throw more light on the entire subject of Mercury Trade, Handling and its effective management, including setting up appropriate guidelines and facilitating policy initiatives and interventions on the subject.

However, based upon this study, it is possible to recommend that:

- A much more widespread discussion and dialogue be undertaken with junk dealers regarding the sources, hazards and legislation related to Mercury and how they envision work that protects their own health and that of others.
- Mercury handling and disposal must be regulated further at the level of clinics and other generators of bio-medical waste.
- A study to examine the extent of Mercury imports is required as a first step towards ending such trade.
- A longer study should be undertaken to detail the trade in Mercury in the informal sector.








Study Report III



Title: Photo Documentation on mercury status and related environmental health problems in and around Chlor and Alkalai Manufacturing units in Tamil Nadu and Kerala.




Photo Documentation Conducted By: Mr. P. Madhavan





	<p>Dry pond inside the DCW company where the liquid waste is stored and dried.</p>
	<p>Fishermen are busy removing the skin of cod fish. The skin is exported and fetches huge money. The catch is very poor in the month of November, December and January as the DCW releases the sorted water into the sea.</p>
	<p>These blue waters might look very scenic, and mesmerizing. Unlike beauty this is one of the ponds where the water from the plant is stored until the rainy season.</p>


	<p>A salt worker can be seen working behind the DCW Ltd. The company acquired a huge land on 99-year lease basis in 1956. The company has its own captive salt production for its caustic soda unit.</p>
	<p>Salt production ground. The agricultural lands are now largely converted into salt production grounds as agriculture is no more feasible an option due to the polluted waters and solid waste disposed on the fields water front.</p>

		
	<p>Uppanar, a tidal river. Chemplast sanmar ltd in Karaikal discharges wastewater directly into the sea through this tidal river Uppanar. Death of fish is a common phenomenon in the river. The area is comparatively clean due to Tsunami, which washed away most of the dirt of this factory.</p>	




	<p>One of the waste water pipes which carries toxic chemical waste to the storage ponds inside the DCW plant.</p>
	<p>This is one of the 10 equal sized ponds used to store the wastewater from the DCW company. This land belongs to DCW and has been acquired on 99 year lease basis. The land is highly misused for dumping the chemical and waste water</p>
	<p>During salt production, the workers use pumped water from the ponds built by the DCW company. Since the land belongs to DCW, these people have rented the same to make salt. The nature and chemical content of the salt produced can only be assessed by clinical testing. It is quite likely that the manufactured salt is contaminated since</p>

	workers use wastewater from the plant.
	One of the open dumps where the waste from the factory is directly dumped in an open area..
	Brine sludge pond inside the factory.


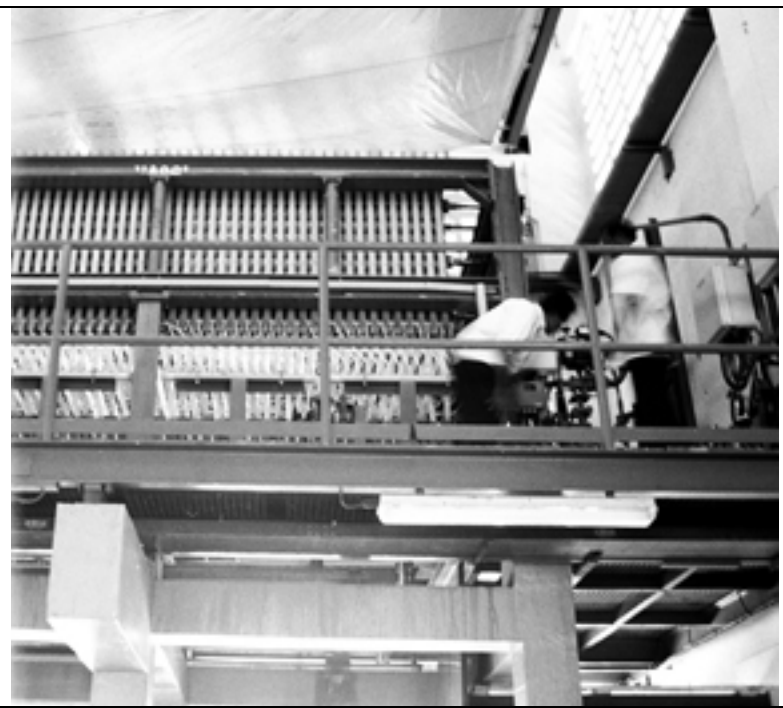





	<p>A huge lake where the wastewater is stored. According to the fisherman around this factory, the water is stored in this pond until the onset of the rainy season. Once the rains start pouring, the company opens the water flow from ponds to mix with the river which subsequently enters the sea.</p>
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	<p>Another dump inside the DCW factory.</p>
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	<p>A worker who dumps the waste from the factory. He says that every day 4 to 5 tractors comes and dumps hear. He works for the contractor and says that they dump where ever the low lying area is found</p>
	<p>The tractor dumps the waste sludge's from the factory. The composition of the waste is not known but according to the tractor driver they collect it from the caustic soda plant.</p>
	<p>One of the pond where waste water is stored.</p>

	<p>The wastewater discharged has completely changed the biodiversity of the surrounding areas. Low fish catchment, abandon of agricultural fields are growing phomina. The pictures shows the water color of tamiraparani water and root.</p>
	<p>An another dumping ground of DCW company. This is very next to the public road and the tamiraparani river which seen at background hear.</p>
	<p>Travancore cochin chemicals Ltd (TCC) The picture shows the 25 TPD membrane cell plant, which was opened in 2005. With German technology.</p>

	<p>125 Tpd membrane cell plant</p>
	<p>Inside view of membrane cell plant</p>

	<p>Chlorine tank ready for filling of liquid chlorine.</p>
	<p>A modern control room of TCC membrane cell plant.</p>
	<p>Hazardous waste storage where the dismantled mercury plant and unused mercury is stored. According the GM the storage facility is made in the specification of CPCB.</p>

	<p>A man filling the liquid chlorine in the one ton Iron container</p>
	<p>An employee of TCC in the chlorine filling station.</p>
	<p>A view of the TCC plant</p>



The Chlor alkali plants use Mercury in the production processes and are traditionally one of the major users of Mercury in the country. These plants are both in the private and public sectors and are spread across the length and breadth of the country. This photo documentation has been done at two plants in Southern part of India and it clearly demonstrates the capacity of the unit to handle waste.

The photographs, noticeably, show the contamination of all three mediums, namely, water, soil and air by the plants. The waste is being dumped indiscriminately and would not just contaminate the immediate vicinity of the plants but would also be carried through the three mediums to places far and wide.

The photographs of the waste drying pond and the open dumping of contaminated waste is a proof of the practices being followed by these plants in handling Hazardous Waste. In these plants environmental norms are not strictly enforced. This is the reason for concern as Mercury is likely to leach into environment due to improper handling of waste.

The change in the colour of water and soil also bear testimony to the degradation and contamination already taken place in the environment around the factory. The leakage in the pipeline and the spread of waste on ground also highlights the kind of practices on ground. The absence of any signage or notification as specified in rules are also not implemented and it appears that the waste will continue to be in the vast open spaces which are being used as landfill by the factory.

The mandatory rule by the Indian Government in 1986 that new caustic-chlorine plant should only be installed with membrane cell technology has expedited the eventual shift from mercury cell technology to membrane technology. The membrane technology has advantage over mercury cells in terms of absence of mercury pollution and energy efficiency.

Central Pollution Control Board/Ministry of Environment and Forest organized a series of industry specific interaction meeting to formulate a Charter on Corporate Responsibility for Environment Protection. (CREP). Task forces were also constituted for overseeing the implementation of CREP. Chlor Alkali industry was also covered under the CREP programme. Under this programme, chlor-alkali plants are to phase out mercury technology by 2012 and there have been certain restrictions on mercury usage as well as discharge. Environmental as well as economical considerations have forced majority of the total 32 plants to shift to the cell membrane technology and the remaining are also in the process of phasing out mercury-based technology.

One of the modern plants using the cell membrane technology has been also covered under this photo documentation. The photographs highlight the cleaner working environment in non mercury plant.

Plant visited during the photo documentation

The **Travancore-Cochin Chemicals Limited (TCC)** is a State Public Sector Undertaking owned by the Government of Kerala. It is situated at Udyogamandal in Cochin industrial belt. Incorporated in 1951, TCC is one of the oldest Chlor-alkali units in the sub-continent. They have a production capacity of 66000 tons Caustic Soda per annum. The plant phased out the mercury-based technology in 2004 and is using the cell membrane technology.

DCW commissioned a plant for the production of Caustic Soda in 1959 at Sahupuram in the southern state of Tamil Nadu. The plant, which has and installed capacity of 60000 MTPA (according to AMAI), is in the process of phasing out mercury-based technology.



Study Report VI

Title: The Religious use of Mercury In India: A Case Study of “Parad”

Study Conducted By: Toxics Link

Introduction

The history of civilization is in many ways linked to the story of the use of metals in antiquity. Although modern metallurgy has seen an exponential growth since the industrial revolution it is interesting that many modern concepts in metallurgy have their seeds in ancient practices that pre-date the industrial revolution. Metals were extracted and utilized in the past in stages progressing usually from the use of native metal, to those metals, which could be smelted easily from ores, to those, which were more difficult to smelt. The commonly used metals in antiquity include gold, silver, copper, iron, tin, lead, zinc and mercury.

The use of mercury is the main concern, as we know that mercury is a toxic, naturally occurring, highly volatile heavy metal. It is found in trace quantities throughout the environment - rocks, soils and the oceans. Mercury being an element that never breaks down but persists in the environment cycling through land, air and water. Mercury exists in the environment in elemental, organic or inorganic forms.

Mercury is highly toxic metal and has the ability to pass all the three delicately designed barriers in nature- the skin, blood brain and the placental barrier. Mercury can be consumed via food, inhaled or be absorbed through the skin.

Objectives of the Study

The uses of mercury in religious and cultural practices are not documented in India. Toxics Link took the initiative after the news on web of the establishment of Parad Shivlinga at Ujjain in the state of Madhya Pradesh. The objective of carrying out this study is to further investigate the facts about “Parad”. The main objectives of the study are:

1. To find out about traditional uses of mercury and “Parad” and its significance as stated in scriptures and documents.
2. Identify possible source of selling and marketing of “Parad”
3. To ascertain and find out the composition of “Parad”
4. To test its leaching behaviour in milk in varied time duration.

Methodology

To fulfil above objectives following methods were adopted:

1. Survey of secondary material:
 - a. Study of various web sites and published material about the Parad and use of mercury in traditional practices.



2. Field work: The fieldwork to one of the places where mercury Parad is established. This is mainly to find out the perspective of people about the mercury Parad and its significance. One field visit was carried out to Siddha Ashram, Ujjain and informal interview with Seer of the ashram was conducted.
3. Laboratory Test: The Lab test was carried out to identify the composition of Parad and its leaching behaviour in the milk. These test were conducted in two nationally accredited labs of India.
 - a. Composition of Parad: The test for composition was done at Sriram Institute for Industrial Research at Delhi. This Lab is nationally accredited and has relevant ISO certification
 - b. Test for Leachet Behaviour: Preliminary test was conducted at Sriram Institute and further leachet behaviour was tested at SGS lab in Gurgaon. The SGS lab is internationally recognized lab for scientific testing. The Leachet behaviour was tested for different time duration starting from ½ hr to 24 hrs.

Sampling

1. Two sample of parad was purchased from the online seller at Delhi.
2. The leaching behaviour of parad is purposefully tested in the milk. As the shiv puja involves immersion and bathing of shivling by milk and drinking of that milk by the devotees. Looking in to the potential hazard of mercury to the common man and threat to the environment. The testing was conducted in milk.
3. The test is carried out in varied time duration in following durations.
 - 30 min, 1 hrs, 3hrs, 6 hrs, 12 hrs and 24 hrs

Findings and Discussion

The Traditional use of Mercury in India

Mercury is a metal that has been of great alchemical importance in ancient times. Mercury is a volatile metal, which is easily produced by heating cinnabar followed by downward distillation of the mercury vapour. Some of the earliest literary references to the use of mercury distillation come from Indian treatises such as the Arthashastra of Kautilya dating from the late first millennium BC onwards.

In ancient India mercury finds itself mentioned in the Vedas. Mercury was found in various forms of medicines and this practice is followed till the current day when the various ayurvedic medicines use mercury.

In Hindu scriptures mercury is regarded as the best of all metals. The following is the purport of a sloka from *Rasyog Chintamani*:

"Sphatik is better than paashan, padmaraaj than sphatik, Kashmir jewel, pushparaaj, i.e., labasunia than Kashmir jewel, panna than labasunia, neelam than panna, godanti or gomed, mauktik than vidrum, silver than diamond, gold than silver, diamond than gold and parad (mercury) is yet better than diamond."

Mercury occupies a very high place in Siddha medicine, which is supposed to have originated in the Southern India. It is used as a catalytic agent in many of its medicines. When mercury is used it is



used in combination with sulphur. The addition of sulphur is to control the fluidity of mercury-this converts to mercuric sulphite, which is insoluble in mineral acids. Siddhas used 5 forms of mercury. (1) mercury metal-rasam (2) red sulphide of mercury-lingam (3)mercury chloride- veeram (4) mercury subchloride (mercury chloride)-pooram (5) red oxide of mercury-rasa chenduram. Ordinary rasa chenduram (red oxide of mercury) is a poison but when it is processed as *Poorna chandrodayam* according to Siddha practice, it becomes ambrosia.

Besides medicine various texts describe mercury usage in making of fireworks and gunpowder.

The texts of Indian alchemy (*rasavidya*) reveal that a wide variety of inorganic and organic substances were used and plant as well as animal products including mercury. The important minerals are generally referred to as *rasas* and, in later texts they are classified into *maha* (superior) and *upa* (subsidiary) *rasas*. Mercury, though a metal, is extolled as the king of *rasas*, the *maharas*, and has several names in the *rasasastra* texts: *parada*, *sita*, *rasendra*, *svarnakaraka* (maker of gold), *sarvadhatupati* and, more significantly in a mythological setting, *Sivaja* (born of Siva); *Siva virya* (semen of Siva) and *Harabija* (seed of Siva). More than two hundred names of plants have been mentioned in the texts, but many of them have not been properly identified from the point of view of modern botanical nomenclature. Generally their roots, leaves or seeds are used for aiding digestion processes. As for the animal products, their excreta, flesh or some other parts of their bodies were diligently processed and used.

The texts written in the medieval period primarily dealt with gold-making and elixir syntheses. Elixir or *Rasayana* was a substance that could transform other base metals in to gold and silver, as well as confer longevity and immortality when taken internally. If an elixir proved successful in transmutation of metals it was supposed to be safe for internal administration as well. Owing to its heavy weight, silvery white and shiny appearance, fluidity, and its property of readily combining with other substances, mercury was considered as the most potent of all substances and as possessing divine properties. The potions containing mercury were supposed to give longevity and immortality, thus making it the main ingredient of the powders used in the transmutation and as elixirs. Mercury had to undergo 18 processes before it could be used for transforming either metals or human body. These processes were as follows:

- *Svedana*: steaming or heating using water bath
- *Mardana*: grinding
- *Murchana*: swooning or making mercury lose its form
- *Utthapana*: revival of form
- *Patana*: sublimation or distillation
- *Rodhana*: potentiation
- *Niyamana*: restraining
- *Sandipana*: stimulation or kindling
- *Gaganabhaksana*: consumption of essence of mica
- *Carana*: amalgamation
- *Garbhadrutī*: liquefaction (internal)
- *Bahyadrutī*: liquefaction (external)
- *Jarana*: calcination
- *Ranjana*: dyeing
- *Sarana*: blending for transformation
- *Sankramana*: acquiring power of transformation or penetration



- *Vedhana*: transmutation
- *Sevana*: becoming fit for internal use

These were known as the *samaskaras*. Briefly the processes are as follows:

Svedana consists in streaming mercury with a number of vegetables and mineral substances; *mardana* involves rubbing the streamed mercury in a mortar with vegetable and acidic substances to remove some more impurities; in *murchanam* mercury is rubbed in a mortar with another set of vegetable substances, till it loses its own character and form; in *utthapana* the mercury is steamed again in alkalis, salts, the three myrobalans, alum, etc.; *patana* involves distillation (3 types: *urdhva*, *adab* and *tiyak*); *rodhana* involves mixing the distilled mercury with saline water in a closed pot; in *niyamana* the process is continued by streaming mercury for 3 days with a number of plant products, alum borax, etc.; *sandipana* involves steaming with alum, black pepper, sour gruel, some alkalis and some plant substances; *ganganagrasa* involves fixation of the desired degree of the essence of mica for its consumption; in *carana* mercury is boiled with sour gruel and leaves of some specific cereal plants, alum etc.; *garbhardrti* involves treating mercury with other metallic substances; in *bahyadrti* the essences of the minerals or metallic substances are utilized in the molten or liquid state; *jarana* involves heating mercury with the desired minerals or metals, alkalis and salts; *ranjana* involves colouring by a complex process; in *sarana* mercury is digested with gold, silver etc. in an oil base; *kramana* requires smearing mercury with a number of plant extracts, mineral substances, human milk etc. and then heating them; *vedhana* consists in rubbing the treated mercury with oil and a few other materials so that it acquires the power of transmutation; and finally *sarayoga* it is available for internal use.

In India, vermilion or cinnabar i.e. mercuric sulphide has had great ritual significance, typically having been used to make the red bindi or dot on the forehead usually associated with Hinduism. Ingeniously in ancient Chinese tombs cinnabar was used successfully as a preservative to keep fine silks intact. Mercury was also at the heart many alchemical transmutation experiments in the middle ages in Europe as well as in Indian alchemical texts, which were precursors to the development of chemistry.³

What is Parad?

Parad is regarded as the sperm (seed) of Lord Shiva and in Ayurveda it as a flowing metalloid (fluid metal). Ancient Vedas has considered Parad as the most pure and auspicious metal, which not only has religious importance but medical importance too. Parad is the combination of mercury and silver, where silver is used to solidify mercury Parad Shivling, Parad Beads, Idols of Parad Ganesh, Parad lakshmi are considered very sacred and is believed to give 100 times more benefit than the puja of any other idol. It is used for worship of God in Indian traditions and customs and worship of Parad Shivling is supposed to destroy the sins.

³ Metallurgical Heritage of India- S. Srinivasan and S. Ranganathan, *Department of Metallurgy, Indian Institute of Science, Bangalore*



Fig: Parad Shivling

It is said in Brahma Purana that he who worships parad idols devotedly, whether one is male or female, Brahmin, Kshatriya, Vaishya or Shudra gets full worldly pleasures, and at last attains supreme destination (salvation). During life span they get glory, honour, high office, name and fame, sons, grandsons and learning.

Various Products of Parad

Mercury parad is said to be very holy and various idols and shivalingams made of parad are worshipped in India.

1. **Shivling:** It is said that worship of parad shivling destroys sins and punyas arise whereby one is enabled to be free from sorrows and strives diseases and calamities. Dedicated worship of parad shivling takes one toward divinity and spirituality. It is said in Brahma Purana that he who worships Mercury Shivling devotedly, whether one is male or female, Brahmin, Kshatriya, Vaishya or Shudra gets full wordly pleasures, and at last attains supreme destination (salvation). During life span they get glory, honour, high office, name and fame, sons, grandsons and learning.

2. **Amrit Cup:** Besides it is recommended to drink the milk in parad amrit cup as it purifies the human body. It gives the good health, prevention of diseases, control asthma, diabetes etc. Parad Amrit Cups are prepared by Ayurvedic methods as written in ancient scriptures and is 99% pure mercury and rare herbs. Amrit cups make a person free from diseases. It not only increases the energy levels but also improves the vitality. Mercury Amrit cup and beads can cure all kinds of diseases. It makes the physical body powerful, agile and lustrous. Solid Mercury ball should be dipped 4 times only in 200 ml of raw milk and then it should be taken before the night sleep. In order to get rid of all diseases, the aforesaid milk should be continuously taken for a minimum of 41 days and maximum 3 months without any break.

3. **Beads:** Parad in the form of beads is also very powerful cure of diabetes, blood pressure and heart diseases. The bead or rosary of parad beads shall be worn around the neck or waist. The solid Mercury i.e parad ball or balls shall be threaded and be worn around the neck in the form of locket to get protection from evil sprits. It is the most effective method to keep evil sprits away. It is always recommended that every house shall keep the solid Mercury figurine of God to keep all evil eyes



away from them. If one has continuous pain on the surface of the body, the mercury ball should be fixed on that portion during night sleep or daytime with an adhesive plaster so that the affected body skin touches the ball. The ball should be kept on the body-skin until the pain is completely cured. The mercury ball should be kept in pure Ghee or oil for 24 hours and it should be massaged on any part of the body for the cure of pain. The Ghee or oil must be cool. For digestive problems, constipation, gas in stomach, headache etc the Mercury ball should be kept at the naval point for 15-20 minutes daily for recovery.

The various benefits of parad promoted by websites are:

- Vaastu Dosh Nivaran (Removal)
- Tanrik dosh Nivaran (Removal)
- Cure of all diseases
- Cure from Evil Sprits
- Awakening of Kundlnis
- Increase the will power
- Nigh Mares
- Marraige Problems

About Parad Shivaling

The Gods, who frequently took a beating in the hands of the Rakshasas (demons), went to Lord Brahma for a lasting solution. Lord Brahma told them that only a warrior born out of Shaktipunj (semen of Lord Shiva) could lead the Gods to victory. The Gods prayed Lord Shiva who agreed and approached Goddess Parvati to conceive a son. The Gods sent Agni, the God of fire, in the form of a pigeon to observe the great event. Lord Shiva found this out and released His semen in the fire of Agni. Even the God of fire couldn't bear the heat of Lord Shiva's reproductive force and dropped it in the holy waters of river Ganges. Mother Ganges also couldn't stand the heat and released it on Earth. After being sanctified by the holy fire and sacred waters of Ganges it became Mercury or Para - the only metal in liquid form. The solid form of mercury is popularly known as Parad.

Solidifying mercury is an ancient Vedic science. 'Dharnidhar Samhita' has given sixteen steps through which the liquid mercury has to pass to make it pure & beneficial. Then mercury can be molded into any solid form.

A number of vedic references point out to the holistic benefits of Parad Shivaling. 'Shivnirnaya ratnakara' states that there's no better Shivaling ever made than the one made out of mercury. In 'Sarvadarshana Sangraha', Lord Shiva says to Goddess Parvati that anyone who worships the Linga made out of solid mercury will face no death, disease or dearth. Its mentioned in 'Rudrasamhita' that Parad Shivalinga embodies the power of Lord Shiva & one can attain anything desired through its worship. 'Rasarnaavtantra' states that one can receive a billion-times more good blessings through the worship of a Parad Shivalinga than that one can receive through worship of a billion ordinary stone Shivalinga. 'Rasratnakar' says worship of a Parad Shivaling showers one oneself a happy long-life, wealth, health, power, beauty & youth. 'Rasratnakara' also mentions that whatever a devotee spends on acquiring a Parad Shivaling, Lord Shiva blesses him a lot more in terms of wealth, grain & peace. 'Shivnirnaya ratnakara' says that a gold Shivaling is billion times more powerful than a ordinary stone one, a gem Shivaling is billion times more potent than a gold one, but a Parad Shivaling is billion times more effective than a gem one & can bestow immense benefits to its worshipper even through a simple darshan (sight).

Maharishi Vashist suggests a Parad Shivaling for attainment of peace & harmony to anyone who's sinned in his entire life. Maharishi Yadnyavalkya says that one can't understand why man is full of sorrow, violence & poverty, when one can achieve peace & harmony through the worship of Parad Shivaling.

Thus there are various idols made from parad are worshiped and are available in the market. The most common form of idol worshipped in India is the Shivling made from Parad. In India, besides being sold in the markets there are several huge Shivlings have been established in the temples for worshipping of common people. One such shivlinga was established in a temple in ashram in Ujjain.

Parad Shivaling at Siddha Ashram

The ashram is situated on the banks of River Shipra in the holy city of Ujjain. The founder and head of ashram is Swami Nardananand Paramahansa Maharaj. The ashram is basically a meditation center where the focus of the sadhana (spiritual practices) taught by the Swami is Kundalini Shaktipat Yoga Meditation, including practices of Yoga, Vedanta and Tantra.



Fig: Parad Shivling at Siddha Ashram in Ujjain

The ashram has a temple in its compound, in which a large Shivaling weighing about 1500 kilograms made from Parad was established last year during the mela. The parad shivling is said to be one of the largest in the world. The temple in the ashram is thus known as “Shri Paradeshwar Mahadev”. It is said that the “the opportunity to have darshan, the touch and worship of this Parad Shivaling is accredited to one's holy and good deeds done in the previous and present life”.



Swami Dr Nardanand Paramahansa Maharaj manufactured the parad shivling locally in the ashram. “Sawamiji Nardanandji is one of the pioneers in making parad shivlinga in India”, says Swami Pramanandji Maharaj. He adds, “Parad shivling processing is based on Vedas is clearly cast on a mould based on Vedas. Silver is added in mercury to stabilise it thus making Parad” He also added that, “Only swamiji knows the exact process and the required proportion of mercury and silver used in making of the shivling”.

“The required mercury for the making of this shivling was procured locally from Ujjain as well as from Delhi, Mumbai. Some of Maharaja’s disciples from US and Europe have also helped in procuring mercury for the making of parad shivling,” says, Swami Parmananad

It was interesting to note that at a given time you can find around 50-100 kg of virgin mercury in the markets of small town like Ujjain because the thriving ayurvedic medicines manufacturing industry, which uses mercury in making of medicines and “bhasms”.

Besides the big 1500 kg parad shivling there is also one small parad shivling weighing 51 kg present in the basement, which is a study room of Swamiji.

Swamiji was also aware of the fact that mercury is a toxic metal and is a neurotoxin. He told me that mercury and its vapours when burned damages your brain. Thus mercury is made toxics free before using it to making of ‘bhasm’ or other medicines. He said that making mercury poison less is a challenge. This purification process of mercury makes it pure and non-toxic and makes it a stable element on fire also.

When asked that parad shivlings being sold in shops and internet, are they pure or good to use? He retorted that a method of identification of pure parad is to put a “gold wark” will be absorbed by parad in 10 seconds to a minute time.

He said according to Vedas there are four types of mercury; white, yellow, blue, black which is loosely based on the Varna system. He said that white mercury is the purest one. In Hindu scriptures parad (mercury) is regarded as the best of all metals.

Parad finds also mentioned in “Rasendra Puran”, thus parad is the best of all the metals and jewels and a lingam of Lord Shiva made of the best of all the metals should without doubt defy any parallel. Siddha Ashram provides a purposeful opportunity to have a darshan, a touch and worship of Parad Shivaling.

All the metals and sub-metals found in the world are sending out their waves. Parad (mercury) is a metal too and sends out its waves likewise. As parad is the unstable among all metals, similarly man's mind is the most wavering too. Both are closely related. When destroying its unsteadiness stabilizes parad, its waves will solidify. This process causes effect on the mind. If one meditates beside a parad Shivaling, the mind naturally gets concentrated. Therefore, a compact form of parad is of great significance because it is extremely helpful in enhancing the faculties for concentration.

Besides Ujjain there are also some important places where parad shivlings are established:

1. Sadhanadham Ashram, Parbhani: Located in Maharashtra this ashram has established a parad shivling weighing 250 kg.
2. Harihar Ashram, Kankhal (Haridwar): located in Haridwar in the state of Uttaranchal where a 150 kg parad shivling is established.



3. Ashrams of Delhi: there are also 5 kg parad shivlings, established in Delhi.
4. Interestingly there is also 1500 kg parad shivling in United States on the banks of River Hudson.

“The temple the first one of its kind in India, as it has a large Shivaling consisting of 1500 kilograms of Parad (mercury), the largest in the world. The opportunity to touch and worship Parad Shivaling is accredited to one's holy and good deeds done in the previous and present life,” says the Seer of Siddha Ashram, Ujjain, India.

In Hindu scriptures parad (mercury) is regarded as the best of all metals. The following is the purport of a sloka from Rasyog Chintamani:

Sphatik is better than paashan, padmaraaj than sphatik, Kashmir jewel, pushparaaj, i.e., lahasunia than Kashmir jewel, panna than lahasunia, neelam than panna, godanti or gomed, mauktik than vidrum, silver than diamond, gold than silver, diamond than gold and parad (mercury) is yet better than diamond.

Thus parad is the best of all the metals and jewels and a lingam of Lord Shiva made of the best of all the metals should without doubt defy any parallel. Siddha Ashram will provide you a purposeful opportunity to have a darshan, a touch and worship of Shri Paradeshwar Mahadev told by the Seer at Siddha Ashram.⁴

The Composition of Parad

The chemical composition of Parad is given in following table:

Chemical Composition of Parad (% by weight)		
Sl. No	Elements	Result
1	Tin	74.8
2	Mercury	24.9
3	Zinc	Less than 0.01
4	Antimony	Less than 0.01
5	Silver	0.04
6	Iron	0.03
7	Nickel	Less than 0.01
8	Aluminium	Less than 0.01
9	Molybdenum	0.03
10	Vanadium	Less than 0.01

It is evident from the above observation that Parad is essentially an amalgam of Tin and Mercury with some other metals in varying proportion. Mercury in Parad is found in high concentration. But as claimed by various sellers that it is a pure form of mercury with a mixture of silver found to be wrong. It is largely Tin and only 25 percent of it is Mercury.

Leaching behaviour of Parad in water and milk.

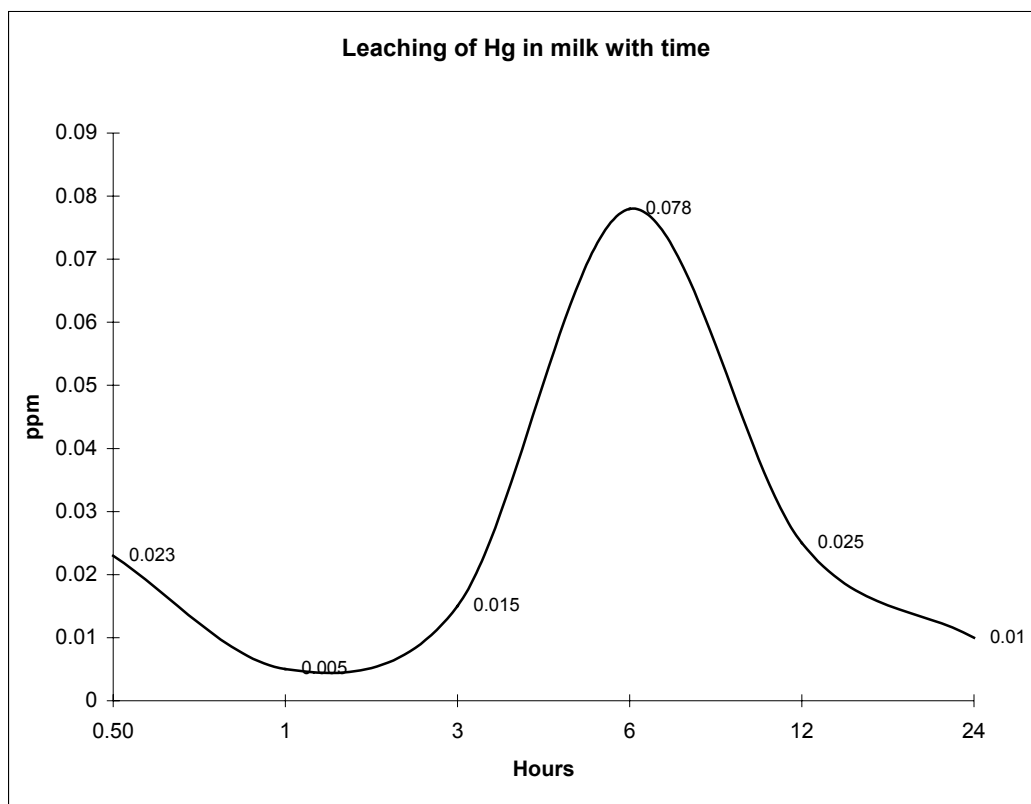
Parad was kept in milk and water for varying duration to determine the leaching behaviour of mercury. The experimental findings are given in following table.

⁴ Field visit and interaction held in Siddha Ashram, Ujjain in 25th October 2005.



Concentration of Hg in milk after parad was k in it for varying duration		
Time	Concentration (ppm)	pH
½ Hour	0.023	7.02
1 Hour	0.005	7.05
3 Hour	0.015	7.24
6 Hour	0.078	6.80
12 Hour	0.025	6.94
24 Hour	0.010	7.01

Concentration of Hg in water after parad was k in it for varying duration	
Time	Concentration (ppm)
1 Hour	Less than 0.01
14 Days	6.69



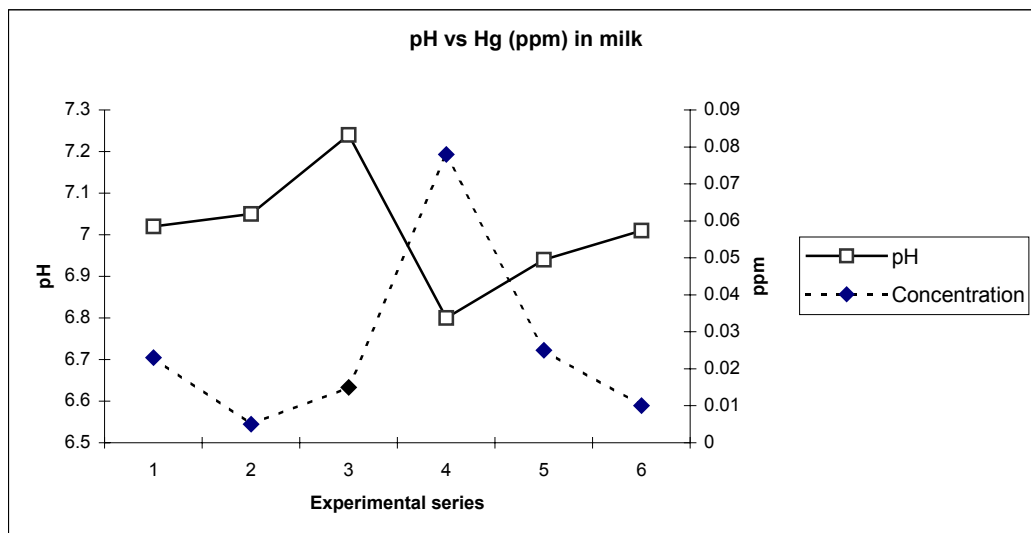


Fig: Leaching of mercury

Discussion on Leaching behaviour of Hg in milk

1. Mercury leaches out from parad into milk.
2. Leaching of mercury in milk seems to be dependent upon pH. When pH increases leaching decreases and vice-versa. The maximum concentration of Hg in milk is found when pH is lowest after 6 hrs.
3. The pH of milk changes with time because lactose in milk gets converted into lactic acid.
4. Concentration of Hg in milk after 1 hr is less than that of after first half an hour. It may be due to surface leaching of Hg from parad. Leaching picks up only after acidity of the medium starts increasing.

Health effects of mercury

Mercury is extremely dangerous neurotoxin and causes severe health problems for human and wildlife. Once mercury is airborne it falls in precipitation and contaminates



Lakes, rivers and other water bodies. Fish absorbs Mercury where it accumulates in their body tissue. To date, the recorded health effects of mercury poisoning include impaired memory, delayed development, reflex abnormalities, lung, kidney and liver damage, and even cerebral palsy, the effects of mercury exposure are most grave for developing fetuses and nursing infants.

Most effects of mercury exposure develop slowly over time. Symptoms usually occur only after repeated overexposure. These effects include insomnia, loss of appetite, nausea, weakness, and muscle tremors. Brief exposures to very high levels of mercury vapors can affect the lungs.

Typical health Problem of Mercury

Nervous System: Long-term overexposure to mercury vapors can cause a number of symptoms. The first symptoms may be loss of appetite, fatigue, insomnia, and changes in behavior or personality (nervousness, excitability, and shyness). Later, more serious symptoms may include nausea, abdominal cramps, diarrhea, weight loss, weakness, and muscle tremors. Some of these symptoms have been reported after years of exposure to mercury at air levels slightly above the legal limits (see "Legal Exposure Limits"). When overexposure stops, these symptoms will usually go away.

Severe mercury poisoning can permanently damage the nervous system. Such damage may be accompanied by hallucinations, whole-body tremors, a tingling "pins and needles" sensation, pain, tenderness, numbness, and weakness. An interesting note is the past use of mercury in felt production. Felt hat manufacturers suffered from many symptoms of high-level mercury exposure, as witnessed in the Mad Hatter character in *Alice in Wonderland*, and the popular phrase "mad as a hatter."

Kidney: Long-term overexposure to mercury can injure the kidneys. In most cases, this damage is reversible and kidney function will gradually recover once exposure is stopped. No obvious symptoms are associated with kidney damage, unless the injury is severe. Special urine tests are used to detect this kidney damage (see "Tests for Exposure and Medical Effects"). Generally you will not have kidney damage if you do not have other symptoms of chronic mercury overexposure.

Lungs: Inhalation of very high levels of mercury vapors can affect the lungs, causing coughing, chest tightness and pain, difficulty in breathing, and pulmonary edema (fluid in the lungs). Fever, chills, nausea, and vomiting may also occur. If you develop these symptoms after an exposure to mercury, see your physician immediately.

Eyes, Nose, and Throat: Long-term mercury overexposure can cause increased salivation and inflammation of the mouth and gums. Repeated exposure to mercury vapors may also discolor the lenses of your eyes. This discoloration (usually brown) is a sign of mercury overexposure. It can occur with or without other symptoms of overexposure.

Skin: Prolonged skin contact with liquid mercury can irritate the skin and cause a rash that allows increased absorption through the skin.

Cancer: There is little reason to think that mercury could cause cancer, although that possibility has not been studied.

Reproductive System: The effects of metallic mercury on pregnancy and reproduction have not been studied thoroughly. When metallic mercury vapor is absorbed into your body, some of it is



changed into another form, inorganic mercury. In limited studies, exposure of pregnant animals to moderate levels of either metallic or inorganic mercury caused growth retardation, birth defects, and death of the fetus or of the offspring shortly after birth. In another study, exposure of male animals to inorganic mercury reduced their fertility.

Impacts of these practices to use mercury:

Use of elemental mercury in certain cultural and religious practices can cause high exposures to mercury vapour and produce indoor air mercury concentrations one or two orders of magnitude above occupational exposure limits. Exposures resulting from other uses, such as infrequent use of a small bead of mercury, could be well below currently recognized risk levels.

Though mercury users are aware that mercury is hazardous, but are not aware of the inhalation exposure risk. The wholesale sources of elemental mercury remain difficult to discern. As the sale of mercury is not regulated in this country (although the labelling is), it could come from a number of sources.

As a result of the practices, living spaces may become contaminated with mercury. Removal of elemental mercury from floorboards and carpets is difficult. These mercury practices can be a direct source of contamination not only in the users, but also in their families, people living in adjacent apartments, and any future residents of the premises. The potential liability to present and future landlords is significant, because current and prospective homeowners may raise concerns about health risks related to prior mercury use on the premises.

In addition, much of the mercury used in folk medicine and religious practice may be disposed of improperly. Most of times mercury has been thrown in the garbage or flushed it down the drain or thrown outdoors.

Conclusion and Recommendations

The thought of carrying out this study occurred after the news of establishing of largest Parad shivling at Ujjain. The further investigation on parad revealed that Parad is marketed through TV Sky shop and Websites through out the country. The study without touching anyone sentiments and culture tried to reveal the facts about mercury in parad and possible danger it may cause to the environment and human beings due to its instability and leaching behaviour.

The study is not a one point raising of the issue rather it recommends for the further study to find the unrestricted use and source of supply of the mercury for such type of manufacturing. The occupational hazards to the people who are involved in the making of these artifacts.

The mercury release in the environment and its possible exposure to human beings from these unknown sources needs to be further tested and the authorities in the country should take up strong measures.

A parallel effort to educate the community and awareness generation is key for the people to understand the toxic facts about the mercury.



D. Generating Trade related data

The mercury available on the world market is supplied from a number of different sources, including (not listed in order of importance):

- Mine production of primary mercury (meaning extracted from ores within the earth's crust):
 - either as the main product of the mining activity,
 - or as by-product of mining or refining of other metals (such as zinc, gold, silver) or minerals;
- Recovered primary mercury from refining of natural gas (actually a by-product, when marketed, however, is not marketed in all countries);
- Reprocessing or secondary mining of historic mine tailings containing mercury;
- Recycled mercury recovered from spent products and waste from industrial production processes. Large amounts ("reservoirs") of mercury are "stored" in society within products still in use and "on the users' shelves";
- Mercury from government reserve stocks, or inventories;
- Private stocks (such as mercury in use in chlor alkali and other industries), some of which may later be returned to the market.

The mining and other mineral extraction of primary mercury constitute the human mobilisation of mercury for intentional use in products and processes. Recycled mercury and mercury from stocks can be regarded as an anthropogenic re-mobilisation of mercury previously extracted from the Earth.

Despite a decline in global mercury consumption (global demand is less than half of 1980 levels), supply from competing sources and low prices, production of mercury from mining is still occurring in a number of countries. Spain, China, Kyrgyzstan and Algeria have dominated this activity in recent years, and several of the mines are state-owned. Although Spain have stopped the mining and exporting only the stored ready mercury. The table below gives information on recorded global primary production of mercury since 1981. There are also reports of small-scale, artisanal mining of mercury in China, Russia (Siberia), Outer Mongolia, Peru, and Mexico. It is likely that this production serves robust local demand for mercury, often for artisanal mining of gold – whether legal or illegal. Such mercury production would require both accessible mercury ores and low-cost labor in order for it to occur despite low-priced mercury available in the global commodity market.

Period	1981-85	1986-89	1990-95	1996	1997	1998	1999	2000
Recorded annual, global primary production (in MT)	5500-7100	4900-6700	3300-6100	2600-2800	2500-2900	2000-2800	2100-2200	1800



Source: Global Mercury Assessment, Summary of the report

It is difficult to get a detailed picture of global mercury flows because of its varied usage. Earlier the largest consumers were the industrialised countries of the OECD family, but lately the 'eastward' shift observed in last two decades due to phase out of industries using mercury in industrialised countries and to the growing habit of shifting these industries to developing countries. Mercury is not mined in India and is totally imported.

India's Trade Policy: The Foreign Trade (Development and Regulation) Act, 1992 has made mercury and its various forms (chloride, oxide and sulphide) freely importable to India.

Despite mercury's toxicity and related-hazards, the EXIM Policy has licensed mercury as a free product for imports and "Items which do not require any license under the export and import policy have been denoted as 'free' subject to licensing notes". Though mercury can be freely imported in India, its wastes and compounds are included in the waste streams of "The Basel Convention on trans-boundary movements of hazardous waste and their disposal". Mercury compounds are also included as hazardous and toxic chemicals in "The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989".

Mercury and its various compounds are all 'free' for import to India. Import of other mercury compounds included as hazardous waste in the Hazardous Waste Rules, is permitted against a license and only for the purpose of processing and reuse.

Mercury and its various forms licensed as free for import are:

Exim Code	Articles/item/goods	Policy	Duty
280540 00	Mercury	Free	67.086
282739 01	Mercuric chloride	Free	67.086
282739 05	Mercurous chloride	Free	67.086
282590 04	Mercury oxide (mercuric oxide)	Free	67.086
283329 02	Mercuric sulphates	Free	67.086

- *"Exim code 280540 00 includes quicksilver (as mercury) vide policy circular No.49 (RE-99)/97-02 dated 20.1.2000.*

Along with mercury, other mercury-based products, items or goods can also be freely imported. These are:

Exim Code	Item/goods	Policy	Duty
902511 00	Thermometers (all types)	Free	53.816
853932 00	Mercury or sodium vapour lamps, metal halide lamps	Free	67.086
853939 01	Mercury vapour lamps	Free	67.086
300640 00	Dental fillings	Free	67.086

Since mercury is used in manufacturing of variety of products in India, it is difficult to monitor the total usage of mercury in India.



Mercury oxide and some mercury-based products have been mentioned as free to import under the conditions that the listed items/goods are in new/prime condition and that they originate from SAARC countries (South Asian Association for Regional Co-operation), in accordance with the Customs Tariff (Determination of origin of goods under the agreement on SAARC Preferential Trading Arrangement) Rules, 1995.

The mercury goods/items included in the list to be free for import are:

Exim Code	Item/Goods	Used
850630 00	Mercuric oxide	Battery Industry
853932 00	Mercury or sodium vapour lamps, metal halide lamps	Lighting purposes
853939 01	Mercury vapour lamps	Lighting purposes

Trade In Mercury

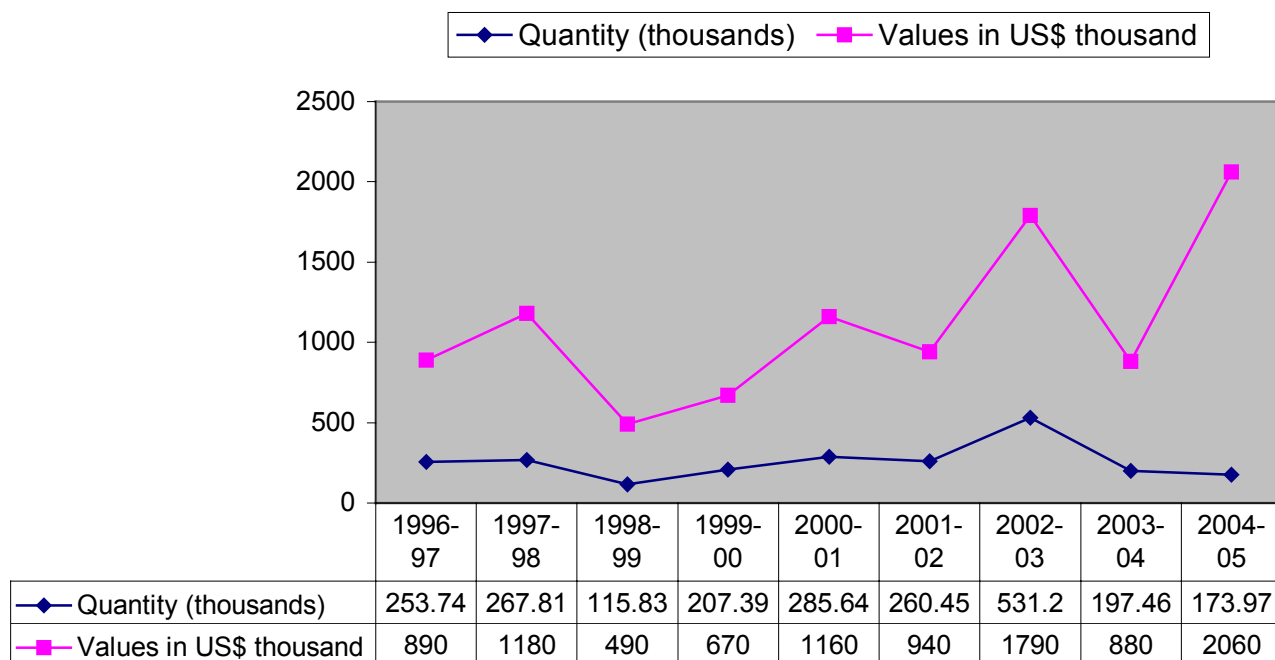
Import of Mercury: In India mercury is a demand driven commodity, and its import depends on the demand in the country. It is used in variety of manufacturing processes, industries, institutes, research laboratories, schools, colleges, etc.

Over the years, India had multiple mercury trading partners as they kept on changing from time to time. The important mercury exporters to India are the United States, UK, Spain, Russia, Netherlands, Finland and Algeria.

The import figures as well as the rates vary from one country to another one, sometimes the rate or value of mercury also varies from country to country on a monthly basis. It shows how unpredictable is mercury trade.

The import data of mercury for the decade does not follow a smooth trend, as shown in the graph below. The quantity of mercury imported has fallen from 603 tonnes in 1993-94 to as low as 125 tonnes in 1998-99. The demand pattern of mercury in the manufacturing sector is clearly influencing the import pattern over the years.

Import of Mercury in India



(Source: <http://commerce.nic.in/eidb/Icoment.asp>)

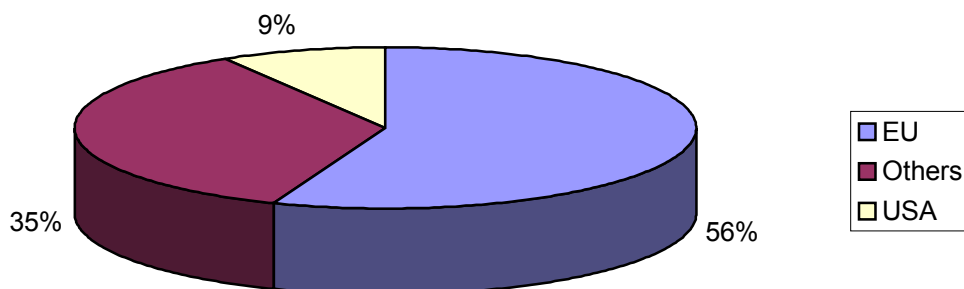
The figure shows that the import of mercury is not constant but very fluctuating. This reflects the fluctuating demand pattern of mercury in India.

The detailed data also suggests that from year 1996 to 2004, India imported about 2293.43 tonnes of mercury worth 10060 thousand USD. Of the 2293 tonnes of mercury imported in India, the European Union is the biggest supplier with 1282.21 tonnes of mercury contributing 56 per cent of total mercury import. In Europe, Spain alone contributed 683.28 tonnes of mercury i.e. 53 percent to total mercury exported from EU to India, as it is the only mercury mining country in the world. Spain contributes 30 percent of the total mercury imports to India. On the other hand UK exported 182.52 tonnes of mercury to India i.e. 15 percent of total mercury exported from EU to India.

Besides Europe, United States is also major exporter of mercury to India contributing about 198.87 tonnes. Other importing countries exporting mercury to India are Algeria, Russia, China, etc.



Share of Mercury Import to India (1996-2004)



The table below shows the quantities of mercury imported by the major consumers for 1999-2000 and 2000-2001

Importer's Name	Quantity (2000-01)	Quantity (1999-00)
Champa Purie-Chem Industries Ltd	6,900 kg	3,450 kg
DCW Ltd	60 nos.	--
Enkay Associates	1,622 kg	--
GE Lighting India Ltd	25 Pc	50 nos.
Indian Dyestuff Industries Ltd	50 kg	1,725 kg
Indian Dyestuff Industries Ltd	50 nos.	--
Major Metals Ltd	47,334 kg	--
Major Metals Ltd	954 nos.	--
Shriram Alkalies & Chemical Industries Ltd	8,493 kg	--
Surya Roshni Ltd	1,725 kg	3,450 kg
Beri Merurio Ltd		16,380 kg
Excel Industries Ltd		3,174 kg
Goa Instrument Industries Ltd		6 nos.
HBR Sales P Ltd		1,000 kg
L S Chemicals & Pharmaceuticals		500 nos.
Mehta Flint		2,000 kg
Shriram Vinyl & Chemical Industries Ltd		1,725 kg
Lalwani Industries Ltd		2,000 kg

(Source: Minerals and Metals Review, 2000)

The import data above shows that, the chlor-alkali industry is the biggest consumer of mercury in India in the manufacturing sector followed by the lighting industry and the instrument manufacturing industry. Besides this industries there are some traders also importing mercury in India to sell in the local market.



Export of Mercury: Although India imports mercury to meet its domestic needs, but sometimes there is re-export also been observed. India has exported mercury to country like Sri Lanka.

It is very difficult to ascertain the reason behind export of mercury in a small quantity. The only logic behind these exports could be profit.

The data in the table below shows that exporting mercury has been a regular phenomenon for the last two years:

Export of Mercury from India

Years	Quantity (kg)	Value (Rs)
1999-00	35 837	2 502 254
2000-01	359 534	31 179 773

(Source: Monthly Statistics of the Foreign Trade in India, Annual No (Exports), 1990-2000)

Trade In Mercury Compound: Along with import of mercury, its various compounds are also imported in India. Mercury compounds such as mercury oxide, mercuric chloride and mercuric sulphide are also imported as well as exported from India. These compounds also have wide industrial usage in India.

Import of Mercury Compounds

Years	Mercury Oxide		Mercuric Chloride	
	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
1996-97	21 435	2 634 356	600	1 011 020
1997-98	---	---	60	64 204
1998-99	2 725	1 300 019	22 225	3 317 458
1999-00	2 041	268 900	16 876	2 563 937

(Source: Monthly Statistics of the Foreign Trade in India, Annual No (Imports), 1990-2000.)

The import data for both mercury oxide and mercuric chloride do not show any pattern. There is no trend for their import over the years. Only 60 kg mercuric chloride was imported in 1997-98, but in 1998-99, the import of mercuric chloride was to the tune of 22,225 kg. The story is the same for mercury oxide: 21,435 kg were imported in 1996-97, dropping to 2,041 kg in 1999-2000.

Export of Mercury Compounds

Years	Mercuric Chloride		Mercury oxide		Mercurous Chloride	
	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
1996-97	6620	1811201	---	---	---	---
1997-98	3350	1277674	---	---	---	---
1998-99	3900	741935	---	---	---	---
1999-2000	54602	27146132	---	---	20630	691660
2000-2001	74416	4942059	11000	6110120	2400	420082

(Source: Monthly Statistics of the Foreign Trade in India, Annual No (Exports), 1990-2000.)

The export data for mercuric chloride does not show any pattern either. There is no trend for its import over the years. In 1996-97, 6, 620 kg of mercuric chloride were exported but the next year it dropped to 3,350 kg.



Trade of mercury based products: A number of mercury-based products are traded (imported and exported) in the country. These products, such as fluorescent lamps, mercury vapour lamps, batteries, thermometers etc. They represent a big market. Industries related to these products command a presence in the international market because of these products and their trading pattern in the international market. The wide trading pattern and usage of these products underline the importance of mercury and its compounds as raw materials.

Import of Mercury-Based Products: Some major articles imported by India, which use mercury or mercury compounds as raw materials, are:

- Primary cells and batteries of mercuric oxide.
- Fluorescent, hot cathode discharge lamps.
- Mercury or sodium vapour lamps, metal halide lamps.
- Blood pressure instruments (sphygmomanometers).
- Clinical thermometers.

These products though made in India are also imported to meet the wide Indian consumption pattern.

Import of Mercury-based Products

Years	Quantity (in numbers)				
	Primary Cell (mercury oxide)	Fluorescent lamps	Mercury vapour lamps	Sphygmoman ometers	Clinical thermometers
1996-97	1 170	405 885	2 126	10	670 283
1997-98	70	1 228 210	32 114	5 780	308 808
1998-99	7	4 520 184	34 038	2 541	431 322
1999-00	NA	9 692 561	115 487	170	338 990

(Source: Monthly Statistics of the Foreign Trade in India, Annual no (Imports), 1996-2000.)

Primary cells were widely imported, in 1996-97, but this figure dropped down to a mere seven in 1998-99. While there is a steady increase in the import of fluorescent and mercury vapour lamps, only ten blood pressure monitoring instruments were imported in 1996-97, and this figure jumped to 5,780 the next year. Clinical thermometers are also imported in very unpredictable patterns, from about 600 thousand in 1996-97 to around 300 thousand in 1999-2000.

Export of Mercury-Based Products: Some of the major articles exported by India, which use mercury or mercury compounds as raw materials, are:

- Primary cell and batteries of mercuric oxide
- Fluorescent, hot cathode discharge lamps
- Mercury or sodium vapour lamps, metal halide lamps
- Blood pressure instruments (sphygmomanometers)
- Clinical thermometers



Beside these products, chlorine and caustic soda also have a great export potential for India. However, it is difficult to estimate the amount of chlorine and caustic soda (produced from mercury cell technology) that is exported. There is no break-up for this category in the export data.

Export of Mercury-based Products

Years	Quantity (in numbers)				
	Primary cell (mercury oxide)	Fluorescent lamps	Mercury vapour lamps	Sphygmoma nometers	Clinical thermometers
1996-97	00	3 569 477	235 849	1 958	4 497 326
1997-98	2 104 100	2 312 740	166 680	22 786	1 873 458
1998-99	1 030 000	1 313 505	91 165	00	6 057 029
1999-00	200 172	9 692 561	NA	NA	3 799 636

(Source: Monthly Statistics of the Foreign Trade in India, Annual No (Exports), 1996-2000.)

Nearly 2 million primary cells were exported in 1996-97 and this figure dropped to 200 thousand in 1999-2000. There was an increase in the export of fluorescent lamps and a prominent decrease in the export of mercury vapour lamps. Blood pressure monitoring instruments are also exported in a very unpredictable manner and it is not different for clinical thermometers also as 6 million were exported in 1998-99, and this number dropped to 3.7 million in 1999-2000.

The export pattern of these products doesn't show any pattern or trend. The data we receive is not static and thus it's very difficult to establish the trend. As we all know that import and export of such products are based on demand, thus as there will be the trend in the demand, there will be same trend in the exports.



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IMPORT OF MERCURY

In 000'kg

Countries	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05
Algeria	4.00	14.63		3.45		1.73	134.62	89.74	5.91
Australia					18.04	17.53			
Belgium		36.36			0.230				
Canada									24.15
Chile									
Chinese Taipei					3.00				
China				5.17		18.00	6.18		
Croatia									11.21
Denmark									
Finland	17.25	23.29	10.32						
France					0.004				0.05
Germany	0.828	1.72		0.600	3.00	1.89	6.87	1.80	4.11
Hong Kong									
Indonesia		11.75							
Italy		24.00	13.22				134.31	4.20	
Japan							0.01	17.25	21.37
Kyrgyzstan		1.725							
Macedonia								18.02	
Mauritius					10.00				
Morocco		8.50	9.00						
Netherlands	7.00	20.31	5.48	6.83	13.18		26.35	11.54	1.35



Norway									
Poland	0.207								
Russia	171.67	6.96	22.89	38.13	12.90		14.69	0.60	
Singapore			0.036		0.850				
Slovak Republic				4.00					
Slovenia									0.91
Spain	189.93	54.48	29.12	19.70	80.77	33.17	180.65	13.37	82.09
South Africa		24.15			7.00				
Sweden	1.00								
Switzerland	0.010								
Thailand									0.03
Turkey									
UAE							25.50		6.00
UK	1.90	17.25	34.50	11.21	79.14		2.02	35.50	1.00
Ukraine			0.260						
USA		22.66		118.29	23.66			18.26	15.74
Venezuela	30.88								
Total	424.675	267.785	124.826	207.38	251.774	72.32	531.2	210.28	173.92



Summary

It can be concluded that the mercury trade is a demand driven trade in India and sometimes very difficult to understand the fluctuation in demand. Products, not manufactured in India are imported from developed countries but later re-exported to developing countries probably for better profit margins. Often goods and products made in India are also imported and re-exported.

But the main findings from this trade data analysis suggest that the country lack any kind of inventerisation of mercury import. The elemental mercury and mercury compound is listed as free to import commodities by this we mean any body in the country can import mercury for what ever use as there is no restriction on its use.

India needs a strong regulation on mercury import and use. The current trade policy doesnot adequately

E. Participating with EEB for work on EU mercury policy

Letter to EU embassies

A letter of support for the EU ban on export of mercury to country like India was sent to the all the major European embassies and offices in India. Recognizing the fact that Europe contributes to more than half of the total import of mercury in India.

The letter highlighted this fact and urged the respective countries to garner support in the important Environmental Council Decision, foreseen for 24th June 2005, with respect to the Community Strategy on Mercury, as presented by the European Commission in January 2005.

As we felt that the proposed ban of EU mercury exports should be implemented as soon as possible, preferably by 2008 as originally proposed in earlier Commission drafts but also by the Luxemburg Presidency, but certainly not later than 2011.

Mercury is toxic heavy metal with wide environment and health impacts with EU as the major exporter of mercury to India, where it is used in poorly controlled processes. Europe, on the other hand, has progressive and an aggressive mercury strategy and is spearheading active global mercury management policy. It is our understanding that the global mercury problem cannot be resolved without a demand reduction strategy in India, which needs a strict supply side control, since mercury releases from India will pollute both local as well as the global environment.



It is our humble submission that an EU export ban, coupled with other international actions as specified in the EU strategy document, will significantly reduce the disproportionate impacts of mercury exposure in India caused by abundant mercury supplies, inadequate resources to enforce existing regulations and virtually no incentive to upgrade outdated technologies. It is our sincere hope as Indian environmental groups that your country will support such a ban and strategy.

III. Parallel activities related to mercury

1. Toxics Link has released a detailed study report on usage of mercury in hospitals. Titled 'Lurking menace: Mercury in Health Care' This report covers disposal patterns, awareness of hazards related to mercury amongst the staff, particularly the nurses, government policies and international trends.
2. Conducted and implemented mercury reduction in four hospitals in Delhi.
3. Participated in South East Asia Conference on Alternatives to Mercury in Health Care in Jan 2006
4. Conducted training and awareness of Hospital and NGOs on mercury in different regions of India
5. Participated and presented paper in international conference of solid waste management at Kathmandu, Nepal
6. School awareness drive in Delhi
7. Published Various types of IEC material for dissemination

IV. Success and Future work

1. Formation of NGO forum to take the issue of mercury elimination forward (Annexure I.)
2. Letter to EU (Annexure II.)
3. Due to current awareness generation in past few years Delhi pollution control committee has come up with public notification on mercury (Annexure IV)
4. Four hospitals in Delhi started replacing mercury thermometer and prepared the guidelines for the mercury reduction from their facilities in a phased manner.
5. Policy initiative of replacing mercury from chlor-Alkali Industry by 2008
6. Presence of mercury in electrical and electronic sector still to be addressed.



Annexure I.

List of Network Partners

S. No	Name	Organization	Phone
1.	Khaidem Monindro	Center for Social Studies, Manipur	91-9873242212
2	Dr Anjana Pant	WWF India	91-11-51504812
3	Pranjal Jyoti Goswami	Centre for Environment and Communication	91-9313342762
4	Atanu Sarkar	Centre for Science & Environment	91-9899393422
5	Ms Nitu Sinha	Centre for Environment Education	91-11-26497049
6	MV Prajapati	OSHA	91-9327003467
7	Prakash Vaghela	OSHA	91-9824012121
8	Suneel Pandey	TERI	91-11-24682100
9	Ravi Agarwal	Toxics Link	91-11-24320711
10	Hiralal Jha	Banwasi Sewa Ashram, Govindpur	91-5447-295224
11	Dr. Anil Gautam	People's Science Institute, Dehradun	91-135-2762516
12	Dr. Ramesh Tripathi	People's Science Institute, Dehradun	91-135-2762516
13	Sasanka Dev	DISHA	91-9831291064
14	Ashok Kumar	JANHIT FOUNDATION	91-121-2763918
15	Alok Dangwal	VOICE	91-11-24319078
16	Bharati Chaturvedi	CHINTAN	91-11-24314478
17	Souparna Lahiri	Delhi Forum	91 11 26680883
18	T.K.RAMKUMAR	EXNORA INTERNATIONAL	91-9380659404
19	Jyoti Mhapsekar	Stree Mukti Sanghata	91-11-25297108



Annexure II

Copy of Letter to European union

To,

The Hon'ble Ambassador
Embassy of Belgium
New Delhi 110021

June 9, 2005

Sub: Support for European Union Ban on Mercury Exports

Dear Hon'ble Ambassador,

We are an environmental group working on issues related to waste and toxics since last eight years (details are enclosed). We also part of various international discussions forums and have participating actively in the process of Stockholm, Basel and Rotterdam Conventions. We have also been working closely with European Environment Bureau, and been contributing to various EU deliberations on mercury as a Southern Representative of the international Ban-Hg Working Group.

We also work in civil society networks and are spearheading Indian networks on mercury, food safety, hazardous wastes and asbestos. A coalition of civil society groups was formed on 5th of April 2005 to push for the demand reduction of mercury in India (details and resolution enclosed).

This is to garner support of your country in the important Environmental Council Decision, foreseen for 24th June 2005, with respect to the Community Strategy on Mercury, as presented by the European Commission in January 2005. From our information, different opinions exist amongst the various Council working group on environment on the proposed export ban on mercury, by 2011 at the latest. This letter is intended to explain the urgent need and justification for endorsing this very important measure.



We feel that the proposed ban of EU mercury exports should be implemented as soon as possible, preferably by 2008 as originally proposed in earlier Commission drafts but also by the Luxemburg Presidency, but certainly not later than 2011.

Mercury is toxic heavy metals wide environment and health impacts and the EU is the major exporter of mercury to India, where it is used in poorly controlled processes. Europe, on the other hand, has progressive and an aggressive mercury strategy and is spearheading active global mercury management policy. It is our understanding that the global mercury problem cannot be resolved without a demand reduction strategy in India, which needs a strict supply side control, since mercury releases from India will pollute both local as well as the global environment.

It is our humble submission that an EU export ban, coupled with other international actions as specified in the EU strategy document, will significantly reduce the disproportionate impacts of mercury exposure in India caused by abundant mercury supplies, inadequate resources to enforce existing regulations and virtually no incentive to upgrade outdated technologies. It is our sincere hope as Indian environmental groups that your country will support such a ban and strategy.

Thanking you

Yours sincerely

Ravi Agarwal



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Annexure III.

NATIONAL WORKSHOP ON “MANAGING THE DEMAND CYCLE OF MERCURY: INDIAN AND INTERNATIONAL PERSPECTIVES”

**GULMOHAR HALL, INDIA HABITAT CENTRE, NEW DELHI
APRIL 6-7, 2005**

Minutes of the workshop



INTRODUCTION

The dispersion of mercury into the environment is a major concern in the world today, especially in developing countries. Although mercury occurs naturally in the environment, human activities cause most mercury releases. In India, chlor-alkali plants are using mercury since 1936. Various reports indicate the levels of mercury in rivers; coastal waters, soil as well as the food items are way above acceptable levels in India. In fact mercury usages in most cases are substitutable of this and not doing so reflects the lack of concern about this toxic element.

Mercury is not mined in India and is totally imported. The EXIM Policy (2002-2007) has categorized mercury as an unrestricted product for imports, and the European Union is the largest exporter of mercury to India along with other countries like USA, Russia, China etc. Of the stated global demand of mercury of about 3,000 tonnes, India emerges as the single second largest consumer, importing approximately 250-300 tonnes annually. Hence, India has become one of the main hot spots for global and local contamination of mercury.

It is our understanding that the global mercury problem cannot be resolved without a demand reduction strategy in India, thus Toxics Link organized a two day workshop on 6-7th April 2005 to bring together all the important stakeholders to present and discuss the status of mercury in the country and to work towards demand management and a phase out strategy for mercury.

Objective of workshop

Toxics Link has been involved both at the global and the national level in working on the issue of mercury. It participated in the UNEP Global Mercury Assessment, which was sanctioned by the UNEP Governing Council. We also published the first national mercury assessment for India “Mercury in India: Shimmering” (on www.toxicslink.org) and have been participating in international meetings on this issue, in association with a global NGO coalition on Mercury Ban-Hg Working Group.

Toxics Link has been successful in highlighting the issue in both national and international media, generating interest among the people and government on this issue. The workshop was another important step towards this end.

The main objectives behind this workshop were:

- An status and overview of the mercury problem in India
- To understand the environment and health issues related to mercury in India.
- To share the existing knowledge on mercury.
- Generate a conversation amongst various stakeholders.
- Work towards alternatives and demand management of mercury.

Approximately, 75 participants from diverse backgrounds took part in the two-day workshop, sharing their views on the issue of mercury. The discussion involved the use of



mercury in various industries, health sector as well as the pathways of this toxic element entering the environment. The objective of the workshop was to bring recognition of toxicity of mercury and create a consensus on replacing mercury with alternatives.

6th April, Day One

Welcome and inaugural session

Mr. Ravi Agarwal, Director of Toxics Link, welcomed the gathering and flagged the issue of unregulated mercury usage in India, highlighting the possible health and environmental impacts due to its toxicity and the need to identify appropriate alternatives for this. The important issues he raised were:

- Lack of adequate data and information on the toxicity and impacts of mercury on environment and human health in India.
- No legislation framed for this particular element considering its potent toxicity.
- India being the second highest importer of mercury in the world second only to China.
- Mercury entering to the public domain through products containing mercury.
- Need for serious engagement on the issue by all stakeholders and find solutions. .
- Urgent need to take stock of the total quantity in circulation and its sector wise usage in India.

Key note Address

Dr B Sengupta, Member Secretary, Central Pollution Control Board (CPCB) delivered the keynote address on the issue. He informed the gathering on the efforts of the government and the future plans to manage mercury. More specifically he stated that the:

- CPCB was concentrating on the potential source of mercury, industries like, coal burning, electrical appliances, hospitals and the laboratories.
- CPCB was planning a proper inventory to regulate the use of mercury in India in various sectors. To start with five sectors have already been identified.
- The need for regulation to be framed in order to alleviate the threat posed now.
- That thermal power plant was making significant contribution of mercury in the environment, and a study on mercury emissions of thermal power plants was to be released soon.

He concluded with a very positive note that this workshop will form the base for NGOs and CPCB to work towards a policy on Mercury.

Mr. Ravi Agarwal then made a detailed presentation on various issues pertaining to Mercury. Key issues highlighted are listed below:



- The issue is far advanced worldwide and it is about time we too gave more attention toward this issue.
- India becoming the hotspot for dumping mercury waste unless concerted effort was put.
- Mercury in Indian environment has to be taken far more seriously as 50 per cent of population lives along the coast and eat fish, a medium of mercury storage.
- Lack of data on mercury and its sectoral usage, as we are one of the major importers of mercury.
- CPCB should do an impact mapping.
- Govt. should phase out mercury from all such sectors, which have viable alternatives.
- Pregnant women and infants are more prone to the toxicity of mercury.
- As part of the global clean up being initiated in the developed countries the fear or apprehension of this element finding its way into India.
- Need to actively participate in larger global conversations on Mercury.

During the discussions, the following emerged:

- Inadequate data available on the content of mercury in the products used in all the sectors, especially the health care sector.
- Emphasis should be given on the safety level of mercury and not totally ban it.
- Important to know the fate of the breakage so that it can be contained lest it should go unnoticed polluting the environment.
- Onus should be put on the manufacturer of equipments containing mercury and be asked to put certain code on the products.
- Forming an inter-ministry committee for tackling the hazard of mercury.
- In effective food standard to tackle the issue of mercury in fish sold in open markets and accountability of ensuring the safety of such food.
- PFA does not have limits for the food sold in open market and that this needs to be looked into.
- MoEF coming out with the exact permissible limit for mercury.
- No data available on the use of mercury imported due to which correct policies cannot be made.
- Obtaining sector wise data but said that much could be done with the production and consumption data available.
- Adopting the take back policy as is done in US.
- Mercury management requires an integrated approach and manufacturers role was also found to be critical to disclose the amount of mercury in their products.



Session 2:

Mr. Satish Sinha, Toxics Link moderated the second session in which three speakers, Mr. S. K. Agrawal, President, Alkali Manufacturers Association of India, Dr. Inamul Haq, Senior Scientist, CPCB and Mr. Chandra Bhushan, Associate Director, Centre for Science and Environment (CSE) participated.

This session focused on mercury usage and its management in the Chlor Alkali Sector of India. Firstly Mr. S. K. Agarwal gave a presentation on the plan of phasing out mercury usage. He said that the industry were sensitised to the issue due to efforts of NGO like CSE, which came out with a study in 2002. Highlights of his presentation are:

- Chlor-alkali is not the biggest user of Mercury in India as perceived by many, but consumes only 12-13% of the imported mercury, i.e. 24.9 tonnes per annum.
- Impurity of salt is also a reason for producing high mercury bearing sludge. EU consumption is 10 g/tonne as against 50 g/tonne in India.
- Under the charter on Corporate Responsibility for Environmental Protection (CREP), it is targeted to bring down the consumption to 50g/tonne by December 2005 in all the units.
- It is mandatory to dispose of sludge containing mercury in secured landfills.
- Under CREP charter, there is a programme for conversion to membrane cells by 2012.
- High cost involved in switching into an alternative technology and unavailability of funding agencies for it.
- Need to be a greater exchange of data between NGOs and industries, as there seems to be lot of difference in data and perception about the mercury issue. More research on the part of NGOs on this issue before going public.
- Praised the NGOs for acting as a change factor in moving towards cleaner production especially on the issue of mercury.
- Currently only 13 chlor-alkali units (contributing around 25% of production) are based on mercury cell process. These units will changeover to membrane cell process by 2012.
- Need for some incentives from the Govt side for the industries that are converting to membrane cell process like putting off the Public hearing, etc while expansion process.

Dr. Inamul Haq – CPCB in his presentation also agreed that mercury losses are very high due to the bad quality of salt and also due to power failure, and he promised that CPCB will try to provide incentives in the form of fast track clearing process, technology up gradation funds, etc to speed up the conversion process.

Dr. Haq pointed out the stance of CPCB in tackling the mercury threat:

- Since 1986, CPCB has been pursuing for the shift of technology.



- The importance of pre-treatment of effluent to bring down the content to permissible level (0.1 mg/L) before disposal which 11 plants has complied with.
- Review of industries would be submitted to steering committee and speedup the process.

On the other hand Mr. Chandra Bhushan from Centre for Science and Environment raised his doubts over the industry's claims on recycling mercury laden effluent, and industry's claim that mercury emissions are negligible by stating that these emissions account for about 25 tons of mercury in the environment every year.

He raised the critical issues of:

- Need for our regulators being more proactive and also praised the industry's efforts for the steps taken to change over to non-mercury based technologies.
- Decommissioned plants are not recovering their mercury and thus contaminating the new membrane cell process as well and ideally decommissioned plants should recover their mercury and send it to existing mercury cell based plants.
- Industry has still a long way to go as far as mercury is concerned and there should be a constant dialogue between industries and government and should also involve NGOs.
- Taking up more stringent steps and mentioned about regulators not being proactive.
- He put his point across on the need for industries to be more involved and conduct studies on the recovery of mercury.
- Focused on taking into account the contaminated sites and their consequent remediation by the responsible bodies.

During discussions following important issues were raised:

- Lack of data in public domain on the occupational hazards in mercury cell plants of chlor-alkali industry.
- Industries capabilities of phase-out mercury from soils and water, as the landfills are not lined and mercury-laden waste is dumped leaching into ground water.
- CPCB data on ambient air in the mercury cell plants show that mercury emissions in work areas are very high.
- Safety gears are provided especially during planned maintenance, but safety gears may not be there during unplanned maintenance.
- Membrane cell process involves initial capital cost but in the long run it is economical and energy efficient as well.
- Recovered mercury from decommissioned plants lying with the industry with no clue on what to do with it.



3rd Session (part 1)

Mr. Satish Sinha again moderated the 1st part of the third session with two presentations from Dr. Ann Mathew from St Stephens Hospital and Dr. Ramesh K Tripathi representing Banwasi Sewa Ashram, Govindpur and Peoples Science Institute of Dehradun.

Dr. Ann Mathew presented the successes story of mercury phase out at the St. Stephen's Hospital in Delhi. She informed that digital instruments have replaced the mercury-based instruments at the hospital and there is no problem of accuracy and are cost efficient in long run. She highlighted that:

- Awareness among the health professionals is an essential part of phasing out mercury in the health sector.
- Cost is no problem in phase out of mercury
- Accuracy is no problem with the digital instruments

Dr. Ramesh Tripathi in his presentation showed how a small town like Singrauli in UP, is contaminated with mercury. The key points of his presentation were:

- Mercury occurs naturally in fossil fuels like coal and its burning releases mercury in the air.
- Seven to eight coal fired thermal power plants producing electricity in the town.
- All these plants are functioning in a small area.
- Mercury pollution from these plants has affected the local community of the area.
- The blood samples of population showed high mercury concentration.
- Signs of disorder visible in the sampled population.
- Presence of mercury in the local water bodies, rivers, reservoirs and tanks of the area.
- Needs to be further researched, studied and documented.

3rd Session (part 2)

Dr. T. K. Joshi from Lok Nayak Hospital, Govt of NCT of Delhi moderated the last session of the day, where Mr. L. Ramakrishnan from Philips India talked various electrical appliances where mercury is utilized, Ms. Ulla Falk from KEMI, Sweden and Dr. Christine Beinhoff from Austria focused on mercury usage in small-scale gold mining

Mr. Ramakrishnan pointed out:

- Electrical appliances sector is an important consumer of mercury.
- About 6 tonnes of mercury is annually consumed by fluorescent light manufacturing sector.
- Each tube light (4 ' long) may contain from 15 to 20 mg of Hg; 35 mg reported may be an extreme case. In Philips Tube lights (4') manufactured in India the value is around 15 mg.



- Focus on recycling of these products when they complete their life cycle rather than going in to waste dumps which in long run pollute the environment.

Ms. Ulla Falk threw some light into the Restriction of Hazardous Substances (RoHS) Directive of European Union and the proposed process of implementation and the role of the Technical Adaptation Committee (TAC), which make recommendations for the deletion, and exceptions as new technologies come in. She also outlined the manner in which they are going to phase out various hazardous materials like mercury from electronics and electrical equipments.

Dr Beinhoff stated the need to establish environmental and health-monitoring programme. He expressed his fear of the pollution in Indonesia, which has reached catastrophic level. Beinhoff showed a film on Global Mercury Project funded by UNDP, GEF and UNIDO, which focused on how laymen handle mercury not knowing its toxicity on health.

During discussions participants concerns were:

- The safety of tube lights used at home.
- Suggestion of establishing take back of used tube lights to companies, which manufacture them.
- Monitoring of mercury impact on health.
- Take back policy is the key in tackling the problem of mercury getting into the environment from end of life products.
- The need to set up recycling plants.
- Examine low cost involved in recycling units contrary to the assumption of industries.
- The requirement of a strong leadership to initiate a tackling system.
- Mercury present in the tube light is in vapour form so will be in as entire length.
- Philips plant monitor air emissions once in a week to once in two weeks, and analyses blood and urine samples of workers
- Difficult to find labs to analyse them.
- Air curtains between mercury and the person handling it.
- I am not sure if Philips sponsors take back of end of life TL in EU. To my knowledge this issue is addressed through WEEE.
- Philips India waits for directive from the Govt to launch take back in India.
- Institutions like FICCI, CII should come forward and do it voluntarily as they have an environmental and social responsibility.
- Consortiums of industries for take-back and recycling have been proved cost-effective.



7th April, Day Two

Session 4:

Dr. J Behari of ITRC chaired the session and the speakers were Ms. Ulla Falk from KEMI, Sweden and Mr. Ravi Agarwal of Toxics Link.

Ms Ulla Falk made a presentation on Sweden and European Union have planned to phase out and ban mercury usage. It was carried out in a phased manner targeting high consumption industries to moving down to low consumption industries.

Mr. Ravi Agarwal in his presentation cited how the global community is moving towards phase out of mercury and outlined the international initiatives undertaken to phase mercury.

He informed that:

- Mercury was recognized as a global pollutant, and the UNEP Global Assessment of Mercury Report was prepared where the report recognized health effects, importance for a global action (international waters, international fishing), reducing mining and thereby emissions and alternatives to Hg.
- Report was put up before the UNEP Governing Council, which had called for awareness and capacity building through regional workshops.
- UNEP is planning to develop information on trade flows of mercury and had also asked for partnerships.
- While EU came up with a global legally binding treaty but the US suggested multi-stakeholder or voluntary partnerships.
- India being one of the important countries in Asia does not have a regulation on Mercury.
- Countries like China, Japan, and Thailand have already started programmes to reduce Mercury usage in various products.

During discussions issue raised and discussed were:

- EU ban on mercury usage and its implications on WTO
- Mercury emissions from incinerators.
- Phasing out of mercury equipments.
- Sweden has 2 or 3 mercury based chlor alkali plants but they will switch to non-mercury based processes by 2009.
- PFA is very ineffective in addressing food from the unorganised sector, as there has been no conviction in the last 50 years
- Food labs in India are ineffective to test mercury in food.
- Lack of infrastructure to analyse, etc should not be linked to public health
- No effort from the Ministry of Health to address this issue.
- Try to adopt the international best practices in addressing this issue and it can't be an isolated effort. It should involve all the stakeholders. (MoEF, MoH, etc.)



- Mercury from thermal power plants is still ignored in India

Session 5:

The session was chaired by Dr. G S Toteja of ICMR where presentations were made by Dr Anil Gautam from PSI, Dr T K Joshi from Lok Nayak Hospital, Govt of Delhi, Mr. Rajesh Rangarajan from Toxics Link Chennai and Ms Preeti Mahesh from Toxics Link Delhi.

Mr. Anil Gautam (PSI) made a presentation on mercury contamination of groundwater in Bhopal, where he informed:

- 1 MT of mercury was abandoned by UCIL, Bhopal post gas tragedy, which has started leaching and contaminated the groundwater in and around the UCIL plant Bhopal.
- 16 samples were analysed in Sept 2001, 12 showed mercury contamination above permissible limits.
- Study showed the maximum concentration of mercury close to the UCIL plant. It was about 70 microgram of mercury.

Dr. T K Joshi made presentation on Mercury in occupational health where he stressed:

- Provisions in the factories act that recognizes mercury exposure should be identified as occupational hazard.
- Health linkage to environmental exposure is important.
- 40 mercury compounds are used in health care and 1gm mercury pollutes 5 million gallons of water.
- There is 0.5-0.7 gm mercury in thermometers and in one hospital 2 thermometer /bed/year are broken.
- Only 27% of the nurses were aware of safe mercury clean up.
- 0.1 -0.2 mg/meter cube is harmful and 74%-80% of inhaled mercury is retained in the tissues and crosses the pulmonary lining is transferable thorough blood brain barrier.
- Urinary Prophyrin has been reported to be characteristic of mercury exposure, where one test =Rs2000/-.
- Formal training & educational programmed for health workers, is the key and more studies on mercury awareness.
- Breakage frequency of thermometer was conducted in the LNJP and Guru Teg Bahadur hospitals on 90 respondents, 40 in LNJP and 50 in GTB, where LNJP is 1700 bed and GTB is 850-bed hospital.
- More breakage reported at GTB than LNJP where nurses were aged, more breakage in Paediatrics & medicine wards, awareness of mercury spill was found in only 26.6% respondents despite the fact that LNJP is one of the best teaching institute.
- 15 nurses (16.7%) nurses had spontaneous abortions and stillbirths, 54.4% of respondents showed clinical symptoms of mercury exposure.



- Risks were thus established and Bio medical waste rules do not address this issue, no rules protect the workers health.
- Indian hospitals also do not have EHS (environmental health survey) or OHS (occupational Health Survey).

Mr. Rajesh Rangarajan made a presentation on behalf of Mr. Navroz Mody of TamilNadu Alliance Against Mercury on 'Mercury Contamination due to Hindustan Lever Thermometer Factory, at Kodaikanal'. He also stated that he had collected the material for the presentation from him due to his inability to be present in this workshop. He informed the gathering that:

- 1997 HLL acquires plant from Ponds India
- 165 million mercury (Hg) thermometers between 1984-2001
- March 2001 - Green peace and PHCC exposé of HLL
- 23 March 2001 – Closure order by TNPCB
- May 2001 – Hazardous Waste Management Committee (HWMC) constituted
- Mercury laden broken glass waste was found in local waste markets of Kodai kanal.
- Mercury waste also dumped in the hill slopes
- 600-800 times over permissible limits!
- CHC Health study shows workers suffering from Mercury poisoning
- Workers have found to be dying of mercury poisoning and the local environment of the area is contaminated with mercury.

Ms. Priti Mahesh made presentation on how mercury is coming out from hospitals in Delhi and how hospitals have become big source of mercury to the environment. She said:

- A household survey carried out in Delhi, Mumbai and Patna has shown minimum level of awareness among the community on mercury and its toxic health effects.

During discussions important points noted were:

- NGOs when doing such studies should try to make them more scientific, involving scientists and statisticians.
- Lack of resource always a hindrance for NGOs to conduct these studies we were not able to do a larger study with more components.
- Difficult to trace the entire mercury after spillage. Hospitals can use sniffer dogs.
- Good suction apparatus exists that collects mercury for being reused
- LNJP & GTB has plans of shifting from mercury as said by Dr. T K Joshi.
- Education on this issue is the most important issue to be addressed.

On Kodaikanal the points discussed were:

- HLL was ready to share the basic health data of workers data and not the entire data due to some ethical reasons.



- NGOs first to point out about the mercury scrap.
- HLL has employed consultants to study the area by taking samples of water, lichens, etc. and found that there is no mercury contamination in Kodaikanal.
- The analysis of lichens from Kodaikanal by Department of Atomic Energy in Hyderabad had found higher amounts of mercury in them far more than permissible limits

WAY FORWARD

Dr. T K Joshi chaired the way forward. Other panel members were Mr. Ravi Agarwal and Mr. L Ramakrishnan. Important suggestions made:

- Mercury waste collection centres should be there in major cities.
- Promote mercury recycling, as it will reduce imports.
- Hospital/dentist/workers be informed about mercury collection centres.
- Each hospital must have mercury spillage protection kit and people handling mercury be trained.
- There should be regulation in Trade, Packaging and Transport of mercury.
- Authorities collect all contaminated wastes
- Detailed sector wise inventory for mercury be prepared for India.
- Medical curricula should include awareness on mercury and school level education should also be done
- Low cost equipment to be developed for monitoring mercury which can only be like indicator showing above/below some limit
- Regulations for mercury should cover compensation for handling mercury.
- Alternatives to mercury be explored & used in India and life cycle analysis of alternative products for mercury should be done prior to being introduced.
- Mercury should be recycled in Chlor-alkali industries and they should not buy new mercury.
- Labelling of mercury containing products about hazards, breakage etc
- Need for a RoHS directive in India.
- There should be a massive awareness campaign on mercury and informing consumers about the presence of mercury in products.



Annexure IV

Public Notification on Mercury By DPCC, Govt. of Delhi

dpcc

Mercury is poisonous
Inhalation of mercury vapour is toxic.

It's safe disposal is your responsibility.

- Avoid brooms, brushes and vacuum cleaners to clean spill mercury
- Never put mercury in trash bins, burners or drains or in municipal dustbins
- Switch off heating or air-conditioning systems during mercury spillage
- Collect spill mercury using paper board to accumulate small mercury droplets together
- Keep the collected drops in airtight glass or plastic containers under water as mercury vapourizes under normal temperature
- Tie up with manufacturers or suppliers of instruments to return the collected mercury

Elemental Mercury is a volatile metal that can cause severe harm when inhaled by human beings. Hence, it is extremely important for **medical & para-medical staff** to take utmost care in disposing this hazardous substance. Follow the above guidelines to effectively dispose of mercury and ensure maximum safety.

Issued in public interest by:
DELHI POLLUTION CONTROL COMMITTEE
Department of Environment
Government of NCT of Delhi

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Bhagidari

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