Ministry of Environment
Government of Pakistan

UNEP

MERCURY INVENTORY REPORT

OF

PAKISTAN

MINISTRY OF ENVIRONMENT
Mercury Inventory Pilot Project
In collaboration with

UNITED NATIONS ENVIRONMENT PROGRAM (UNEP) Chemicals Branch

The Mercury Inventory Report of Pakistan was written by Mr. Zaigham Abbas, Technical Officer (Chemicals)/Project Coordinator & Mr. Muhammad Suhail Anwar, Local Expert/Consultant, Mercury Inventory Pilot Project in Pakistan supported by the United Nation Environment Programme (UNEP).

This report is published in English by the Ministry of Environment, Government of Pakistan to provide information of mercury sources and quantity in Pakistan. This report is a first time in the history of Pakistan regarding inventory of mercury and mercury products data collection by the Ministry of Environment, Government of Pakistan.

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Preface

The Global Mercury Assessment completed in December 2002 by a UNEP working group, shows that environmental mercury levels have increased considerably since the on-set of the industrial age. Mercury is now present in various media and food, especially fish, all over the globe at levels that adversely affect humans and wildlife. Widespread exposures are occurring due to human-generated sources. Even regions with no significant mercury releases, such as the Arctic, are adversely affected due to long-range transport of mercury.

Mercury is highly toxic, especially to the developing nervous system. Some populations are especially susceptible, most notably the fetus and young children. Yet mercury continues to be used in many products and processes all over the world, including in small-scale gold mining; manometers and thermometers; electrical switches; fluorescent lamps; dental amalgams, batteries and VCM (vinyl-chloride-monomer) production and some pharmaceuticals. The most significant mercury releases to the environment are emissions to air, but mercury is also released from sources directly to water and land. Important emissions sources include: coal-fired power generation, waste incineration, cement, steel and chlor-alkali production, gold and other metals mining, cremation, landfills and other sources such as secondary smelting operations and industrial inorganic chemical production.

UNEP Governing Council decisions 23/9 and 24/3 call for work to be facilitated on the promotion and development of inventories of mercury uses and releases. A key training and guidance document that supports countries efforts to take action on mercury is the 'Toolkit for identification an quantification of mercury releases'. The Toolkit pilot was finalized in November 2005. This project will provide a start in identifying and quantifying mercury use and release in the pilot countries while pilot testing the methodologies outlined within the toolkit through the Asian Mercury Inventory Pilot Project. Countries will apply inventory results to develop associated action plans on mercury to assist in communicating results nationally and setting priorities on next steps with regard to mercury pollution. Cambodia, Pakistan, Philippines, Syria, Yemen are participating in the pilot project. Thailand will participate in the pilot project as a corresponding member.

In 2007, United Nations Environmental Program (UNEP) approved financial support for Pakistan to study the mercury releases from all identified sources. In May, 2008, UNEP-Chemicals expert provided the training to the inventory team from the Ministry of Environment, Government of Pakistan, by indicating a specific need data and information for gathering related to mercury releases

After training, the inventory team initiated and identified hotspot areas of possibly mercury releases sources based on local knowledge and current activities (as compared with activities mentioned in the UNEP Toolkit for identification and quantification of mercury releases, November 2005). Based on this material, the inventory team decided to select 04 provinces and Federal Territory through the country. The inventory was conducted from May, 2008 to August, 2008 for data entry and analysis.

Inventories for releases of priority hazardous substances constitute an important decision making tool in the process of mitigating environmental impacts from the pollutants in question. When Pakistan has decided that mercury pollution is a potential priority problem that needs to be evaluated further, it will typically need to estimate both the relative and the absolute contributions to mercury releases from the different sources present in the country. This information can be used to determine which release source types are significant and which sources should be addressed through release reduction initiatives.

Combined with additional knowledge of the specific release source types and available options for bringing about release reductions, the most cost-effective reduction measures can be identified for selection in the decision making process. Often, such inventories are also vital in the communication with stakeholders such as industry, trade and the public.

Furthermore, baseline inventories, and subsequent up-dates, can be used to monitor progress towards pre-set goals, and thereby identify successful approaches which could serve as examples in other areas, as well as areas where the applied measures do not prove adequate and further attention and initiative is needed.

Message of SAICM National Focal Point, Ministry of Environment

This mercury inventory report was the results of field survey of 04 provinces and Federal Territory, the cooperation of different stakeholders from both public and private sectors and the consultation meeting in August 25th, 2008.

This mercury inventory report provide basic useful information for ministries, private companies, civil society, and stakeholders with responsibilities for the management and using of mercury and help them in promoting improvement of human health care and environment protection in Pakistan.

A background document entitled UNEP Toolkit for identification and quantification of mercury releases, November 2005 is based for preparation of the mercury inventory report of Pakistan by the Ministry of Environment.

I would like to express my sincere appreciation to UNEP chemicals branch for funding. Specials thanks for our Pakistan Inventory Team provide the best outputs, hard works, and strongest commitment for mercury data collection and development of the inventory report. I am deeply indebted for all views and comments were made by representatives of the governmental institutions, private sector and other stakeholders and all participants in technical working group and consultative meetings organized by Ministry of Environment in Islamabad, Pakistan.

Finally, I would like to announce that, this mercury inventory report was adopted by the Ministry of Environment as official baseline information for official purposes use.

(Khizar Hayat)

Islamabad the, 14th November, 2008

Joint Secretary (International Cooperation)/
SAICM National Focal Point
Ministry of Environment
Government of Pakistan

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Summary

This report is focused on the preliminary field survey on mercury uses and release within Pakistan territory and such surveys had been undertaken from January, 08 to August, 08 throughout Pakistan by the mercury task team of the Ministry of Environment which is leaded by Project Manager. This team had been gone through the toolkit provided by UNEP before the survey took place.

It was remarkably that the products and equipment contained mercury or mercury compound have been used in Pakistan, however, there is no official record could confirms when such equipment was first introduced to Pakistan. Nevertheless, it is no doubt to state that equipment containing mercury and mercury compound have been imported to Pakistan, which resulting mercury release into the environment after disposal of such equipment. In addition to this, Chlor-Alkali production activities, lime production and other manufacturing, processing and combustion activities could cause the release of mercury into the atmosphere as well.

Therefore, based on the preliminary data, it was understood that the total import quantity of mercury in Pakistan is approximately **34013 Kg** for there year from 2005-2008. The major uses of mercury in Pakistan are in the production of Chlor-alkali plants, followed by lighting source, dental amalgams. It is unable to obtain information for calculation including electrical and electronic switches, light sources with mercury, biocides and pesticides, paints, pharmaceuticals for human and veterinary uses, cosmetics and related products, etc.

Pakistan has no specific guideline regarding the management of mercury release into the environment, dealing with safe and sound management and use of either products/equipment containing mercury or mercury compounds nor other specific chemicals so far. The existing legislation available is generally focusing on the overall management of chemicals particularly related to pesticides (for agricultural purposes) and waste management (for the environmental purposes). In term of the technical infrastructures, there are about fifteen main laboratories available in Pakistan, which is belonged to technical ministries and have capacity to analyze mercury.

Pakistan is faced with severe constraints related to the national budget, knowledgeable and expertise people in this area, the country requires further assistance in terms of both budget and technical support from GEF/UNEP and other international communities and development partners, in order to undertake further detail inventories as well as designing and implementing mercury management plans. This will assist Pakistan in sound management of mercury, which will provide benefits for not only the current generation, but also for the next generations nationally, regionally and globally.

1 National Information

1.1 Country profile

1.1.1 Physical Geography

The Islamic republic of Pakistan emerged as an independent sovereign state on 14th August 1947, as a result of the division of former British India. It lies between 23-35 to 37- 05 north latitude and 60-50 to77- 50 east longitude touching the Hindukush Mountains in the north and extending from the Pamirs to the Arabian Sea.

Located in South Asia, Pakistan shares an eastern border with India and a north-eastern border with China. Iran makes up the country's south-west border, and Afghanistan runs along its western and northern edge. The Arabian Sea is Pakistan's southern boundary with 1,064 km of coastline.

The country has a total area of **796,095 sq km** and is nearly four times the size of the United Kingdom. From Gwadar Bay in its south-eastern corner, the country extends more than 1,800 km to the Khunjerab Pass on China's border.

Pakistan is divided into four provinces viz., North West Frontier Province (NWFP), Punjab, Sindh and Balochistan. The tribal belt adjoining NWFP is managed by the Federal Government and is named FATA i.e., Federally Administered Tribal Areas. Azad Kashmir and Northern Areas have their own respective political and administrative machinery, yet certain of their subjects are taken care of by the Federal Government through the Ministry of Kashmir Affairs and Northern Areas. Provinces of Pakistan are further divided into Districts.

Table 1: Area of Provinces of Pakistan

Area	Punjab	205,344 Sq. km.
	Sindh	140,914 Sq. km.
	North West Frontier Province	74,521 Sq. km.
	Balochistan	347,190 Sq. km.
	Federally Administered Tribal Areas	27,220 Sq. km.
	Islamabad (Capital)	906 Sq. km.
	Total	**796,095 Sq. km.**

Climatically, Pakistan enjoys a considerable measure of variety. North and north western high mountainous ranges are extremely cold in winter while the summer months of April to September are very pleasant.

The country has an agricultural economy with a network of canals irrigating a major part of its cultivated land. Wheat, cotton, rice, millet and sugar cane are the major crops. Among fruits: mangos, oranges, bananas and apples are grown in abundance in different parts of the country. The main natural resources are natural gas, coal, salt and iron. The country has an expanding industry. Cotton, Textiles, sugar, cement, and chemicals play an important role in its economy.

1.1.2 Population

Pakistan covers 796,095 sq. km with a population of 160.09 million (approximately). It is divided into four provinces:

- Sindh,
- Punjab,
- North West Frontier Province
- Balochistan.

1.1.3 Salient Features of Pakistan

• GDP grew by 5.8 percent in 2007-08 as against 6.8 percent last year and growth target of 7.2%. The economy has shown great resilience against internal and external shocks of extraordinary nature during the out going fiscal year. Pakistan's economy has grown at an average rate of almost 6.6 percent per annum during the last five years.

• Agriculture sector showed dismal performance and grew by 1.5 percent as against 3.7 percent last year and target of 4.8 percent.

• Overall manufacturing, accounting for 18.9 percent of GDP registered a modest growth of 5.4 percent against 8.2 percent last year.

• Pakistan's per capita real GDP has raised at a faster pace in real terms during the last six years (4.5% per annum on average in rupee terms). The per capita income in dollar term has grown at an average rate of 13.5 percent per annum during the last six years rising from $ 586 in 2002-03 to $ 1085 in 2007-08.

• The main factor responsible for the sharp rise in per capita income include four fold increases in the inflows of workers' remittances, acceleration in real GDP growth, and stable exchange rate.

• Fixed investment has declined to 20.0 percent of GDP from 21.3 percent last year.

• Overall Foreign Investment during the first ten months (July-April) of the current fiscal year has declined by 32.2 percent and stood at $ 3.6 billion as against $5.3 billion in the comparable period of last year.

• The agriculture growth this year is estimated at 1.5 percent as compared with 3.7 percent during 2006-07.

• The main contributors to manufacturing sector, the 4.8 percent growth during July-March 2007-08 were beverages (30.5%), sugar (34.0%), beverages (30.5%),upper leather (13.5%), cement (17.9%), refrigerators (10.7%) , electric fans (18.3%), TV sets (19.3%), diesel engines (46.0%), buses (32.1%), motor cycles (28.1%), and LCV'S (60.5%).

• Total revenues collected during the current year stood at Rs 1545.5 billion, higher than the targeted level of Rs 1476 billion. However, there are expectations that the FBR may fall short of its targeted level, and the year is most likely to end with total tax collections amounting to Rs 1.0 trillion—Rs. 25 billion less than the original target.

• Total expenditure for 2007-08 was budgeted at Rs. 1875 billion. According to revised estimates this figure stood at Rs 2228.9 billion. Two factors had a significant impact on the budgetary outlook. Firstly oil prices continued to rise at a greater pace, reaching as high as $ 115 per barrel in May 2008 - an increase of over 116 percent during the fiscal year. Secondly, the high international price of oil was not passed on to the domestic consumers. Consequently, the oil subsidy is projected to rise to Rs 175 billion - over shooting the targeted level by Rs 160 billion.

Wheat shortage forced the government to import 1.7 million tons of wheat at all time high prices.

- By end-June 2007 total domestic debt stood at Rs. 2610.2 billion which was estimated at 30 percent of GDP. The outstanding stock of domestic debt rose by Rs. 409.9 billion and stood at Rs. 3020.1 billion by end-March 2008 or 30.3 percent of GDP. The domestic debt has increased by 15.7 percent by end-March 2008 over end-June 2007.

- Inflation Rate stood at 10.3 percent during the first ten months (July-April) of the current fiscal year, 2007-08, as against 7.9 percent in the comparable period of last year. The food inflation is estimated at 15.0 percent and non-food 6.8 percent, against 10.2 percent and 6.2 percent in the corresponding period of last year.

- Exports were targeted at $ 19.2 billion or 12.9 percent higher than last year. Exports during the first ten months (July-April) of the current fiscal year are up by 10.2 percent – rising from $ 13847.3 million to $ 15255.5 million in the same period last year.

- Pakistan's export performance has been impressive in recent years (2002-03 to 2005-06) with exports registering an average growth of 16 percent per annum. Pakistan's export performance was dismal in 2006-07 as it witnessed abrupt and sharp deceleration to less than 4 percent. However, when viewed in the back of last year's performance, exports managed to recover somewhat this year but its performance has remained far short of the average growth of 16 percent achieved during 2002-03 to 2005-06

- Imports were targeted to increase by 5.9 percent in 2007-08 to $ 32.3 billion from last year's level of $ 30.5 billion. Imports are up by 28.3 percent during July-April 2007-08 – rising from $ 25.0 billion to $ 32.0 billion, showing an increase of almost $ 7.0 billion. The growth in imports increased substantially owing to unprecedented rise in oil and food prices.

- Major contributions to import bill have come from petroleum groups (40%). raw material (21%) and food groups (16.3). Almost three-fourth contribution came from three categories (petroleum, raw material and food group) to this year's rise in imports. Interestingly, consumer durables' contribution was negative (-0.4%) mainly on account of a decline in the import of road motor vehicles which registered a decline of 8.6 percent.

- Workers' remittances totaled $ 5.31 billion in the first ten months (July-April) of the fiscal year as against $ 4.45 billion in the same period last year, depicting an increase of 19.5 percent. If this trend is maintained workers' remittances are likely to touch $ 5.8 billion for the year – the highest ever in country's history.

- Pakistan's current account deficit further widened to $ 11.6 billion (6.8% of GDP) in the first ten months (July-April) of the current fiscal year from 6.6 billion (4.6% of GDP) in the same period last year. The deterioration in current account deficit mainly emanated from the sharply widening trade deficit.

- Pakistan's total foreign exchange reserves stood at $ 12,344 million at the end of April 2008. However, October 2007 onward, draining of investment and rise in the current account deficit led to a sharp decline in foreign exchange reserves of country.

- Pakistan rupee after remaining stable for more than 4 years, lost significant value against the US dollar, depreciating by 6.4% during July – April 2008.

- External debt at the end of March 2008 was US$ 45.9 billion.

- Male literacy rate increased from 58 percent in 2001 to 67 percent in 2006-07 while it increased from 32 to 42 percent for females during the same period.

- There are currently 231,289 educational institutions in the country. Their overall enrolment is recorded at 34.84 millions with teaching staff of 1.37 million.

- To promote research and development (R&D) activities, Higher Education Commission (HEC) has awarded 5,837 PhD scholarships (3,237 indigenous, 2,600 foreign) over the past three years.

- At present there are 945 hospitals, 4755 dispensaries, 5349 basic health units & sub health centers and 903 maternity and child health centers in Pakistan.

- With the existing number of 127859 doctors, 8195 dentists ,62651 nurses and 103285 hospital beds, the population and health facilities ratio turns out to be 1225 persons per doctor,19121 person per dentist, 2501 persons per nurse and 1517 persons per bed .

- Eighty thousand (80,000) Lady Health Workers (LHWs) have been trained and deployed mostly in the rural areas.

- Some 7.5 million children have been immunized and 22 million packets of ORS distributed.

- Various health programs with a special focus on major public health problems have been carried out. These include the national programs for the prevention of tuberculosis, malaria, HIV/AIDS, hepatitis, blindness and program on motherchild The total outlay of health sector budget is Rs.60 billion which is equivalent to 0.6 % of GNP.

- Pakistan's current population is 160.9 million with a growth rate of 1.80 percent. The overall vision of the population policy is to achieve population stabilization by 2020.

- The life expectancy in Pakistan for males is 64 years and for females is 66 years.

- About 2.6 million workers are estimated as un-employed in 2006-07 and unemployment rate is 5.3 percent.

- Agriculture remains the dominant source of employment in Pakistan. The share of agriculture in employment has increased from 43 percent in 2003-04 to 43.61 percent by the year 2006-07, with manufacturing (13.54%) and trade(14.43%) & services(14.41%) absorbing a growing share of the work force.

- The total road network is about 260,000 km of which around 60% is paved.

- Telecom sector continued to show a stellar growth in last few years. Today total subscriber base stands at 82.5 million (Mar 2008) whereas it was 34.5 million in 2006.

- Currently there are about 3.5 million internet subscribers in Pakistan where total users crossed 17 million marks. Currently around 3,008 cities are connected to internet cities.

- Production of crude oil per day has increased to 70,166 barrels during July-March 2007-08.

- Production of natural gas per day stood at 3,966 million cubic feet during July-March, 2007-08. The overall production of gas has increased to 1,090,620 million cubic feet during July-March 2007-08 as compared to 10,62,124 million cubic feet in the same period last year, showing an increase of 2.7 percent.

- The total installed Electricity generation capacity has increased to 19,566 MW during July-March 2007-08 from 19,440 MW during the same period last year, showing a marginal increase (0.65 percent).

- The number of villages electrified increased to 126,296 by March 2007 from 113,605 upto 2005-06, showing an increase of 11.2 percent.

1.2 Sectoral profile

1.2.1 Agricultural profile

Agriculture remains the dominant source of employment in Pakistan. The share of agriculture in employment has increased from 43 percent in 2003-04 to 43.61 percent by the year 2006-07, with manufacturing (13.54%) and trade(14.43%) & services(14.41%) absorbing a growing share of the work force. Agriculture sector showed dismal performance and grew by 1.5 percent as against 3.7 percent last year and target of 4.8 percent. The agriculture growth this year is estimated at 1.5 percent as compared with 3.7 percent during 2006-07.

Production indicators

Table 2: Main crops

Product	Production (in thousands)	Harvested surface (1000 ha)	Yield by hectare (kg/ha)
Sugar cane	47244	967	48874
Wheat	21612	8358	2586
Rice paddy	8321	2621	3174
Cottonseed	4429	3102	1428
Maize	3110	1042	2984

Source : 2005, FAOSTAT

Table 3: Livestock

Specie	Headcount (in thousands)
Chickens	166000
Goats	56700
Buffaloes	26300
Sheep	24900
Cattle	24200

Source : 2005, FAOSTAT

Table 4: Fishing (in metric tons)

Shellfish, mollusks and cephalopods	Saltwater fish	Freshwater fish
29 827	309 888	175 191

Source : 2005, FAOSTAT

1.2.2 Industrial profile

During the 1960s and 1970s, light industry expanded rapidly— especially textiles, sugar refining, fertilizers, and other manufactures derived from local raw materials. Large government investments in the 1970s established the country's first large-scale ship-building and steel milling operations; the production of chemical fertilizers was also given special government support. The Pakistan Industrial Development Corp., established in the early 1980s with IDA credit, developed industrial estates for small- and medium-scale industries, assisting their occupants in obtaining credit, raw materials, technical and managerial assistance, access to production facilities, as well as marketing support. Despite steady overall industrial growth during the 1980s, the sector remains concentrated in cotton processing, textiles, food processing and petroleum refining.

The 1973 nationalization program, which placed 10 basic industries wholly within the public sector, was reversed in 1991 with the enactment of an ambitious privatization program. In 1992, the government began auctioning off majority control in nearly all public sector industrial enterprises, including those manufacturing chemicals, fertilizers, engineering products, petroleum products, cement, automobiles, and other industrial products requiring a high level of capital investment, to private investors. In 1995, however, the speed of privatization began to slow as the sale of some large state-owned units were stalled and postponed. In 2002, the public industrial sector, under the Production Wing of the Ministry of Industries and Production consisted of eight public holding companies—Pakistan Steel, the State Cement Corporation (PACO), Federal Chemical and Ceramics Corporation (FCCC), State Petroleum Refining and Petrochemical Corporation (PERAC), State Engineering Corporation (SEC), the Pakistan Industrial Development Corporation (PIDC), the state fertilizer corporation and Pakistan Automobile Corporation. The majority of the 74 production enterprises controlled by these holding companies have been privatized, and most of those remaining are scheduled to be sold. The public sector continues to dominate in steel, heavy engineering, automobiles, petroleum and defense-related production.

Cotton textile production is the most important of Pakistan's industries, accounting for about 19% of large-scale industrial employment, and 60% of total exports in 2000/01. Pakistan has become self-sufficient in cotton fabrics and exports substantial quantities. Some long and extra-long staple cotton is imported to meet demand for finer cottons. About 80% of the textile industry is based on cotton, but factories also produce synthetic fabrics, worsted yarn and jute textiles. Jute textile output amounted to 70,100 tons in 1999/00. The textile industry as a whole employs about 38% of the industrial work force, accounts for 8.5% of GDP, 31% of total investment, and 27% of industrial value-added.

Other important industries include food processing, chemicals manufacture, and the iron and steel industries. Food processing is considered Pakistan's largest industry, accounting for slightly more than 27 of value-added production. Pakistan Steel, the country's only integrated steel mill, employs about 14,500 workers and has an annual production capacity of 1.1 million tons. The government plans to expand the mill's annual capacity to 3 million tons. Pakistan Steel produces

coke, pig iron, billets, hot and cold rolled coils and sheets, and galvanized sheets. In June 1999, the first tin-plating plant began operation, a joint venture with Japan.

Pakistan has ten fertilizer plants, six state-owned and four private, with a total annual production capacity of 4.65 million tons. Production in 2000/01 was 3.66 million tons, up 10.5% from 1999/00. There are 21 cement plants, four state-owned and 17 private, with an annual production capacity of 19.2 million tons. Production in 1999/00 was 9.9 million tons., up 4% from 1999/98. Pakistan's chemical industry produces an number of basic chemicals used in its other industries, including soda ash, caustic soda and sulfuric acid. Industrial output from other major industries also includes refined sugar, vegetable ghee, urea, rubber tubes, electric motors, electrical consumer products (light bulbs, air conditioners, fans refrigerators, freezers, TV sets, radios, and sewing machines), and pharmaceuticals

Chemicals including pesticides, fertilizers, industrial chemicals and consumer chemicals have become indispensable in many economic activities and are increasingly used in the industrial agricultural and consumer sectors of all societies. However, increasing evidence suggests that chemicals can contribute to health and environmental problems at various stages during their life-cycle from production/ import through disposal. Such problems include pollution generated during production processes, improper handling, storage and transport accidents and diseases and environmental contamination due to unsound disposal methods. Majority of such evidence is associated with the use, and misuse, of pesticides in the agricultural sector, but increasingly industrial and consumer chemicals are reported to cause severe health and environmental problems as countries develop from agricultural to industrial societies.

Accordingly, “Agenda 21” was adopted in the Rio Conference of the United Nations on Environment and Development held in 1992. Chapter 19 of “Agenda 21” is entitled “Environmentally Sound Management of Toxic Chemicals including Prevention of Illegal International Traffic in Toxic and Dangerous Products”. It implies that all the participating countries agreed on the goal of achieving the sound management of chemicals. In 1994, the international conference on Chemical Safety was held to identify priorities to implement chapter 19 of “Agenda 21” of the Rio Conference and to establish mechanisms for the implementation of its recommendations. As a result, an intergovernmental Forum on Chemicals Safety (IFCS) was established. It was followed in 1995 by the constitution of an Inter-Organization Programme for the Sound Management of Chemicals (IOMC) involving the inter-national organizations such as FAO, OECD, ILO, UNIDO, UNEP and WHO. Several other international policy instruments have also been adopted in the meantime which address specific aspects of chemical management.

All policy instruments and fora introduced above have been established with one common goal i.e. to facilitate the establishment/strengthening of national programmes for the sound management of chemicals in all countries. According to Chapter 19 of “Agenda 21”, basic elements of such programmes should include adequate legislation, information gathering and dissemination, capacity for risk assessment and interpretation, establishment of risk management policy, capacity for implementation and enforcement, capacity for rehabilitation of contaminated sites and poisoned persons, effective education programmes and capacity to respond to emergencies. In order to help the member countries develop national programmes for the sound management of chemicals on the lines envisaged in Chapter 19 of “Agenda 21”, the United Nations Institute for Training and Research (UNITAR) initiated a programme in 1995 to assist countries to prepare National Profiles to assess the national infrastructures. A draft version of a Guidance Document was prepared in close cooperation with FAO, ILO, OECD, UNEP, UNIDO, and WHO. The draft document was pre-reviewed by experts and tested through pilot projects in the Czech Republic, Guinea, Mexico and Zambia. Results of the National Profile Pilot Project were presented at the second meeting of the Inter-sessional Group (ISG-2) of the IFCS in

Canberra in March 1996. Following the recommendations of ISG-2 and experiences gained in the four Pilot Project countries, the final version of the Guidance Document was prepared by UNITAR in cooperation with IOMC. Present National Profile on Chemical Management in Pakistan has been prepared in line with the Guidance Document of the UNITAR/IOMC.

Pakistan, as a nation state is 61 years old. Gross area of the country is nearly 80 million hectares with only 27 percent of it cultivated and bulk of the rest is not cultivable. It has continental climate, precipitation ranging between 5 inches and 70 inches. Supported by a large irrigation system, Pakistan economy flourishes based on agriculture. It is thus an agricultural economy showing intentions to become industrial over time. Still its industry is either agro-based or agriculture oriented. Accordingly, consumption of chemicals is also primarily confined to agriculture. Chemical fertilizers are the largest chemical products consumed in the country. Pesticides too have a widespread use in Pakistan. Other chemicals used in the country are dyestuffs used in the textile industry and other chemicals used in making man-made fibres again for the textile industry. Some more chemicals consumed in the country in sizeable quantities are Soda Ash, Sulphuric Acid and Caustic Soda.

Most of the Chemical fertilizers are locally produced. Pesticides are generally imported either branded/packed from abroad or formulated/packed locally based on imported base matters. For both the chemicals, there exists adequate control inasmuch as the production/import, transportation, storage and distribution is concerned. Arrangements also exist for determining the useable quantities and qualities of both the chemicals. Their impact on crops, human beings and after effects are also determined to a great extent. No arrangement, however, exists for the disposal of expired pesticides. Quality control over the fertilizers used in the country are simply non-existent.

By value, petroleum products are the largest single element of petro-chemical used in the country. It is 51 percent of the gross value of all chemicals consigned. Petroleum products are major pollutants in the whole country. Little, if any, effort is being made to control pollution on this account. In particular , transportation of petroleum products in the country requires considerable amount of precautionary measures to be adopted as incidents are in abundance where the tankers carrying petroleum products over-turned due to hazardous driving, bad roads and lack of protective measures.

All the above irritants arise out of chemicals handled in the organized sector where the awareness is manifest and efforts can be made to control the mis-management. Moreover, the damage is not widespread. Problem arises when one looks at the chemicals being handled by the micro- units spread in the length and breadth of the country. The magnitude of this problem is likely to increase as the country pursues its desire for industrialization. Todate, industrialization in Pakistan has been agriculture-based and rural oriented. From hereon it will move into the high-tech, sophisticated industrialization. With little or no infrastructure for the management of chemicals, it will be difficult to control the mishaps emanating from poor handling of the chemicals.

Most effective legal instrument available in the field of chemical management is the Agricultural Pesticides Ordinance of 1971. Its subsidiary legal framework is found in the Pakistan Agricultural Pesticides Rules, 1973. Under these legal instruments, the Directorate of Plant Protection in the Ministry of Food & Agriculture controls the use of pesticides through its registration process. The Ministry enjoys powers to ban any pesticide which it considers harmful to the land, labor both of the producer or the consumer. The Ministry also has powers to allow new products found useful for the agriculture in Pakistan. But these legal instruments too have a loophole inasmuch, the destruction of expired pesticides pose insurmountable difficulties.

No legal instrument is available for the registration or de-registration of fertilizers nor there exist any regulation for ensuring its quality. Similarly, no legal instruments exist to manage the industrial or consumer chemicals except that by the use of Explosives Act, 1884 and/or the Factories Act, 1934 some exercise can be undertaken to mitigate impact of chemicals. There is, therefore an urgent need for the development of a specialized legal instrument to control and manage the industrial or consumer chemicals. The Pakistan Environmental Protection Act, 1997 may, however, help in the management of chemicals from the point of view of their end –results. Production/import, storage, transportation and use of chemicals is likely to effect the environment in one way or the other. Since the Pakistan Environmental Protection Council and its subsidiaries of PEPA/EPAs are responsible for protecting, rehabilitating and improving the environment under the Pakistan Environmental Protection Act, 1997, it may be advisable to assign the responsibility for management of chemicals in the country to this Ministry. Of course, the Ministry of Food and Agriculture as also the Ministry of Industries and Production should continue as before, dealing with the supply and demand for Pesticides and Fertilizers. The Ministry of Environment may be assigned the functions of management of chemicals from the point of view of the end-results.

For the purpose of management of chemicals in the country, a Chemical Management Cell is under consideration in the Ministry of Environment where basic data on the production/import, storage, distribution, transportation of chemicals is maintained so that the Ministry is able to coordinate the management of chemicals, its impact on the environment. Using the good offices of the Pakistan Environmental Protection Council, the Ministry would be in a suitable position to coordinate its efforts.

1.2.3 Health Profile

The health profile of Pakistan is characterized by high population growth rate, high infant and child mortality rate, high maternal mortality ratio and high burden of communicable diseases. The infant mortality rate and under-5 mortality rate are respectively 77 and 103 per 1000 live births. The major causes of these high rates of mortality include malnutrition, diarrhea, acute respiratory illness and other communicable and vaccine-preventable diseases. Twenty-five per cent (25%) of babies are born with low birth weight. Over 35% of children below 5 years of age are short for their age, over 10% are under weight for their height and over half are anaemic. The maternal mortality rate is also high at 350 per 100000 live births. This is malnutrition and insufficient access to emergency obstetrics care services.

Communicable diseases account for around half of deaths in Pakistan Vaccine preventable diseases, such as measles, hepatitis B and neonatal tetanus, have high prevalence. Other communicable diseases, such as tuberculosis, malaria, hepatitis C, typhoid and meningitis, also contribute significantly to the burden of disease. The incidence of tuberculosis is extremely high in the country, being estimated at 177 cases per 100000 populations per year. Pakistan has the sixth highest burden of tuberculosis in the world. The incidence of malaria cases ranges from 2 to 5 cases per 1000 population. Malaria remains a major public health problem in many areas of Pakistan. Since 2000, the annual number of cases has oscillated between 82 526 and 104 603. However, it is acknowledged by the authorities that not more than 20% of the actual number of cases is recorded. Although malaria is contained in general, the quality of malaria control is not the same in all provinces, which run their programmes with a considerable degree of autonomy. The prgramme is notable weaker in Baluchistan and North-West Frontier Province (NWFP), There are signs of substantial deterioration of the situation in these provinces.

With regard to the HIV/AIDS problem, Pakistan is placed in the low prevalence but high risk category. There are indications of a concentrated HIV epidemic among intravenous drug users, which has become a major concern.

The burden of no communicable diseases is also on the rise. Diabetes, hypertension, cardiovascular diseases and cancer are growing rapidly due to changing lifestyles. It is estimated that no communicable diseases account for 25% of total deaths in Pakistan. However, accurate information on the burden of no communicable diseases is often not available. The number of injuries due to road traffic accidents is high, being estimated at 6.7 per 100000 population, and is expected to increase with growing traffic congestion.

Around 1.8% of the population is blind, mainly due to cataract. Al-Shifa Trust Eye Hospital, the Layton Rahmatullah Benevolent Trust, Pakistan Institute of Community Ophthalmology (PICO) and many more NGOs are working closely with WHO to develop district eye care and train human resources. The country signed the Vision 2020 declaration of support, and a national plan has been developed, but still more expansion and support are needed. Disease control strategies, human resource development for eye care, strengthening of infrastructure and human resources, as well as extra funds are needed.

Poverty is an important factor in the health profile of Pakistan. Those living in absolute poverty are five times more likely to die before reaching the age of 5 years, and 2.5 times more likely to die between the ages of 15 and 59. The major problems in health are due to poverty-related communicable diseases, childhood illnesses, reproductive health problems and malnutrition.

Health Systems Development

Governance

The Federal Ministry of Health and provincial health departments are the principal organizations for ensuring a well-governed health system. However, their capacity for policy analysis and formulation is limited and they are institutionally unequipped to make use of some of the new policy analysis tools such as burden of disease estimation, national health accounts and cost-effectiveness analysis. As a consequence, institutions (such as hospitals, and academic and research institutes) and priority programmes managed by the Federal Ministry of Health and provincial health departments are functioning below their potential capacity.

The recognition of the role of the private health sector, and the ability of the Federal Ministry of Health and provincial health departments to regulate, support and build partnerships with the private sector is limited. At the level of programme implementation the expected benefits of devolution in strengthening the district health system have yet to emerge.

Health Care Financing

The estimated total heal expenditure in Pakistan is US$ 18 per capita of which public expenditure on health is US$ 4 per capita. This compares unfavourable with the figure of US$ 34 per capita recommended by the Commission on Macroeconomics and Health. 15 During 2003-2004, public health expenditure was estimated at Rs.32.80 billion (US$ 565 million) of which Rs. 8.5 billion (US$ 146 million) was development and Rs. 24.30 billion (US$ 418 million) recurring, which is 0.84% of GNP, registering an increase of 13.8% in absolute terms over the past year. 16 While the government has been spending progressively more on health, it has yet to reach the target of 1% of GNP. Out of-pocket payment continues to be significant sorce of financing of health care in Pakistan, accounting for over 75% of total health spending. There is limited experience with social health insurance, except of the employees' social security insurance (ESSI)

scheme under the Social Welfare Department, for the almost 1 million formal sector workers. A national health account study has yet to be undertaken in Pakistan.

Human Resource Development

A major challenge is the imbalance in the health workforce and the lack of nurses, paramedics, skilled birth attendants and health system managers ((Table 1). Currently, for every three physicians there is one nurse and almost 70% of deliveries are not conducted by a skilled birth attendant. The rapid increase in the number of medical colleges, mostly in the private sector, from 20 to 56 over the last 10 years has led to an overproduction of physicians and compromised the quality of medical education. An accreditation system is needed to monitor the quality of educational programmes, especially in the newly established college.

In the area of in-service training and continuing medical education, the health Services Academy in Islamabad and the elaborate infrastructure of provincial and district health development centers are not functioning to their potential and require considerable technical assistance to achieve their mandate. Preliminary estimates indicate that almost 2000 health system managers are required to manage the 126 health districts and 900 public sector hospitals. Recently, emphasis has been placed on community-oriented medical education (COME) but it needs further strengthening. A large number of trained human resources migrate to other countries, leaving a vacuum in the required fields. Currently, there is no federal level unit on heal human resource planning in the Federal Ministry of Health to forecast the requirement in various spheres of human resource.

Health Service Provision

There is an elaborate public Sector health care delivery system, which consists of about 10000 first level care facilities, more than 900 secondary and tertiary care hospitals, and almost 70000 health houses run by lady health workers (LHWs) (Table2).

Table 5: Human Resources for Health

Health Personnel	1990	2000	2003
Registered doctors	52794	92734	108062
Registered nurses	16948	37623	46331
Registered lady health workers (LHWs)*	--	43000	71600
Population per doctor	2082	1529	1404
Population per nurse	6374	3732	3296

* LHW Programme started in 1993

Table 6: Health Infrastructure

Health Infrastructure	1990	2000	2003
Hospitals	756	876	906
Basic health units	4213	5171	5290
Total beds	72997	93907	98684
Population per bed	1480	1495	1536

According to statistic year book 2006, indicated that the total number of registered public health personnel decreased 0.07 percent from 17,137 in 2004 to 17,125 in 2005. The number of doctors decreased 0.6 percent to 2,079; pharmacists decreased 2.8 percent to 377; registered dentists decreased from 233 to 220; and nurses increased 0.6 percent to 7,091; registered midwifes increased 1.1 percent to 2,850; and labs also increased 0.9 percent to 435. The number of other health personnel decreased 2.4 percent to 1,759. The ratio of doctors to the general population was 1:6,638 in 2005, compared to 1:6,453 in 2004, and 1:7,374 in 1997.

The number of health establishments has decreased 8.5 percent to 1,086 in 2005 compared 1,187 in 2004, and was down 13.8 percent compared to 1,260 establishments in 1997. The number of medical beds available was down to 7,599 compared to the previous year, and down 31.5 percent compared to the 11,100 beds available in 1997.

2 Preliminary inventory of mercury use and release in Pakistan

2.1 Introduction

Based on investigations and their experiences, developed countries and some developing countries revealed that the production, consumption, and disposal of chemicals and/or chemical compounds, especially for those that are used in industrial and agricultural sectors, created enormous impacts to the atmosphere, biodiversity, soil, water, human health, etc., not merely for this generation, but also for future generations. The devastation results from the environmental impacts posed a great obstacle to socio-economic development. The nightmare of Minamata, Yokkaichi, and Itai-itai Diseases, for example, were widespread in parts of Japan in the mid 1950s to 1960s, causing damage to human health and domestic animals, and also severely polluted water sources and the atmosphere. To eliminate and phase out these catastrophes, the Japanese Government, in taking more efforts, spent tremendous money and took time for surviving whatever was destroyed. The Minamata Bay tragedy in Japan alerted the world to the potentially lethal effects of industrial chemicals that are discharged into the environment without proper treatment. Many western countries' reports have also mentioned other types of adverse environmental impacts that they have confronted because socio-economy development was undertaken without considering the sustainable environment.

The UNEP Governing Council concluded, at its 22nd session in February 2003, after considering the key findings of the Global Mercury Assessment report, that there is sufficient evidence of significant global adverse impacts from mercury to warrant further international action to reduce the risks to humans and wildlife from the release of mercury to the environment. The Governing Council decided that national, regional and global actions should be initiated as soon as possible and urged all countries to adopt goals and take actions, as appropriate, to identify populations at risk and to reduce human-generated releases. This commitment to addressing the global adverse impacts of mercury pollution was reinforced by Governments at the 23rd session of the Governing Council in February 2005. The Governing Council also requested UNEP, in cooperation and consultation with other appropriate organizations, to facilitate and conduct technical assistance and capacity building activities to support the efforts of countries to take action regarding mercury pollution.

In response to the Governing Council's request, UNEP has established a mercury program within UNEP Chemicals, with the immediate objective to encourage all countries to adopt goals and take actions, as appropriate, to identify exposed populations, minimize exposures through outreach efforts, and reduce anthropogenic mercury releases.

This report is considering mercury release into the environment through the use of mercury and mercury contained in products, as well as through use of certain high volume materials with mercury trace concentrations. The calculation of mercury release into the environment is made based on guideline, methods, sources, and factors mentioned in the "***UNEP toolkit for identification and quantification of mercury releases***".

2.2 Mercury release sources identified in Pakistan

Major source categories and subcategories of mercury release listed in the UNEP toolkit are listed in table 1. The table also shows which mercury sources exist in Pakistan. Due to limitations in data availability and constraints in time and budget, it has not been possible to quantify all mercury release sources present in Pakistan; the table shows which sources have been identified as part of this preliminary inventory work.

Table 7: Classification sources of mercury release

No.	Categories and sub-categories of mercury release courses	Pakistan source
1	**Extraction and use of fuels/energy sources**	
1.1	Coal combustion in large power plants	✓
1.2	Other coal use	✓
1.3	Mineral oils - extraction, refining and use	✓
1.4	Natural gas - extraction, refining and use	✓
1.5	Other fossil fuels - extraction and use	×
1.6	Biomass fired power and heat production	✓
1.7	Geothermal power production	×
2	**Primary (virgin) metal production**	
2.1	Mercury (primary) extraction and initial processing	×
2.2	Gold and silver extraction with mercury amalgamation processes	✓
2.3	Zinc extraction and initial processing	✓
2.4	Copper extraction and initial processing	✓
2.5	Lead extraction and initial processing	×
2.6	Gold extraction and initial processing by methods other than mercury amalgamation	×
2.7	Aluminum extraction and initial processing	✓
2.8	Other non-ferrous metals - extraction and processing	×
2.9	Primary ferrous metal production	✓
3	**Production of other minerals and materials with mercury impurities**	
3.1	Cement production	✓
3.2	Pulp and paper production	✓
3.3	Production of lime and light weight aggregates	✓
4	**Intentional use of mercury in industrial processes**	
4.1	Chlor-alkali production with mercury-technology	✓
4.2	VCM production with mercury catalyst	×
4.3	Acetaldehyde production with mercury catalyst	×
4.4	Other production of chemicals and polymers with mercury	×
5	**Consumer products with intentional use of mercury**	
5.1	Thermometers with mercury	✓
5.2	Electrical switches and relays with mercury	×
5.3	Light sources with mercury	✓
5.4	Batteries with mercury	×
5.5	Biocides and pesticides with mercury	×
5.6	Paints with mercury	×
5.7	Cosmetics and related products with mercury	×
6	**Other intentional product/process use**	
6.1	Dental mercury-amalgam fillings	✓
6.2	Manometers and gauges with mercury	✓
6.3	Laboratory chemicals and equipment with mercury	✓
6.4	Mercury metal use in religious rituals and folklore medicine	×
6.5	Miscellaneous product uses, mercury metal uses, and other sources	✓
7	**Production of recycled metals ("secondary" metal production)**	
7.1	Production of recycled mercury ("secondary production")	✓
7.2	Production of recycled ferrous metals (iron and steel)	✓
7.3	Production of other recycled metals	✓
8	**Waste incineration**	

No.	Categories and sub-categories of mercury release courses	Pakistan source
8.1	Incineration of municipal/general waste	×
8.2	Incineration of hazardous waste	×
8.3	Incineration of medical waste	✓
8.4	Sewage sludge incineration	×
8.5	Informal waste incineration	✓
9	**Waste deposition / land-filling and waste water treatment**	
9.1	Controlled landfills/deposits	✓
9.2	Diffuse disposal under some control	×
9.3	Informal local disposal of industrial production waste	✓
9.4	Informal dumping of general waste	✓
9.5	Waste water system/treatment	✓
10	**Crematoria and cemeteries**	
10.1	Crematoria	×
10.2	Cemeteries	×
11	**Potential hotspots**	✓

Source: ***UNEP Toolkit, Pilot draft, November 2005***

2.3 Methodology

Ministry of Environment adopted the following methodology to implement Mercury Inventory Pilot Project in Pakistan;

1. Recruitment of the personnel
2. Creation of Stakeholder team
3. Identification of mercury and mercury products uses and releases by federal/provincial EPA's.
4. The selection of areas susceptible/effected for mercury contamination in the country.
5. Collection of water, air and soil samples from the country with the help of federal/provincial EPA's.
6. Analysis of the samples in the laboratories of Institute of the chemistry, University of the Punjab, Lahore.
7. Data collection of mercury and mercury products from mercury usage markets/industries in the country.
8. Technical working group and consultation meetings of all stakeholders.
9. Training of core members of the team by UNEP expert.
10. Preparation of baseline data/inventory of mercury and mercury products about the current situation in the country.

For conducting the inventory of the release of mercury at the preliminary survey from various sources including desk study, the responsible stakeholders team was formed and comprised fourteen members and was approved by the Secretary Environment namely as follow:

1. Mr. Khizar Hayat
   Joint Secretary (International Cooperation) Project Manager, Ministry of Environment
2. Mr. Zaigham Abbas
   Technical Officer (Chemical) Project Coordinator, Ministry of Environment
3. Mr. Muhammad Suhail Anwar
   Local Expert/Consultant Ministry of Environment

4.	Mr. Ahmad Rauf Secretary (Custom Tariff-I)	Member, Federal Board of Revenue (FBR)
5.	Mr. Zulfiqar Ali Senior Chemist, EMS–Project	Member, Pak-EPA, Ministry of Environment
6.	Dr. Muhammad Bashir Khan Director General	Member, EPA, N.W.F.P, Peshawar
7.	Mr. Naseer Ahmad Khatak Chemist	Member, EPA, N.W.F.P, Peshawar
8.	Mr. Ainuddin Agha Research Officer	Member, EPA, Balochistan, Quetta
9.	Mr. S. M. Yahya Deputy Director (Labs)	Member, EPA, Sindh, Karachi
10.	Mr. Ashiq Ali Assistant Director	Member, EPA, Sindh, Karachi
11.	Mr. Jahangeer Asad Chemist – EMS,	Member, EPA, Sindh, Karachi
12.	Muhammad Farooq Alam Assistant Director	Member, EPA, Punjab, Lahore
13.	Prof. Dr. Ch. Jamil Anwar Director	Member, Institute of Chemistry, University of the Punjab, Lahore
14.	Dr. Tariq Mehmood Assistant Professor	Member, Institute of Chemistry, University of the Punjab, Lahore

To accomplish the objectives of mercury data, the Mercury Project Coordinator requested to stakeholders team to be able using the UNEP Toolkit for preparing the inventory throughout the country, as mercury issue is a new subject for Pakistan. Prior to this, Pakistan had no experience in preparing an inventory of mercury releases. Knowledge on the inventory process, and concepts and techniques regarding data gathering and analysis is very limited, even though the members of the stakeholders team took part in the three Technical Working Group and consultative meetings in the Ministry of Environment, Islamabad.

Before conducting the inventory, the stakeholders team had identified 04 provinces and 1 federal territory, where expected to have potential release of mercury, based on the above categories release sources and human activities. Those 04 provinces are: Punjab, Bolochistan, Sindh, NWFP.

Emission factor is a parameter that plays a fundamental role in the calculation of the release of mercury into the environment. If emission factors cannot be assigned values, we cannot effectively calculate the release of mercury. In this regard, the UNEP Toolkit clearly identifies emission factor values according to specific source categories/sub-categories. Although the UNEP Toolkit is a very useful document for the development of a mercury release inventory report, even it mostly seems to be designed for use in developed countries rather than developing countries. This may create some confusion for developing countries with limited experience.

Determining release sources for Pakistan mainly depended on the UNEP Toolkit even in a few cases pose some difficulty and complexity. For determining suitable release sources in this case,

we considered and elaborately debated with Mr. Guibert, UNEP's international consultant, to find available solutions based on the UNEP Toolkit. In this regards and based on local knowledge, the mercury inventory team decided to focus the survey work for primary data on selected sources including:

1. Chlor-alkali plants
2. Health sector (hospital, health care, and clinic) for both mercury contained in products (thermometer and amalgam filling) and mercury release from waste incineration,
3. Landfill (municipal waste dumping),

Besides undertaking field survey for primary data production, the inventory team had undertaken desk study on other sources of possibility mercury release including:

4. Secondary ferrous and non-ferrous metal production
5. Energy sources
6. Waste burning (industrial and medial waste)
7. Cremation
8. Cell batteries,
9. Production of lime, etc.

3 Quantification of mercury releases

Information and data gathering from survey and desk study, the estimated amount of mercury use and release in Pakistan will be discussed by each category set under UNEP Toolkit as the following description.

3.1 Extraction and use of fuels/energy sources

3.1.1 Natural gas - extraction, refining and use

Activity rates

The fossil fuel used for Pakistani household cooking is a Natural gas .Cooking by using liquefied petroleum gas (LPG) and Compressed Natural Gas (CNG) for vehicles have been present in Pakistan.

The information/data regarding Sector wise Natural Gas Consumption in Pakistan during 2007-08.

Table 8: Natural Gas Consumption in Pakistan

Unit: MMCFT

Sectors	**2007-2008**	**%age**
Power	425,138	33.5
Fertilizer	199,845	15.7
G. Industries	322,510	25.4
Cement	12,725	1.0
CNG/Transport	72,019	5.7
Commercial	33,753	2.7
Domestic	204,138	16.1
Total	**1,270,128**	**100.0**

Average per Day	**3,480**	

3.2 Primary metal production-small scale gold mining

Pakistan is an agricultural country. So far no primary mercury production is extracted in Pakistan context

3.3 Production of other minerals and materials with mercury impurities

There are no production activities of other minerals and materials with mercury impurities in Pakistan, except the production of lime and bricks.

3.4 Intentional use of mercury in industrial processes

Chlor-alkali production with mercury cell technology is the major intentional use of mercury in industrial processes in Pakistan.

The status of chlor-alkali industry in Pakistan regarding use of mercury is as below;

Table 9: chlor-alkali industry in Pakistan

S.#	Name of Industry	Capacity (tons)	Basis
1	Sitara Chemicals	180,000	100% Production is based on Membrane Cell
2	Ittehad Chemicals	132,000	60% Production is based on Membrane Cell
3	Nimir Chemicals	10,000	100% Production is based on Membrane Cell

10,000 M. Tons of Caustic Soda consumes Mercury (Hg) = 2.5 M. Tons

I M. Tons of Caustic Soda consumes Mercury (Hg) = 2.5/10,000=0.00025 M. Tons

0.00025 Ton Or 0.25 Kg per Metric Tons of Caustic Soda

Total Capacity of Pakistan is 322,000 M. Tons out of which 20% is based on mercury cell technology.

3.5 Consumer products with intentional use of mercury

There are 8 sub-categories addressed in the UNEP Toolkit regarding consumer products with intentional use of mercury including:

1. Thermometers with mercury
2. Electrical and electronic switches, contacts and relays with mercury
3. Light sources with mercury
4. Batteries containing mercury
5. Biocides and pesticides
6. Paints
7. Pharmaceuticals for human and veterinary uses
8. Cosmetics and related products

So far, no one knows about the mercury being use in the above described products except thermometers and batteries. Nevertheless, there is no record on about where thermometers and batteries have been used and how many thermometers and batteries have been distributed or dispose of within the country. Based on history, it was understood that such mercury thermometers had been used as medical thermometer, ambient air temperature thermometer, in chemical laboratory, and in industrial equipment, while batteries are being use to power electrical device, i.e. radio throughout the country.

Beside information on thermometer and battery containing mercury, there are no any information related to the quantity of other consumer products i.e. electrical and electronic switches, light source with mercury (fluorescent lamps), biocides and pesticides, paints, pharmaceuticals for human and veterinary uses, and cosmetic and related products been imported to Pakistan or been disposed of neither in a yearly basis or in a period of time. So, the calculation of the releases of mercury from these types of products is not available.

3.6 Other intentional products/process uses

Other intentional products use in this category is referring to various products including amalgam fillings, manometers and gauges, laboratory chemicals and equipment, and others. For Pakistan context, mercury metal use in religious rituals does not exist. Beside this, for mercury use in manometers and gauges, laboratory chemicals and equipment, and remain we have no information and data, whether of origin and quantity imported, or where supplied to. Nevertheless, it is known that such product have been use in health cares (manometers and gauges) and laboratories.

Source description

Mercury may be released to air, water, and wastes during the use and disposal of amalgam fillings especially during the placing of fillings and the removal of fillings or teeth containing fillings. The releases can be also occurred after the death of a person with fillings, e.g. dental amalgams,

In Pakistan history on when the dental clinics operated are remains unknown. Most of dental clinics are operated by private sector and few by public sector. Most dental clinics have from one to four chairs in operation and other few dental clinics may up to 10 chairs. .

There are several types of tooth filling materials in use in Pakistan including amalgam, composite, glass ionomer cement, poly carboxylate cement, and ceramic. Pakistani people who went to dental clinic prefer to use composite for filling their tooth rather than amalgam. Ceramic materials are favorite use by wealthy people.

According to dentists report, it is known that amalgam is usually supplied in two forms either 1) as pure mercury along with a powder mix of the other metals, which are weighed and mixed in the clinic; or 2) as small capsules where mercury and the metal powder are present in the right proportions and need only to be mixed (in the capsule before opening) in the clinic, prior to filling the cavity in the tooth.

3.7 Production of recycled metals (secondary metal production)

The category 7 indicates the mercury release from the production of recycled metals regarded as secondary metal production. There are three types of sub-categories considering in this sector including (1) production of recycled mercury, (2) production of recycled ferrous metal (iron and steel) and (3) production of other recycled metals. In Pakistan practices, the secondary metal production is available only for scraped iron, aluminum, copper, and lead.

3.8 Waste incineration

The category 8 (waste incineration) refer to any waste that going to burned down at incinerators regardless with or without air pollution control system. As indicated in the UNEP Toolkit, there are five type of waste incineration sub-categories addressed including: incineration of municipal/general wastes, incineration of hazardous waste, incineration of medical waste, incineration of sewage sludge, and informal incineration (burning) of waste. In this regards and based on Pakistan context, the waste incineration in Pakistan can be addressed only one type i.e. medical waste incineration.

3.9 Waste deposition/land filling and waste water treatment

The category 9 (waste disposal) refer to any waste that going to disposal of at landfill or backyard. As indicated in the UNEP Toolkit, there are five type of waste deposition and waste water treatment sub-categories addressed including: controlled landfills/deposit, diffuse deposition under some control, informal local disposal of industrial production waste, informal dumping of general waste, and waste water treatment. In this regards and based on Pakistan context, the waste deposition in Pakistan can be addressed in three types: (1) controlled landfill; (2) waste water treatment, and (3) informal waste disposal.

3.10 Crematoria and cemeteries

The practice of burning dead bodies is not practiced in Pakistan**.**

3.11 Identification of potential hot-spots

The potential hot-spots of mercury release identified by the UNEP Toolkit refer to post or abandon sites of chemical production, pulp and paper manufacturing, chlor-alkali production, etc. which classified as the following:

- Closed/abandoned chlor-alkali production sites
- Other sites of former chemical production where mercury compounds were produced (pesticides, biocides, pigments etc.), or mercury or compounds were used as catalysts (VCM/PVC etc.)
- Closed production sites for manufacturing of thermometers, switches, batteries and other products
- Closed pulp and paper manufacturing sites (with internal chlor-alkali production or former use of mercury-based slimicides)
- Tailings/residue deposits from mercury mining
- Tailings/residue deposits from artisanal and large scale gold mining
- Tailings/residue deposits from other non-ferrous metal extraction
- Sites of relevant accidents
- Dredging of sediments
- Sites of discarded district heating controls (and other fluid controls) using mercury pressure valves
- Sites of previous recycling of mercury ("secondary" mercury production)

In Pakistan, there are two abandoned chlor alkali plant and can be considered as potential hot-spot of mercury release.

3.12 Overview of the Inventory Results

Pakistan has a different and complex situation regarding the collection of exact data about the use and release of mercury compared to some other developed and developing countries. However, the data of Pakistan is based on estimation due to non availability of proper inventory of mercury and mercury containing products.

4 Conclusion

It is the first time in the history of Pakistan in preparing a report on the use and release of mercury throughout the country for use as a key document for global sound management of mercury release. To achieve the goal of reporting in this area, the responsible stakeholders team in cooperation with concerned ministries, their line agencies, and local authorities conducted survey on mercury use and release sources in 04 selected provinces and federal territory.

While carrying out the survey at the concerned ministries, provincial departments, local authorities, etc. and various sites, the stakeholders team faced many problems regarding critical gaps in making and keeping statistical records, such as shortage of reliable data and information from the various generating/releasing sources. In this regard, most data/information was obtained by estimations made by local line institutions and as a result, the stakeholders team had some difficulty in calculating actual levels of the release of mercury into the environment. Despite these challenges, through the survey activities stakeholders become more aware of mercury issues and related harmful effects to human health and the ecosystem.

Nevertheless, the stakeholders team tried their best in obtaining and calculation for the release of mercury to the environment and they can conclude that the total quantity of mercury in Pakistan is approximately **34013 Kg** for there year from 2005-2008. The stakeholders team assumed that this amount may be released to the environment which was unable to obtain the exact information for calculation including electrical and electronic switches, light sources with mercury, biocides and pesticides, paints, pharmaceuticals for human and veterinary uses, cosmetics and related products, etc.

This findings and conclusion is made by the inventory team for its preliminary survey on the release of mercury throughout the country, without present this results to concerned ministries, stakeholders, and civil societies for reflecting, comments and update data and information, if applicable. So, it is recommended that, a full inventory on the release of mercury shall be carried out in the near future, which will enable Pakistan to prepare proper plan for sound management of mercury release, basically dealing with sound management of release sources. For such a full inventory it will be necessary to collect all information from various sectors fields as specified in categories and sub-categories addressing in the UNEP Toolkit, which reflecting to Pakistan context.

As Pakistan is faced with severe constraints related to the national budget and knowledgeable people in this area, the country requires further assistance in terms of both budget and technical support from GEF/UNEP and other international communities and donors, in order to perform such further inventories and management plans. This will assist Pakistan in sound management of mercury, which will provide benefits for not only the current generation, but also for the next generations though out the globe.

5 Appendices

5.1 Appendix 1: Quantity of mercury imported, 2005-2008

SUMMARY OF IMPORT DATA FOR THE PERIOD JUL-2005 TO JUN-2006

S.#	IMPORTER NAME	QUANTITY (KG)
1	MERCK (PRIVATE LIMITED)	3
2	REHAN AHMED AND COMPANY	7
3	PHILIPS ELECTRICAL INDUSTRIES OF PAKISTAN LIMITED	345
4	SITARA CHEMICAL INDUSTRY	2,146
5	FAUJI FERTILIZER COMPANY LIMITED	1
6	NAEEM ALI SHAH	400
7	CROWN LIGHTING (PVT.) LIMITED	690
8	TAYYABA FABRICS	50
9	CROWN LIGHTING (PVT.) LIMITED	30
TOTAL		**3,672**

SUMMARY OF IMPORT DATA FOR THE PERIOD JUL-2006 TO JUN-2007

S.#	IMPORTER NAME	QUANTITY (KG)
1	MERCK (PRIVATE LIMITED)	9
2	MARI GAS COMPANY LIMITED	4
3	PHILIPS ELECTRICAL INDUSTRIES OF PAKISTAN LIMITED	1,031
4	ITTEHAD CHEMICALS LIMITED	21,735
5	FAUJI FERTILIZER COMPANY LIMITED	4
6	UNIVERSAL DENTAL (PVT.) LIMITED	40
7	CROWN LIGHTING (PVT.) LIMITED	53
TOTAL		**22,876**

SUMMARY OF IMPORT DATA FOR THE PERIOD JUL-2007 TO SEP-2008

S.#	IMPORTER NAME	QUANTITY (KG)
1	PHILIPS ELECTRICAL INDUSTRIES OF PAKISTAN LIMITED	345
2	ITTEHAD CHEMICALS LIMITED	7100
3	UNIVERSAL DENTAL (PVT.) LIMITED	20
TOTAL		**7465**

5.2 Appendix 2: Identified sampling points for mercury inventory by EPAs

i. Identification of Sampling Points for Mercury inventory by EPA, N.W.F.P

Source of sample	Sub Source	Number of Sample			Total Samples	Location
		Air Sample	Soil Sample	Water Sample		
1. Extraction of Fuel and Fuel Source	Coal combustion in large power plant	3	3		21	1. Cherat Cement, NWFP 2. Kohat Cement 3. Lucky Cement
	Other coal Combustion	4	4			1. Aeen Khan, Inkalab Roak Peshawar 2. Niaz Muhammad, Bad abera Kohat Road Peshawar 3. Ihsanaullah, PAF cannal Road Peshawar 4. Qazi Abdul Raziq, Sehim Chock Peshawar
	Extraction, refining and used of natural gas	2	2	2		1. Gugari Plant, Karrak 2. Shaker dara Plant, Karrak
	Bio Mass fire Power and heat production	2				1. Frontier Chip Board, Peshawar 2. Peshawar Particle Board, Peshawar
2. Primary metal production	Lead extraction and initial processing			1	3	1. Pakistan accumulator (Volt Batteries)
	Zink, copper, Aluminium					1. National Steel furnace 2. Neelam Steel Furnace
3. Production of others minerals and material mercury impurities	Cement Production		3		13	1. Cherat Cement, NWFP 2. Kohat Cement 3. Lucky Cement
	Pulp and paper production	2		2		1. Olympia 2. Premier For 3. .+mica
	Lime production in light weight aggregate	4				Nowshera

	kilns					
	Other mineral in material			2		1. Malakand mining Mardan 2. Rizvi mining Haripur
4. International use of mercury in industrial processes.	VCM (Vinylchloride monomer) production with mercury dichloride as catalyst	5	5	5	15	1. Royal PVC Peshawar 2. Seven Star PCV Peshawar 3. Pak PVC Peshawar 4. Rehman PVC Mardan 5. Nowshehra PVC Nowshehra
5. Consumer products with intentional use of mercury	Electrical and electronic switches, contacts and relies with mercury and light source with mercury	3		3	12	1. Yaspa electric industry SIE Mardan 2. Swat cables SIE Abbottabad 3. Khyber lamps manufacturing plant Pabbi
	Paint		3	3		1. Tahir paint industry SIE Peshawar 2. Neelam paints industry Havelian 3. China paint industry Nowshera
6. Other intentional products and process use	Dental mercury amalgam filling		5	5	30	1. Khyber college of den testy Peshawar 2. HMC Peshawar 3. LRH Peshawar 4. CMH Peshawar 5. Dabagari garden Peshawar 6. Ayub medical complex Abbotabad
	Laboratory chemical and equipment		10	10		1. PCSIR Lab Peshawar 2. Public health engineering Peshawar 3. PCRWR Peshawar 4. MTL Peshawar 5. DTL Peshawar 6. Chemistry

						department UOP 7. Chemistry department KUST 8. Chemistry department UO Hazara 9. Chemistry department Swat 10. Chemistry department UO D.I Khan
7. Waist incineration	Incineration of municipal/general waist	6	6		12	1. Labour colonies Peshawar 2. Back of KTH Hospital 3. Regimal Lalma 4. Warsak Road 5. Ring Road 6. GT Road Hashneghri
8. Waste deposition/Land filling and waste water treatment	Informal dumping of general waste		25		25	All 25 Districts of NWFP
Total = 8	**19**	**33**	**66**	**35**	**134**	

ii. Identification of Sampling Points for Mercury inventory by EPA, Sindh

S.#	Sampling Sources	No: Source	No: Sample
1	Mass Fired Power Product (Sugar Mills)	07	14
2	Gold processing (Gold smith in Karachi)	10	10
3	Cement product (including cement factories out side the Karachi city)	10	10
4	Pulp & paper industry	10	10
5	Light sources with mercury (bulb and tube lights etc)	10	10
6	Paint (manufacturing units)	10	10
7	Pharmaceuticals	10	20
8	Cosmetics (industrial effluents and products)	10	10
9	Dental clinics	20	20
10	Laboratories (clinical and general Laboratories)	10	10
11	Municipal (landfills and controlled dumping incineration etc)	10	10
12	Informal general waste dumping sites	10	10
Total		**127**	**144**

iii. Identification of Sampling Points for Mercury inventory by EPD, Punjab

1) Extraction of Oils/Fuels

1.1 POL Pindori Rawalpindi
1.2 Pindi Khep

2) Use of Oil and energy sources

2.1 Use of coal
2.1.1 Brick kilns,
2.1.2 Cement industries

There are 10 cement industries in Jehlum, Chakwal, Khusam, Mianwali and DG Khan Punjab using coal in their production.

2.2 Furance Oil
2.2.1 Power plants

There are about 12-16 thermal power plants in Punjab of different capacities using HFO as fuel.

3) Production of other energies and materials.

Ceramics and Glass industries are possible sources which are in Gujranwala, Gujrat, Sheikhupura and Lahore.

4) Intentional use of Mercury in Industrial processes.

4.1 Pesticides, Insecticides manufacturing.

There are 3 major uses of Mercury in District Sheikhupura and Faisalabad which are Ittehad Chemicals, Nimir Chemicals and Sitara Chemicals.

5) Consumer Products with intentional use of Mercury

Mercury cells, Mercury Thermometers

6) Production of Recycled Metals,

There are hundreds of units of metal works in form of melting furnaces, foundries and steel re-rolling mills mainly concentrated in Lahore Sheikhupura, Kasur, Faisalabad and Gujranwala.

7) Waste Incineration

There are two hospital waste incinerators in Lahore and one in Multan.

8) Waste Deposition/Land Filling and waste water treatment.

8.1 There is no proper land fill in the province however open land filling is available in every city.

8.2 There are almost 15-20 waste water treatment plants which are mainly constructed by textile units in districts of Lahore, Kasur, Sheikhopura and Pindi Bhattian

9) Identification of Potential Hot Spots

Possible Hot spot may be district Shikhupura wher Ittehad Chemical and Nimer chemical are major user and releaser of mercury in the Environment.

iv. Identification of Sampling Points for Mercury inventory EPA, Balochistan

S.No.	Sample Collection Sites
1	Quetta Industrial zone (Sirki Road)
2	Quetta Industrial zone (Western By Pass)
3	Hub Industrial Zone
4	Civil Hospital area
5	BMC Hospital area
6	Quetta main city area
7	Mariabad area
8	Brewery area
9	Sabzal area
10	Miyan Gundi area
11	Airport area
12	Hazar Ganji area
13	Hana Lake area
14	By pass (both) area

v. Identification of Sampling Points for Mercury inventory by Pak-EPA

S.#	Types of Samples	Area for sample collection	Total Sample
1	Air	1. Industrial area, sector I-9 & 10 2. Zero pints 3. Kashmir Highway 4. Blue area 5. others proposed area	10
2	Water	1. Industrial waste water 2. Rawal Dam 3. Simli Dam 4. Muncipal waste water 5. Hospital waste water 6. others area	20
3	Solid waste/land	1. Hospital waste 2. Industrial waste 3. Amalgam process waste 4. Agriculture land 5. others area	15
4	Soil	1. Point in industrial area 2. Agriculture land near industrial area and others.	5

5.3 Appendix 3: Identified sampling points for mercury inventory by UNEP Expert

Appendix 5: Mercury containing products in markets of Pakistan

Mercury Containing Products in Markets of Pakistan

S.#	Source	Mercury Content
1	Barometers and Vacuum Gauges	Mercury content generally ranges from 300 to 600 grams. Rare old collectable barometers have been found to contain as much as 6 kilograms mercury.
2	Batteries	Mercury-containing batteries generally consist of the button cell type found in wrist watches, hearing aids, calculators and various types of applications in labs, hospitals, military and commercial facilities
		Batteries generally contain between 5 and 25 milligrams of mercury per battery. Specially batteries for labs, hospitals and military and commercial applications may have higher mercury content
3	Dental Amalgam	Silver coloured dental amalgams generally contain about 50% mercury.
4	Flame Sensors	Sensors contain about 1 gram of mercury.
5	Flowmeters	Flowmeter can contain up to 5000 grams of mercury
6	Hydrometers	Content can range from 0.002 grams to 1 gram depending on the application and size of instrument
7	Hyrometers/Psychrometers	Content generally ranges from 3 to 7 grams
8	Compact Fluorescent Lamps	Mercury content is generally between 1 and 25 milligrams.
9	Fluorescent U-Tubes	Mercury content is approximately 3 to 12 milligrams
10	Fluomeric Lamps	Content is approximately 2 milligrams per lamp
11	Linear Fluorescent Lamps	Content ranges from 3 to 12 milligrams (mercury-reduced lamps) to 10 to 50 milligrams (non-mercury reduced lamps).
12	Mercury Vapor Lamps	Content varies with wattage from 25 milligrams in a 75-watt lamp) to 10 to 50 milligrams (non-mercury reduced lamps).
13	Sodium Vapor Lamps	Mercury mass varies with wattage from 20 milligrams (35-watt lamp) to 145 milligrams (1000-watt lamp)
14	Manometers	Milking system manometers contain approximately 340 grams of mercury other manometers may contain from 100 to 500 grams or more
15	Esophageal Dilators	Esophageal dilators may contain more than 1000 grams of mercury
16	Gastrointestinal Dilators	These devices may contain approximately 1000 grams when filled to capacity
17	Sphygmomanometers	Content can vary from 20 to 60 grams of mercury
18	Mercury Compounds	Mercury can be found in a variable range in the following chemicals, mixtures of chemicals and waste. Chemical examples include: • Arsenic-calcium regent

		• Elemental mercury • Mercuric sulfate • Mercurous Chloride • Merthiolate (Thiomersal)
19	Pyrometers	Content ranges from 5 to 10 grams
20	Relays	The device is sealed and found mainly in molding machines, large battery charges, and industrial electric heaters. Other applications include mining and refineries Mercury content can vary, but can be in the range of 150 grams

Appendix 6: Mercury and mercury products in the field of health in Pakistan

Mercury and Mercury Products in the Field of Health in Pakistan

Hospital Instruments:

The hospital instruments, which contain mercury, are give below;

Thermometers

Body temperature thermometers
Heating & cooking system thermometers
Incubator, water bath thermometers
Calibration thermometers

Sphygmomanometers

Blood pressure monitoring devices
Gastrointestinal tubes
Cantor tubes
Esophageal dilators
Feeding tubes
Miller Abbott tubes

Dental Amalgams

Pharmaceutical supplies

Contact lens solutions
Ophthalmic products containing thimerosal
Phenylmercuric acetate
Phenylmercuric nitrate
Diuretics with mersalyl and mercury salts
Pregnancy test kits with Hg containing preservatives
Merbromin water solution
Nasal spray with thimersol

Cleaners & detergents with Hg containing caustic soda or chlorine

Medical use Batteries

Alarms
Blood analyzers
Defibrillators
Hearing aids
Meters
Monitors
Pacemakers
Pumps
Scales
Telemetry transmitters
Ultrasound
Ventilators

Non – medical uses Batteries

Lamps
Fluorescent
Germicidal
High intensity discharge or high pressure sodium, mercury vapor metal hoders

Electrical equipment

Tilt switches
Airflow control
Building security
Chest freezer lids
Fire alarms
Laptop computers
Pressure control
Silent light switches
Temperature control
Washing machines

Flout control

Septic tanks
Sump pumps
Thermostats (non-digital)
Thermostant probes
Read relays analytical equipment
Plunger or displacement relays

Thermostant probes in gas

Appliances
Flame sensors
Base safety values

Pressure gauges

Barometers
Manometers
Vacuum gauges

Hospital Devices

Blood gas analyzer
Cathod – ray oscilloscope
Electron microscope
Flow meters
Generators
Hitachi chem. Analyzers
ESA lead analyzer
Sequential multi channel-auto analyzer
Vibration meters

Laboratory chemicals

Stone analysis kits
Antibody test kits
Antigens
Antiserums
Buffers
Acetic acid
Ammonium regent
Calibration kits
Diluents
Conjugate kits
Enzyme immunoassay test kits
Enzyme tracers
Ethanol
Extraction enzymes
Immu- sol
Phenobarbital reagent
Positive & negative control kits
Phenyloin regent
Potassium hypochlorite
Lab stains
Substance abuse test kits
Sulfuric acid
Fixatives
Hematology reagents
Hormones
Thimersol
Tracer kits
Urine test kits
Immuno electrophoresis regent
Immuno fixation phoresis regent

Appendix 7: Data of mercury and mercury compounds from the markets/institutes of Pakistan

Data from the Markets of Lahore, Karachi, Quetta, Kasur, Rawalpindi and Research Institutes

Cheap Chemicals Store, Lahore

S.#	Mercury Compounds	Qty
1	Mercury (Hg) (commercial)	10 kg
2	Mercuric Chloride (HgCl2)	10 kg
3	Mercuric Iodide (HgI) (red)	15 kg
4	Mercuric Nitrate (HgNO3)	5 kg
5	Mercuric Oxide (HgO) Yellow & Red	15 kg
6	Mercuric Sulphate (HgSO4)	10 kg
7	Mercuric Sulphide (HgS) (red)	800 gm
8	Mercurous Acetate (C4 H6 Hg2 O2)	10 kg
9	Mercurochrome	20 kg

Akbari Chemicals Store, Lahore

S.#	Mercury Compounds	Qty
1	Commercial Mercury 99.9%	100 kg

Merck (Pvt.) Ltd, Lahore

S.#	Mercury Compounds	Qty
1	Mercuric Chloride (HgCl2)	1kg
2	Mercuric Sulphate (HgSO4)	2.5 kg
3	Mercuric Bromide (HgBr)	1 kg
4	Mercuric Nitrate (HgNO3)	750 gm

Nawab Chemical Store, Karachi

S.#	Mercury Compounds	Qty
1	Commercial Mercury 99.9%	100 kg

Dawawala Chemical Corporation , Karachi

S.#	Mercury Compounds	Qty
1	Mercuric Chloride (HgCl2)	15 kg

Mohammad Jamil Sons, Karachi

S.#	Mercury Compounds	Qty
1	Commercial Mercury 99.9%	60 kg

Rahat Chemicals , Quetta

S.#	Mercury Compounds	Qty
1	Mercuric Chloride (HgCl2)	500 gm
2	Mercuric Sulphate (HgSO4)	3 kg
3	Mercuric Nitrate (HgNO3)	1 kg

Alam Instruments & Chemicals , Quetta

S.#	Mercury Compounds	Qty
1	Mercuric Chloride (HgCl2)	2 kg
2	Mercuric Sulphate (HgSO4)	5 kg

Kasur Tannery Waste Management Agency (KTWMA), Kasur

S.#	Mercury Compounds	Qty
1	Mercuric Sulphate (HgSO4)	1.5 kg

Data from the Markets of Rawalpindi

1. Shalimar Scientific Store

S.#	Mercury & Mercury Containing Products	Qty
1	Analitical Grade Pure Mercury	20 kg
2	Normal Grade Pure Mercury	20 kg
3	Thermometer 110 c	100
4	Barometer	5

2. Scientific Home

S.#	Mercury & Mercury Containing Products	Qty
1	Analitical Grade Pure Mercury	13 kg
2	Normal Grade Pure Mercury	18 kg
3	Mercuric Bromide (HgBr)	4 kg
4	Mercuric Sulphate (HgSO4)	2 kg
5	Mercuric Chloride (HgCl2)	3 kg

3. Nobel Scientific Traders

S.#	Mercury & Mercury Containing Products	Qty
1	Analitical Grade Pure Mercury	7 kg
2	Normal Grade Pure Mercury	10 kg
3	Mercuric Sulphate (HgSO4)	1 kg
4	Mercuric Chloride (HgCl2)	2 kg
5	Thermometer 110 c	60
6	Barometer	4

4. Medi Plus Chemist

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	72
2	Safety Thermometer	12
3	B.P Apparatus	4

5. Shaheen Chemist

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	100
2	Safety Thermometer	35
3	B.P Apparatus	7

6. Khattak Chemist

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	500
2	Safety Thermometer	300
3	B.P Apparatus	15

7. City Surgical

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	40
2	B.P Apparatus	5

8. The Mall Chemist

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	100
2	Safety Thermometer	30
3	B.P Apparatus	5

9. W. Watson Chemist

S.#	Mercury & Mercury Containing Products	Qty
1	Master Thermometer	200
2	Safety Thermometer	800
3	B.P Apparatus	4

Institute of Chemistry University of the Punjab, Lahore

In Stock

Chemical Name	Qty
Mercury Metal	24.5 Kg
Mercury Chloride	600 gm
Mercury Cyanide	165 gm
Mercury Iodide	1.7 kg
Mercury Iodide (red)	750 gm
Mercury Oxide (Yellow)	300 gm

Seldom Used (on Demand)

Chemical Name
Mercury Acetate
Mercury Bromide
Mercurous Chloride
Mercury Oxide (red)
Mercuric Sulfate
Mercuric Thiocyanate

Pakistan Council for Scientific and Industrial Research (PCSIR), Lahore

S.#	Mercury Compounds	Qty
1	Mercuric Sulphate (HgSO4)	2 kg

Appendix 8: Pictorial glimpses of mercury project in Pakistan

Pictures of Meetings, Industries and Sampling Points


"National Consultative Meeting on
Identification and Quantification of
Mercury in Pakistan"
UNEP