



**FEDERAL MINISTRY OF ENVIRONMENT
NIGERIA**

**INVENTORY OF MERCURY
RELEASES IN NIGERIA**

April 2012

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INVENTORY OF MERCURY RELEASES IN NIGERIA

1. EXECUTIVE SUMMARY OF MERCURY INVENTORY RESULTS

This report has been prepared for the Government of Nigeria for the objectives and to the scope set out in the report.

This report has inputs from relevant stakeholders that have submitted data on mercury-containing materials and devices, and mercury in processes. The information being accepted as provided, has not been independently checked and could contain errors in estimates made. Stakeholders that made data available for the different sectors highlighted in the Toolkit inventory Level 1 are: Federal Ministry of Trade and Investment, Power Holding Company of Nigeria (PHCN), the National Bureau of Statistics (NBS), Abuja Environmental Protection Board (AEBP) and the Lagos Waste Management Authority (LAWMA).

Information on the use of mercury, and natural and anthropogenic fate and transport of mercury, in Nigeria is not readily available and in some cases incomplete.

The inadequacies experienced in comprehensivity of data may have resulted in over or under-estimates of particular sectors.

The table below summarises mercury releases from highlighted source categories.

This mercury release inventory was made with the use of the "Toolkit for identification and quantification of mercury releases" made available by the United Nations Environment Programme's Chemicals division (UNEP Chemicals). The Toolkit is available at UNEP Chemicals' website:

<http://www.unep.org/hazardoussubstances/Mercury/MercuryPublications/GuidanceTrainingMaterialToolkits/MercuryToolkit/tabid/4566/language/en-US/Default.aspx>.

This inventory was developed on the Toolkit's Inventory Level 1. The Toolkit is based on mass balances for each mercury release source type. Inventory Level 1 works with pre-determined factors used in the calculation of mercury inputs to society and releases, the so-called default input factors and default output distribution factors. These factors were derived from data on mercury inputs and releases from such mercury source types from available literature and other relevant data sources.

Results and discussion

An aggregated presentation of the results for main groups of mercury release sources is presented in Table 1.1 below.

**INVENTORY LEVEL 1 -
EXECUTIVE SUMMARY**

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal
Coal combustion and other coal use	13.5	12.1	0.0	0.0	0.0	1.3	0.0
Other fossil fuel and biomass combustion	1,780.8	1,780.8	0.0	0.0	0.0	0.0	0.0
Oil and gas production	49,502.3	148.6	9,806.8	0.0	50.9	133.3	0.0
Primary metal production (excl. gold production by amalgamation)	123,743.6	12,387.8	3.3	37,179.0	37,084.4	6.9	37,082.2
Gold extraction with mercury amalgamation	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other materials production	43,521.0	26,112.6	0.0	0.0	8,704.2	8,704.2	0.0
Chlor-alkali production with mercury-cells	-	-	-	-	-	-	-
Other production of chemicals and polymers	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Production of products with mercury content	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Use and disposal of dental amalgam fillings	25,518.6	510.4	8,472.2	0.0	918.7	4,899.6	4,899.6
Use and disposal of other products	43,054.6	3,452.4	4,735.8	2,381.7	0.0	29,592.5	2,892.1
Production of recycled metals	1,198.6	395.5	0.0	407.5	0.0	395.5	0.0
Waste incineration and open waste burning*1	162,941.9	159,147.7	0.0	0.0	0.0	0.0	3,794.2
Waste deposition*1	16,425.0	164.3	1.6	0.0	-	-	-
Informal dumping of general waste *1*2	17,172.3	1,717.2	1,717.2	13,737.9	-	-	-
Waste water system/treatment *3	1,540.8	0.0	1,386.7	0.0	0.0	154.1	0.0
Crematoria and cemeteries	6,830.5	0.0	0.0	6,830.5	0.0	0.0	0.0
TOTALS	314,820.0	205,830.0	24,740.0	46,800.0	46,760.0	43,890.0	48,670.0

Table 1.1: INVENTORY LEVEL 1 - EXECUTIVE SUMMARY

As shown in the Table 1.1, the following source groups contribute with the major mercury inputs: Use and disposal of other products, Waste Incineration and Open Waste Burning*1, Primary metal production (excl. gold production by amalgamation) Oil and Gas Production and other materials production.

The individual mercury release sub-categories contributing with the highest mercury inputs were Open fire waste burning (on landfills and informally), Production of Zinc from concentrates, Production of Lead from Concentrates, Oil Extraction and Cement Production.

The individual mercury release sub-categories contributing with the highest mercury releases to the atmosphere were Open fire waste burning (on landfills and informally), incineration of medical waste and Cement Production.

Detailed presentation of mercury inputs and releases for all mercury release source types present in the country are shown in the following report sections.

2. MERCURY RELEASE SOURCE TYPES PRESENT

Table 2-1 shows which mercury release sources were identified as present and absent, respectively, in the country. Only source types positively identified as present are included in the quantitative assessment.

It should be noted however, that the presumably minor mercury release source types shown in Table 2-2 were not included in the detailed source identification and quantification work.

INVENTORY LEVEL 1 - MERCURY SOURCES IDENTIFIED

Source category	Source present? Y/N/?
Energy consumption	
Coal combustion in large power plants	Y
Other coal uses	Y
Combustion/use of petroleum coke and heavy oil	Y
Combustion/use of diesel, gasoil, petroleum, kerosene	Y
Use of raw or pre-cleaned natural gas	Y
Use of pipeline gas (consumer quality)	Y
Biomass fired power and heat production	Y
Charcoal combustion	Y
Fuel production	
Oil extraction	Y
Oil refining	Y
Extraction and processing of natural gas	Y
Primary metal production	
Mercury (primary) extraction and initial processing	?
Production of zinc from concentrates	Y
Production of copper from concentrates	Y
Production of lead from concentrates	Y
Gold extraction by methods other than mercury amalgamation	Y
Alumina production from bauxite (aluminium production)	Y
Primary ferrous metal production (iron, steel production)	Y

Gold extraction with mercury amalgamation - without use of retort	Y
Gold extraction with mercury amalgamation - with use of retorts	?
Other materials production	
Cement production	Y
Pulp and paper production	Y
Production of chemicals	
Chlor-alkali production with mercury-cells	N
VCM production with mercury catalyst	N
Acetaldehyde production with mercury catalyst	N
Production of products with mercury content	
Hg thermometers (medical, air, lab, industrial etc.)	N
Electrical switches and relays with mercury	N
Light sources with mercury (fluorescent, compact, others: see guideline)	N
Batteries with mercury	Y
Manometers and gauges with mercury	N
Biocides and pesticides with mercury	Y
Paints with mercury	Y
Skin lightening creams and soaps with mercury chemicals	Y
Use and disposal of products with mercury content	
Dental amalgam fillings ("silver" fillings)	Y
Thermometers	Y
Electrical switches and relays with mercury	Y
Light sources with mercury	Y
Batteries with mercury	Y
Polyurethane (PU, PUR) produced with mercury catalyst	Y
Paints with mercury preservatives	Y
Skin lightening creams and soaps with mercury chemicals	Y
Medical blood pressure gauges (mercury sphygmomanometers)	Y
Other manometers and gauges with mercury	Y
Laboratory chemicals	Y
Other laboratory and medical equipment with mercury	Y
Production of recycled of metals	
Production of recycled mercury ("secondary production")	Y
Production of recycled ferrous metals (iron and steel)	Y
Waste incineration	
Incineration of municipal/general waste	Y
Incineration of hazardous waste	Y
Incineration of medical waste	Y
Sewage sludge incineration	Y
Open fire waste burning (on landfills and informally)	Y
Waste deposition/landfilling and waste water treatment	

Controlled landfills/deposits	Y
Informal dumping of general waste *1	Y
Waste water system/treatment	Y
Crematoria and cemeteries	
Crematoria	?
Cemeteries	Y

Table 2-1 Identification of mercury release sources in the country; sources present (Y), absent (N), and possible but not positively identified (?).

Miscellaneous mercury release sources not quantified on Inventory level 1

Source category	Source present?
	Y/N/?
Combustion of oil shale	
Combustion of peat	
Geothermal power production	
Production of other recycled metals	
Production of lime	
Production of light weight aggregates (burnt clay nuts for building purposes)	
Chloride and sodium hydroxide produced from mercury-cell technology	
Polyurethane production with mercury catalysts	
Seed dressing with mercury chemicals	
Infra red detection semiconductors	
Bougie tubes and Cantor tubes (medical)	
Educational uses	Y
Gyroscopes with mercury	
Vacuum pumps with mercury	
Mercury used in religious rituals (amulets and other uses)	
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	
Use of mercury as a refrigerant in certain cooling systems	
Light houses (levelling bearings in marine navigation lights)	
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	Y
Tanning	Y
Pigments	Y
Products for browning and etching steel	
Certain colour photograph paper types	
Recoil softeners in rifles	Y
Explosives (mercury-fulminate a.o.)	
Fireworks	Y
Executive toys	Y

Table 2-2 Miscellaneous potential mercury sources not included in the quantitative inventory; with preliminary indication of possible presence in the country.

3. SUMMARY OF MERCURY INPUTS TO SOCIETY

Mercury inputs to society should be understood here as the mercury amounts made available for potential releases through economic activity in the country. This includes mercury intentionally use in products such as thermometers, blood pressure gauges, fluorescent light bulbs, etc. It also includes mercury mobilised via extraction and use of raw materials which contains mercury in various concentrations.

INVENTORY LEVEL 1 - SUMMARY OF MERCURY INPUTS

Source category	Source present?			Estimated Hg input, Kg Hg/y
	Y/N/?	Activity rate	Unit	Standard estimate
Energy consumption				
Coal combustion in large power plants	Y	8,051	t coal combusted/y	2
Other coal uses	Y	41,771	t coal used/y	11
Combustion/use of petroleum coke and heavy oil	Y	590,220	t oil product combusted/y	32
Combustion/use of diesel, gasoil, petroleum, kerosene	Y	5,581,739	t oil product combusted/y	31
Use of raw or pre-cleaned natural gas	Y	1,695,473,028	Nm3 gas/y	170
Use of pipeline gas (consumer quality)	Y	93,933,653,956	Nm3 gas/y	21
Biomass fired power and heat production	Y	50,000,000	t biomass combusted/y (dry weight)	1,500
Charcoal combustion	Y	228,311	t charcoal combusted/y	27
Fuel production				
Oil extraction	Y	888,000,008	t crude oil produced/y	48,840
Oil refining	Y	8,959,404	t oil refined/y	493
Extraction and processing of natural gas	Y	1,695,473,028	Nm3 gas/y	170
Primary metal production				
Mercury (primary) extraction and initial processing	?	0	t mercury produced/y	?
Production of zinc from concentrates	Y	600,000	t concentrate used/y	63,000
Production of copper from concentrates	Y	0	t concentrate used/y	0
Production of lead from concentrates	Y	600,000	t concentrate used/y	60,600
Gold extraction by methods other than mercury amalgamation	Y	2,000	t gold ore used/y	110
Alumina production from bauxite (aluminium production)	Y	21,200	t bauxit processed/y	11
Primary ferrous metal production (iron, steel production)	Y	460,000	t pig iron produced/y	23
Gold extraction with mercury amalgamation - without use of retort	Y	0	kg gold produced/y	0
Gold extraction with mercury amalgamation - with use of retorts	?	0	kg gold produced/y	?
Other materials production				
Cement production	Y	158,258,267	t cement produced/y	43,521
Pulp and paper production	Y	0	t biomass used in	0

			production/y	
Production of chemicals				
Chlor-alkali production with mercury-cells	N	0	t Cl2 produced/y	-
VCM production with mercury catalyst	N	0	t VCM produced/y	-
Acetaldehyde production with mercury catalyst	N	0	t acetaldehyde produced/y	-
Production of products with mercury content				
Hg thermometers (medical, air, lab, industrial etc.)	N	0	kg mercury used for production/y	-
Electrical switches and relays with mercury	N	0	kg mercury used for production/y	-
Light sources with mercury (fluorescent, compact, others: see guideline)	N	0	kg mercury used for production/y	-
Batteries with mercury	Y	0	kg mercury used for production/y	0
Manometers and gauges with mercury	N	0	kg mercury used for production/y	-
Biocides and pesticides with mercury	Y	0	kg mercury used for production/y	0
Paints with mercury	Y	0	kg mercury used for production/y	0
Skin lightening creams and soaps with mercury chemicals	Y	0	kg mercury used for production/y	0
Use and disposal of products with mercury content				
Dental amalgam fillings ("silver" fillings)	Y	170,123,740	number of inhabitants	25,519
Thermometers	Y	4,728,000	items sold/y	4,728
Electrical switches and relays with mercury	Y	170,123,740	number of inhabitants	23,817
Light sources with mercury	Y	3,000,000	items sold/y	49
Batteries with mercury	Y	0	t batteries sold/y	0
Polyurethane (PU, PUR) produced with mercury catalyst	Y	170,123,740	number of inhabitants	5,104
Paints with mercury preservatives	Y	0	t paint sold/y	0
Skin lightening creams and soaps with mercury chemicals	Y	0	t cream or soap sold/y	0
Medical blood pressure gauges (mercury sphygmomanometers)	Y	0	items sold/y	0
Other manometers and gauges with mercury	Y	170,123,740	number of inhabitants	851
Laboratory chemicals	Y	170,123,740	number of inhabitants	1,701
Other laboratory and medical equipment with mercury	Y	170,123,740	number of inhabitants	6,805
Production of recycled of metals				
Production of recycled mercury ("secondary production")	Y	0	kg mercury produced/y	0
Production of recycled ferrous metals (iron and steel)	Y	1,089,600	number of vehicles recycled/y	1,199
Waste incineration				
Incineration of municipal/general waste*1	Y	0	t waste incinerated/y	0
Incineration of hazardous waste*1	Y	0	t waste incinerated/y	0
Incineration of medical waste*1	Y	1,580,912	t waste incinerated/y	37,942
Sewage sludge incineration*1	Y	0	t waste incinerated/y	0
Open fire waste burning (on landfills and informally)*1	Y	25,000,000	t waste burned/y	125,000

Waste deposition/landfilling and waste water treatment				
Controlled landfills/deposits *1	Y	3,285,000	t waste landfilled/y	16,425
Informal dumping of general waste *1*2	Y	3,434,465	t waste dumped/y	17,172
Waste water system/treatment *3	Y	293,483,520	m3 waste water/y	1,541
Crematoria and cemeteries				
Crematoria	?	0	corpses cremated/y	?
Cemeteries	Y	2,732,187	corpses buried/y	6,830
TOTAL of quantified inputs				314,820

Table 3-1 Summary of mercury inputs to society

The sub-categories with highest inputs were: Paints with Mercury Preservatives, Open fire waste burning (on landfills and informally), Production of Zinc from concentrates, Production of Lead from concentrates, Oil extraction, Cement production, Medical blood pressure gauges (mercury sphygmomanometers) and incineration of medical waste.

4. SUMMARY OF MERCURY RELEASES

In the Table 4-1 below, a summary of mercury releases from all source categories present is given. The key mercury releases here are releases to air (the atmosphere), to water (marine and freshwater bodies, including via waste water systems), to land, to general waste, and to sectors specific waste. An additional output pathway is "by-products and impurities" which designate mercury flows back into the market with by-products and products where mercury does not play an intentional role. See Table 4-2 below for a more detailed description and definition of the output pathways.

Table 4-1 Summary of mercury releases

INVENTORY LEVEL 1 - SUMMARY OF RELEASES

Source category	Estimated Hg releases, standard estimates, Kg Hg/y					
	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal
Energy consumption						
Coal combustion in large power plants	2.0	0.0	0.0	0.0	0.2	0.0
Other coal uses	10.2	0.0	0.0	0.0	1.1	0.0
Combustion/use of petroleum coke and heavy oil	32.5	0.0	0.0	0.0	0.0	0.0
Combustion/use of diesel, gasoil, petroleum, kerosene	30.7	0.0	0.0	0.0	0.0	0.0
Use of raw or pre-cleaned natural gas	169.5	0.0	0.0	0.0	0.0	0.0

Use of pipeline gas (consumer quality)	20.7	0.0	0.0	0.0	0.0	0.0
Biomass fired power and heat production	1,500.0	0.0	0.0	0.0	0.0	0.0
Charcoal combustion	27.4	0.0	0.0	0.0	0.0	0.0
Fuel production						
Oil extraction	0.0	9,768.0	0.0	0.0	0.0	0.0
Oil refining	123.2	4.9	0.0	0.0	73.9	0.0
Extraction and processing of natural gas	25.4	33.9	0.0	50.9	59.3	0.0
Primary metal production						
Mercury (primary) extraction and initial processing	?	?	?	?	?	?
Production of zinc from concentrates	6,300.0	0.0	18,900.0	18,900.0	0.0	18,900.0
Production of copper from concentrates	0.0	0.0	0.0	0.0	0.0	0.0
Production of lead from concentrates	6,060.0	0.0	18,180.0	18,180.0	0.0	18,180.0
Gold extraction by methods other than mercury amalgamation	4.4	2.2	99.0	4.4	0.0	0.0
Alumina production from bauxite (aluminium production)	1.6	1.1	0.0	0.0	6.9	1.1
Primary ferrous metal production (iron, steel production)	21.9	0.0	0.0	0.0	0.0	1.2
Gold extraction with mercury amalgamation - without use of retort	0.0	0.0	0.0	0.0	0.0	0.0
Gold extraction with mercury amalgamation - with use of retorts	?	?	?	?	?	?
Other materials production						
Cement production	26,112.6	0.0	0.0	8,704.2	8,704.2	0.0
Pulp and paper production	0.0	0.0	0.0	0.0	0.0	0.0
Production of chemicals						
Chlor-alkali production with mercury-cells	-	-	-	-	-	-
VCM production with mercury catalyst	-	-	-	-	-	-
Acetaldehyde production with mercury catalyst	-	-	-	-	-	-
Production of products with mercury content						
Hg thermometers (medical, air, lab, industrial etc.)	-	-	-	-	-	-
Electrical switches and relays with mercury	-	-	-	-	-	-
Light sources with mercury (fluorescent, compact, others: see guideline)	-	-	-	-	-	-
Batteries with mercury	0.0	0.0	0.0	0.0	0.0	0.0
Manometers and gauges with mercury	-	-	-	-	-	-
Biocides and pesticides with mercury	0.0	0.0	0.0	0.0	0.0	0.0
Paints with mercury	0.0	0.0	0.0	0.0	0.0	0.0
Skin lightening creams and soaps with mercury chemicals	0.0	0.0	0.0	0.0	0.0	0.0
Use and disposal of products with mercury content						

Dental amalgam fillings ("silver" fillings)	510.4	8,472.2	0.0	918.7	4,899.6	4,899.6
Thermometers	472.8	1,418.4	0.0	0.0	2,836.8	0.0
Electrical switches and relays with mercury	2,381.7	0.0	2,381.7	0.0	19,053.9	0.0
Light sources with mercury	2.4	0.0	0.0	0.0	46.3	0.0
Batteries with mercury	0.0	0.0	0.0	0.0	0.0	0.0
Polyurethane (PU, PUR) produced with mercury catalyst	510.4	255.2	0.0	0.0	4,338.2	0.0
Paints with mercury preservatives	0.0	0.0	0.0	0.0	0.0	0.0
Skin lightening creams and soaps with mercury chemicals	0.0	0.0	0.0	0.0	0.0	0.0
Medical blood pressure gauges (mercury sphygmomanometers)	0.0	0.0	0.0	0.0	0.0	0.0
Other manometers and gauges with mercury	85.1	255.2	0.0	0.0	510.4	0.0
Laboratory chemicals	0.0	561.4	0.0	0.0	561.4	578.4
Other laboratory and medical equipment with mercury	0.0	2,245.6	0.0	0.0	2,245.6	2,313.7
Production of recycled of metals						
Production of recycled mercury ("secondary production")	0.0	0.0	0.0	-	0.0	0.0
Production of recycled ferrous metals (iron and steel)	395.5	0.0	407.5	0.0	395.5	0.0
Waste incineration						
Incineration of municipal/general waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration of hazardous waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration of medical waste	34,147.7	0.0	0.0	0.0	0.0	3,794.2
Sewage sludge incineration	0.0	0.0	0.0	0.0	0.0	0.0
Open fire waste burning (on landfills and informally)	125,000.0	0.0	0.0	0.0	0.0	0.0
Waste deposition/landfilling and waste water treatment						
Controlled landfills/deposits	164.3	1.6	0.0	-	-	-
Informal dumping of general waste *1	1,717.2	1,717.2	13,737.9	-	-	-
Waste water system/treatment *2	0.0	1,386.7	0.0	0.0	154.1	0.0
Crematoria and cemeteries						
Crematoria	?	?	?	?	?	?
Cemeteries	0.0	0.0	6,830.5	-	0.0	0.0
TOTAL of quantified releases	205,830.0	24,740.0	46,800.0	46,760.0	43,890.0	48,670.0

Note that the following source sub-categories made the largest contributions to mercury releases to the atmosphere: [Open Fire Waste Burning (on landfills and informally), Cement production, Production of Zinc from concentrates and Production of Lead from concentrates].

The following source sub-categories made the largest contributions to mercury releases to water: Oil extraction and Dental Amalgam, fillings ("silver fillings"), Other laboratory and medical equipment with mercury, Informal dumping of general waste *1 and Thermometers .

The following source sub-categories made the largest contributions to mercury releases to land: Production of zinc and lead from concentrates and Informal dumping of general waste*1.

The following source sub-categories made the largest contributions to mercury releases as By-products and impurities: Production of zinc and lead from concentrates and cement production.

The following source sub-category made the largest contributions to mercury releases as general wastes: Electrical switches and relay with mercury, Dental amalgam fillings ("silver" fillings) and Polyurethane (PU, PUR) produced with mercury catalyst.

Table 4-2 below provides general descriptions and definitions of the output pathways.

Calculation result type	DescriptionE
Estimated Hg input, Kg Hg/y	The standard estimate of the amount of mercury entering this source category with input materials, for example calculated mercury amount in the amount of coal used annually in the country for combustion in large power plants.
Air	<p>Mercury emissions to the atmosphere from point sources and diffuse sources from which mercury may be spread locally or over long distances with air masses; for example from:</p> <ul style="list-style-type: none"> • Point sources such as coal fired power plants, metal smelter, waste incineration; • Diffuse sources as small scale gold mining, informally burned waste with fluorescent lamps, batteries, thermometers..
Water	<p>Mercury releases to aquatic environments and to waste water systems: Point sources and diffuse sources from which mercury will be spread to marine environments (oceans), and freshwaters (rivers, lakes, etc.). for example releases from:</p> <ul style="list-style-type: none"> • Wet flue cleaning systems from coal fired power plants; • Industry, households, etc. to aquatic environments; • Surface run-off and leachate from mercury contaminated soil and waste dumps
Land	<p>Mercury releases to soil, the terrestrial environment: General soil and ground water. For example releases from:</p> <ul style="list-style-type: none"> • Solid residues from flue gas cleaning on coal fired power plants used for gravel road construction; • Uncollected waste products dumped or buried informally • Local un-confined releases from industry such as on site hazardous waste storage/burial • Spreading of sewage sludge with mercury content on agricultural land (sludge used as fertilizer) • Application on land, seeds or seedlings of pesticides with mercury compounds

Calculation result type	DescriptionE
By-products and impurities	<p>By-products that contain mercury, which are sent back into the market and cannot be directly allocated to environmental releases, for example:</p> <ul style="list-style-type: none"> • Gypsum wallboard produced from solid residues from flue gas cleaning on coal fired power plants. • Sulphuric acid produced from desulphurization of flue gas (flue gas cleaning) in non-ferrous metal plants with mercury trace concentrations • Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with mercury trace concentrations • Metal mercury or calomel as by-product from non-ferrous metal mining (high mercury concentrations)
General waste	<p>General waste: Also called municipal waste in some countries. Typically household and institution waste where the waste undergoes a general treatment, such as incineration, landfilling or informal dumping. The mercury sources to waste are consumer products with intentional mercury content (batteries, thermometers, fluorescent tubes, etc.) as well as high volume waste like printed paper, plastic, etc., with small trace concentrations of mercury.</p>
Sector specific waste treatment /disposal	<p>Waste from industry and consumers which is collected and treated in separate systems, and in some cases recycled; for example.</p> <ul style="list-style-type: none"> • Confined deposition of solid residues from flue gas cleaning on coal fired power plants on dedicated sites. • Hazardous industrial waste with high mercury content which is deposited in dedicated, safe sites • Hazardous consumer waste with mercury content, mainly separately collected and safely treated batteries, thermometers, mercury switches, lost teeth with amalgam fillings etc. • Confined deposition of tailings and high volume rock/waste from extraction of non-ferrous metals

Table 4-2 Description of the types of results.

5. DATA AND INVENTORY ON ENERGY CONSUMPTION AND FUEL PRODUCTION

Coal combustion in large power plants & Other coal uses

Nigeria has vast deposit of coal that is not documented as being used for generation of electricity and other uses since the 1970s. The 2009 initial mercury profile records other coal uses as 41,771tonnes coal used/y (the year is not stated) and the coal type is sub-bituminous coal. The estimated mercury input is 11kgHg/y. Coal combustion in large power plants is 8,051tonnes coal combusted/y and the estimated mercury input is 2kgHg/y. Presently, in Nigeria, Coal is not documented as being used for the generation of electricity and other uses is not stated.

The use of coal in Nigeria for power generation and other used cannot be predicted as it depends on the availability of safer, cheaper and easily assessable alternatives.

Combustion/use of petroleum coke and heavy oil

Demand for oil in Nigeria is high and varies according to available types. Combustion of petroleum coke and heavy oil/uses is documented to be 590,220 tonnes oil product combusted /y and the estimated mercury input is 32kgHg/y. Information source is the Nigerian National Petroleum Corporation (NNPC) Monthly Petroleum Information Report.

Combustion/use of diesel, gasoil, petroleum, kerosene

The demand for diesel, gasoil, petroleum, kerosene is high in the country, as they are used for energy generation, fuelling, cooking etc. The Nigerian National Petroleum Corporation (NNPC) Monthly Petroleum Information Report, documents the combustion of diesel, gasoil, petroleum and kerosene to be 5,581,739 tonnes oil product combusted/y. The estimated mercury input is 31kgHg/y.

Note: To arrive at the figure under the activity rate column, estimates presented by NNPC for February 2012 was multiplied by 12 months.

Use of raw or pre-cleaned natural gas

According to the Nigerian National Petroleum Corporation (NNPC) Monthly Petroleum Information Report, the annual use of raw or pre-cleaned natural gas is 1,695,473,028 Nm³ gas/y. The estimated mercury input is 170kgHg/y.

Note: To arrive at the figure under the activity rate column, estimates presented by NNPC for August 2011 was multiplied by 12 months.

Use of pipeline gas (consumer quality)

According to the Power Holding Company of Nigeria (PHCN) 93,933,653,956 Nm³gas/y is the activity rate (2009&2010) and the estimated mercury input is 21kgHg/y.

Note: To arrive at the figure under the activity rate column, estimates presented by PHCN for 2009 and 2010 were added together and averaged.

Biomass fired power and heat production

The activity rate is 50,000,000tonnes biomass combusted/y and the estimated mercury input is 1,500kgHg/y. Information source is the “Strategic Development in Renewable Energy in Nigeria”, A paper presented to the International Association for Energy Economics by Abubakar Sambo (Director General, Energy Commission of Nigeria).

Charcoal combustion

Annual coal combustion as extracted from the “Review of Technology for the production and use of Charcoal (Daniel Kammen, Debra J. Len) is 228,311 tonnes charcoal combusted/y. The estimated mercury input is 27kgHg/y.

Oil Extraction

According to the Nigerian National Petroleum Corporation, Monthly Petroleum Information Report, annual crude oil produced is 880,000,008tonnes. Estimated mercury input is 48,840kgHg/y.

Note: To arrive at the figure under the activity rate column, estimates presented by NNPC for August 2011 was multiplied by 12 months.

Oil Refining

8,959,404 tonnes oil refined in 2011 according to the Nigerian National Petroleum Corporation, Monthly Petroleum Information Report. The estimated mercury input is 493kgHg/y.

Note: To arrive at the figure under the activity rate column, estimates presented by NNPC for August 2011 was multiplied by 12 months.

Extraction and processing of natural gas

The activity rate for extraction and processing of natural gas for 2011 is 2,392,838,899Nm³gas/y and the estimated mercury input is 1,909kgHg/y. Information source is the Nigerian National Petroleum Corporation, Monthly Petroleum Information Report.

Note: To arrive at the figure under the activity rate column, estimates presented by NNPC for August 2011 was multiplied by 12 months.

6. DATA AND INVENTORY ON DOMESTIC PRODUCTION OF METALS AND RAW MATERIALS

Mercury (primary) extraction and initial processing

There are no documented records of this activity in Nigeria. No available data.

Production of Zinc from concentrates

The USGS 2010 Minerals Yearbook documents this activity in Nigeria and the rate per annum is 600,000tconcentrates used/y. The estimated mercury input is 63,000kgHg/y.

Production of Copper from concentrates

Copper is produced in Nigeria, but available information is inadequate to estimate output.

Production of Lead from concentrates

The USGS 2010 Minerals Yearbook documents this activity in Nigeria and the rate per annum is 600,000tconcentrates used/y. The estimated mercury input is 60,000kgHg/y.

Gold extraction by methods other than mercury amalgamation

The Nigerian Initial Mercury Profile documents this activity in Nigeria and the rate per annum is 2,000tonnes (year yet to be verified). The estimated mercury input is 110kgHg/y.

Alumina production from Bauxite (aluminium production)

21,200 tonnes bauxite was processed for year 2010, according to the USGS 2010 Mineral Yearbook. The estimated mercury input is 11kgHg/y.

Primary ferrous metal production (iron, steel production)

The Nigerian Initial Mercury Profile documents this activity in Nigeria and the rate per annum is 460,000tonnes (year yet to be verified). The estimated mercury input is 23kgHg/y.

Gold extraction with mercury amalgamation - without use of retort

Available Information is inadequate.

Gold extraction with mercury amalgamation - with use of retorts

Available Information is inadequate.

Cement production

According to information provided by the Nigerian Bureau of Statistics and the Federal Ministry of Trade and Investment, Nigeria, the activity rate for cement production in Nigeria is 158,258,267tonnes/y Nigerian Initial Mercury Profile documents this activity in Nigeria and the rate per annum and the estimated mercury input is 43,521kgHg/y.

Pulp and paper production

No data but Nigeria produces pulp and paper

The current contributors to mercury emissions in the sector are metal production and cement production. The major contributor is zinc production from concentrates. Presently in Nigeria, Illegal mining of gold is being carried out with the use mercury or lead.

7. DATA AND INVENTORY ON DOMESTIC PRODUCTION AND PROCESSING WITH INTENTIONAL MERCURY USE

Chlor-alkali production with mercury-cells

No Data. Available Information is inadequate.

VCM production with mercury catalyst

No Data. Available Information is inadequate.

Acetaldehyde production with mercury catalyst

No Data. Available Information is inadequate.

Mercury (Hg) thermometers (medical, air, laboratory, industrial etc.)

No Data. Available Information is inadequate.

Electrical switches and relays with mercury

No Data. Available Information is inadequate.

Light sources with mercury (fluorescent, compact, others: see guideline)

No Data. Available Information is inadequate.

Batteries with mercury

No Data. Available Information is inadequate.

Manometers and gauges with mercury

No Data. Available Information is inadequate.

Biocides and pesticides with mercury

No Data. Available Information is inadequate.

Paints with mercury

The use of mercury in paints is prevalent in the informal paint sector where monitoring and enforcement is weak and there is low awareness on the hazard of mercury. Available information on the use of mercury in paints is inadequate and data is

unavailable. The use of mercury in the general paint sector should be verified in future work.

Skin lightening creams and soaps with mercury chemicals

Illegal importation of creams and soaps containing mercury chemicals are carried out everyday in Nigeria. No data is available. The use of mercury in soaps and cream production is banned.

8. DATA AND INVENTORY ON WASTE HANDLING AND RECYCLING

All the source sectors under waste handling and recycling are present in Nigeria, except the Production of recycled mercury ("secondary production").

Production of recycled mercury("secondary production)

Available Information is inadequate.

Production of Recycled ferrous metals (iron and steel)

The activity rate for production of recycled ferrous metals (iron and steel) is 1,089,600 number of vehicles recycled/year. Estimated mercury input is 1,199 KgHg/y. Information Source is the Abuja Environmental Protection Board (AEPB).

Incineration of municipal/general waste

No Data. Available information is Inadequate.

Incineration of hazardous waste

No Data. Available Information is inadequate.

Incineration of medical waste

Activity rate is 1,580,912 twaste incinerated/yr, estimated input is 37,942kgHg/yr

Sewage sludge incineration

No Data. Available Information is inadequate

Open fire waste burning (on landfills and informally)

Activity rate is 25,000,000 twaste burned/yr, estimated mercury input is 125,000kgHg/yr. Information Source is the paper on "Municipal Solid Waste Characteristics and Management in Nigeria" July 2009.

Controlled landfills/deposits

Activity rate is 3,285,000 twaste landfilled/yr, estimated mercury input is 16,425kgHg/yr. Information source is the Abuja Environmental Protection Board (AEPB).

Informal dumping of general waste *1

Activity rate is 3,434,465 twaste dumped/yr, estimated mercury input is 17,172kgHg/yr. Information source is the Abuja Environmental Protection Board (AEPB).

Waste water system/treatment

Activity rate is 293,483,520m³ waste water/yr, estimated mercury input is 1541kgHg/yr. Information source is the Abuja Environmental Protection Board (AEPB).

9. DATA AND INVENTORY ON GENERAL CONSUMPTION OF MERCURY IN PRODUCTS, AS METAL MERCURY AND AS MERCURY CONTAINING SUBSTANCES

Nigeria has a population of 170,123,740 inhabitants. The entire source categories under this section are present in Nigeria. Available information is inadequate for some. Detailed information on the source categories are as stated in Table 3.1 and Table 4.1.

Thermometers

Medical Mercury Thermometers sold in 2011 is 4,728,000. Estimated Mercury input is 4,728kgHg/y. Information source is the National Hospital Abuja.

Note: To arrive at the figure under the activity rate column, estimates presented by National Hospital Abuja, Nigeria NNPC was multiplied by the number of tertiary and primary Health centres in Nigeria.

Paints with Mercury Preservatives

Illegal importation of Paints with mercury preservatives are carried out everyday in Nigeria and also; the informal sector of the paint industry make use of mercury. Available information on the use of mercury as preservatives is inadequate and data is unavailable. Information should be verified in future work.

Medical Blood Pressure Gauges (mercury sphygmomanometers)

Mercury Sphygmomanometers are in use in the health sector of the nation. However, available information is inadequate and data is unavailable. Detailed information should be verified in future work.

10. DATA AND INVENTORY ON CREMATORIA AND CEMETERIES

Crematoria

Information available is inadequate.

Cemeteries

Activity rate for cemeteries is 2, 732, 18 corpses buried/y and the estimated Mercury input is 6,830 kgHg/y. Information source is CIA World Fact Book, July 2011.

Note: Annual death was calculated based on the rate stated in the CIA WORLD FACT BOOK, JULY 2011

10. LIST OF MAJOR DATA GAPS

- Lack of database/data on most source categories.
- Inadequate information on source categories.
- Difficulty assessing available data.
- Difficulty verifying available data.

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