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Report on activities under the UNEP mercury programme

Summary report on UNEP mercury inventory activities

Note by the secretariat

1. By paragraph 25 of decision 24/3 IV on chemicals management, the Governing Council of the United Nations Environment Programme (UNEP) requested the Executive Director to continue to facilitate work between the UNEP mercury programme and Governments, other international organizations, non-governmental organizations, the private sector and the partnerships established under the mercury programme, as appropriate, to improve global understanding of international mercury emissions sources, fate and transport and to promote the development of inventories of mercury uses and emissions.
2. Annexed to the present note is a summary report on national results in developing mercury inventories, prepared by the Chemicals Branch of the UNEP Division of Technology, Industry and Economics. The document has been reproduced without formal editing.

* UNEP(DTIE)/Hg/OEWG.2/1.

Annex

Summary Report on UNEP Mercury Inventory Activities

Date: 1 October 2008

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Overview

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 and quantification of mercury releases'. The Pilot Toolkit was released in November 2005.

Activities to date have provided a start in identifying and quantifying mercury use and release at the national level while pilot testing the methodologies outlined within the toolkit. In light of the experiences in using the toolkit, UNEP intends to revise the toolkit before the end of 2008. Input into the toolkit update is welcomed at all times. Input should be sent to: mercury@chemicals.unep.ch .

The attached report on UNEP mercury inventory activities is intended to provide a summary of the current results at the country level and outline observations and lessons learned in applying the toolkit methodology to date.

A number of countries are working with UNEP to develop national mercury inventories while applying the Toolkit methodology, including Cambodia, Pakistan¹, Philippines, Syria and Yemen that participated in a regional project in the Asian region, as well as Burkina Faso and Madagascar.

In addition, Chile, Ecuador and Panama have been working with the United Nations Institute for Training and Research to develop an inventory of releases with special consideration of products situation.

UNEP's national inventory and follow-up action plan project results are available on the Fate and Transport partnership area web page on the UNEP Global Mercury Partnership web-site: www.chem.unep.ch/mercury/partnerships/new_partnership.htm

Additional projects will be initiated as funds become available.

¹ Results are not yet available for Pakistan.

1.0 Summary of Current Results

The following results have been consolidated to provide the mercury open ended working group (OEWG) with an overview of the national mercury inventory results of national level projects undertaken with UNEP. It has been compiled to provide a high level analysis of results. It is recognized that national results will vary depending upon the country situation.

For specific detail at the national level, national project results are available on the Fate and Transport partnership area web page on the UNEP Global Mercury Partnership web-site: www.chem.unep.ch/mercury/partnerships/new_partnership.htm

1.1 – Country profiles: Population and GDP

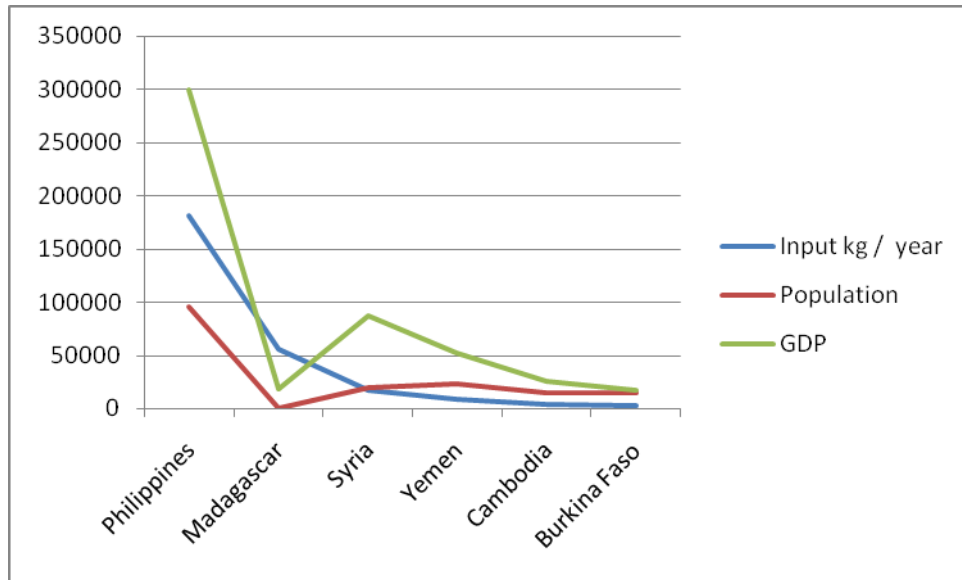
The population and GDP are indicators of both consumption level and economic level.

Table 1: Country profiles: Population and GDP

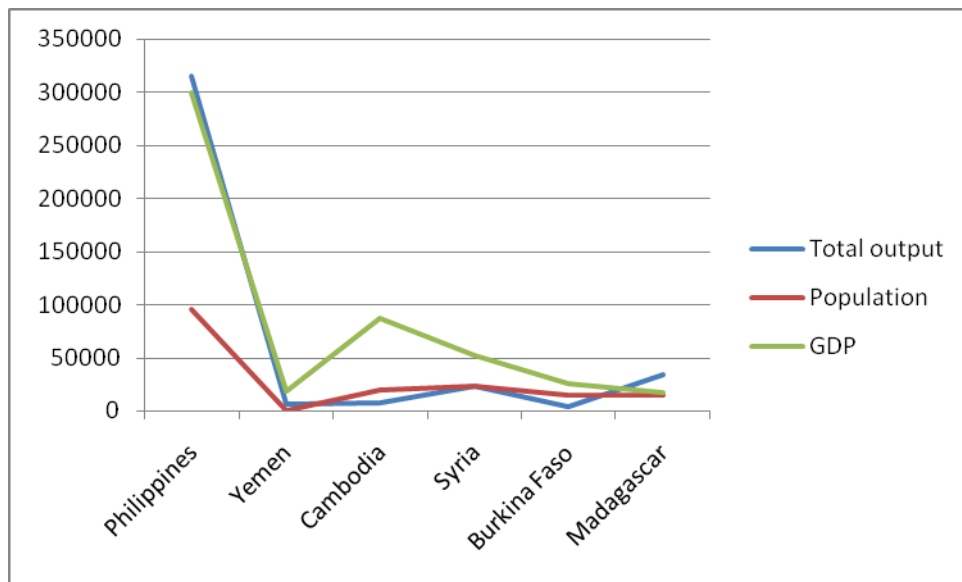
Nom pays	population	GDP (billion \$)
Pakistan	173 000 000	410
Philippines	96 000 000	299
Madagascar	20 000 000	18
Syria	19 747 000	87
Yemen	23 000 000	52
Cambodge	14 000 000	25,9
Burkina Faso	15 000 000	17,2

1.2 – General correlation between population, GDP and Hg Inputs / Outputs

The charts below show the general correlation between population, GDP and inputs / Output of mercury.



Graph 1: Inputs per country compared to Population and GDP



Graph 2: Output per country compared to Population and GDP

1.3 - Categories selected per country

Codes : (S: Syria; P: Philippines; Y: Yemen; C: Cambodia; B: Burkina, M: Madagascar)

The first step outlined within the toolkit is the identification of main source categories at the country level, facilitating preliminary evaluation of activities. The following table highlights the categories identified by countries in applying the toolkit methodology.

The categories provide useful insight. However, they do not illustrate information in terms of mercury input and output.

Table 2: Categories selected per country

no	Sub category name	B	C	M	P	S	Y	Total
511	Coal combustion in large power plants			X	x			2
512	Other coal use	x						1
513	Mineral oils - extraction, refining and use	x	x	X	x	x	x	6
514	Natural gas - extraction, refining and use		x		x		x	5
516	Biomass fired power and heat production	x	x	X		x	x	1
517	Geothermal power production				x			1
522	Gold and silver extraction with mercury amalgamation processes	x	x	X	x			4
524	Copper extraction and initial processing				x			1
525	Lead extraction and initial processing				x			1
529	Primary ferrous metal production			X			x	2
531	Cement production (a			X	x	x	x	4
532	Pulp and paper production				x			1
533	Production of lime and light weight aggregates		x	x				2
533	Production of lime and light weight aggregates						x	1
541	Chlor-alkali production with mercury-technology					x		1
551	Thermometers with mercury	x	x	x	x	x	x	6
552	Electrical switches and relays with mercury			x	x		x	3
553	Light sources with mercury	x		x	x	x	x	5
554	Batteries with mercury	x	x	x		x	x	5
555	Biocides and pesticides with mercury			x				1
556	Paints with mercury			x			x	2
557	Production of pharmaceuticals for human and veterinary uses					x		1
558	Cosmetics and related products with mercury	x		x			x	3
561	Dental mercury-amalgam fillings (b	x	x	x	x	x	x	6
562	Manometers and gauges with mercury					x	x	2
563	Laboratory chemicals and equipment with mercury				x	x		2
565	Miscellaneous product uses, mercury metal uses, and other sources				x			1
581	Incineration of municipal/general waste		x					1
583	Incineration of medical waste	x	x	x		x	x	5
585	Informal waste incineration	x		x		x		3
591	Controlled landfills/deposits (a	x	x		x	x		4

no	Sub category name	B	C	M	P	S	Y	Total
593	Informal local disposal of industrial production waste			x	x			2
594	Informal dumping of general waste (b	x						1
594	Informal dumping of general waste (b						x	1
595	Waste water system/treatment	x		x	x			3
5101	Crematoria		x		x			2
5102	Cemetaries			x	x			2

1.4 Input Data

1.4.1 Summary of max and min Hg input per country

The basic aim of the Toolkit is to enable an estimation of the average annual release to pathway (air, water, land, products, general waste, sector-specific waste treatment) for each release process identified. The classification of maximum and minimum input per country comes from the use of input factors assigned to each category by default in the tool kit and which have been widely used by all countries at the stage of preliminary inventory. Table illustrates that the input factor vary with geography.

Table 3: Summary of max and min Hg input per country

max input factor		min input factor		Difference max /min
Country	Input kg / year	Country	Input kg / year	
Philippines	230 500	Philippines	131 932	98 568
Madagascar	82 949	Madagascar	27 951	54 998
Syria	24 796	Syria	10 457	14 339
Cambodia	14 854	Yemen	4 053	10 801
Yemen	5 770	Cambodia	2 072	3 698
Burkina Faso	4 565	Burkina Faso	1 238	3 327
Total	363 434	Total	177 703	185 731

The default input factors within the toolkit are preliminary and will be reviewed in future updates to the toolkit.

1.4.2 Max & min Input data per category and per country

In developing national inventories, countries were encouraged to choose the input factor that seemed to best represent the sub-category under investigation. It is understood that it may be appropriate to confirm this data for local/national conditions before major decisions are taken on implementation of mitigation activities (particularly where there is large uncertainty in the maximum and minimum data).

Table 4: Max & min Input data per category, per country

No sub cat	Sub category name	Country	Max (kg)	Min (kg)
511	Coal combustion in large power plants	Madagascar	17	2
511	Coal combustion in large power plants	Philippines	5 386	539
512	Other coal use	Burkina Faso	132	13
513	Mineral oils - extraction, refining and use	Philippines	37	0,37
513	Mineral oils - extraction, refining and use	Burkina Faso	62	1
513	Mineral oils - extraction, refining and use	Cambodia	119	3
513	Mineral oils - extraction, refining and use	Madagascar	46	45
513	Mineral oils - extraction, refining and use	Syria	5 542	138
513	Mineral oils - extraction, refining and use	Yemen	5	1 564
514	Natural gas - extraction, refining and use	Cambodia	0,01	0,001
514	Natural gas - extraction, refining and use	Philippines	577	6
514	Natural gas - extraction, refining and use	Syria	3 320	33
516	Biomass fired power and heat production	Syria	0,0004	0,000
516	Biomass fired power and heat production	Cambodia	0,16	0,04
516	Biomass fired power and heat production	Burkina Faso	1	0,27
516	Biomass fired power and heat production	Yemen	3	3
516	Biomass fired power and heat production	Madagascar	182	182
517	Geothermal power production	Philippines	41 860	31 395
522	Gold and silver extraction with mercury amalgamation processes	Madagascar	180	60
522	Gold and silver extraction with mercury amalgamation processes	Burkina Faso	400	400
522	Gold and silver extraction with mercury amalgamation processes	Cambodia	1 182	1 182
522	Gold and silver extraction with mercury amalgamation processes	Philippines	65 824	65 824
524	Copper extraction and initial processing	Philippines	244	16
525	Lead extraction and initial processing	Philippines	8 700	87
529	Primary ferrous metal production	Yemen	0,03	0,03
529	Primary ferrous metal production	Madagascar	40	8
531	Cement production (a	Madagascar	40	8
531	Cement production (a	Yemen	11	52
531	Cement production (a	Syria	521	104
531	Cement production (a	Philippines	1 203	241
532	Pulp and paper production	Philippines	6	6
533	Production of lime and light weight aggregates	Cambodia	0,01	0,002
533	Production of lime and light weight aggregates	Yemen	0,01	0,01
533	Production of lime and light weight aggregates	Madagascar	0,12	0,12
541	Chlor-alkali production with mercury-technology	Syria	1 500	100

551	Thermometers with mercury	Yemen	1	3
551	Thermometers with mercury	Cambodia	21	7
551	Thermometers with mercury	Madagascar	476	22
551	Thermometers with mercury	Philippines	198	66
551	Thermometers with mercury	Burkina Faso	445	148
551	Thermometers with mercury	Syria	750	250
552	Electrical switches and relays with mercury	Madagascar	4 486	359
552	Electrical switches and relays with mercury	Yemen	460	1 610
552	Electrical switches and relays with mercury	Philippines	22 177	1 774
553	Light sources with mercury	Yemen	0,01	0,03
553	Light sources with mercury	Madagascar	2	1
553	Light sources with mercury	Burkina Faso	11	6
553	Light sources with mercury	Syria	15	15
553	Light sources with mercury	Philippines	343	280
554	Batteries with mercury	Syria	18	18
554	Batteries with mercury	Cambodia	8 470	204
554	Batteries with mercury	Burkina Faso	281	281
554	Batteries with mercury	Yemen	483	483
554	Batteries with mercury	Madagascar	21 888	21 888
555	Biocides and pesticides with mercury	Madagascar	10 100	0,00
556	Paints with mercury	Yemen	5	25
556	Paints with mercury	Madagascar	1 165	70
557	Production of pharmaceuticals for human and veterinary uses	Syria	0,18	0,18
558	Cosmetics and related products with mercury	Burkina Faso	100	50
558	Cosmetics and related products with mercury	Yemen	50	250
558	Cosmetics and related products with mercury	Madagascar	10 450	2 090
561	Dental mercury-amalgam fillings (b	Madagascar	3 588	0,00
561	Dental mercury-amalgam fillings (b	Yemen	1	5
561	Dental mercury-amalgam fillings (b	Burkina Faso	25	25
561	Dental mercury-amalgam fillings (b	Cambodia	163	163
561	Dental mercury-amalgam fillings (b	Syria	4 200	4 200
561	Dental mercury-amalgam fillings (b	Philippines	17 741	4 435
562	Manometers and gauges with mercury	Yemen	3	3
562	Manometers and gauges with mercury	Syria	1 464	345
563	Laboratory chemicals	Syria	326	326
563	Laboratory chemicals and equipment with mercury	Philippines	13 105	2 184
565	Miscellaneous product uses, mercury metal uses, and other sources	Philippines	22 800	22 800
581	Incineration of municipal/general waste	Cambodia	35	4
583	Incineration of medical waste	Cambodia	32	6
583	Incineration of medical waste	Yemen	3	8
583	Incineration of medical waste	Syria	40	8
583	Incineration of medical waste	Burkina Faso	41	8
583	Incineration of medical waste	Madagascar	507	101
585	Informal waste incineration	Burkina Faso	326	33
585	Informal waste incineration	Syria	2 422	242

585	Informal waste incineration	Madagascar	7 332	733
591	Controlled landfills/deposits (a	Burkina Faso	1 985	199
591	Controlled landfills/deposits (a	Philippines	4 577	458
591	Controlled landfills/deposits (a	Cambodia	4 670	467
591	Controlled landfills/deposits (a	Syria	4 678	4 678
593	Informal local disposal of industrial production waste	Philippines	4 577	458
593	Informal local disposal of industrial production waste	Madagascar	21 573	2 164
594	Informal dumping of general waste (b	Yemen	4 745	47
594	Informal dumping of general waste (b	Burkina Faso	730	73
595	Waste water system/treatment	Madagascar	5	0,25
595	Waste water system/treatment	Burkina Faso	25	1
595	Waste water system/treatment	Philippines	19 615	981
5101	Crematoria	Philippines	153	38
5101	Crematoria	Cambodia	162	41
5102	Cemetaries	Madagascar	872	218
5102	Cemetaries	Philippines	1 377	344

1.5 Output data

1.5.1 General output data (min and max values)

Table 5: General output data (min and max values)

Max input per country

Country	Total output	Air	Water	Land	Product	Waste	Disposal
Philippines	190 041	96 619	34 708	31 063	4 150	20 892	2 610
Yemen	4 774	21	2 849	1 424	5	476	0
Cambodia	6 200	1 052	4 437	703	0	8	0
Syria	18 349	8 380	2 369	936	2 497	4 168	0
Burkina Faso	3 803	545	1 669	1 589	0	0	0
Madagascar	30 794	8 272	13 421	4 787	0	4 315	0
Total (kg)	253 962	114 889	59 452	40 501	6 652	29 857	2 610

Min input per country

Country	Total output	Air	Water	Land	Product	Waste	Disposal
Philippines	125 377	78 565	14 335	15 447	289	16 715	26
Yemen	1 677	1 627	30	14	0	6	0
Cambodia	1 702	763	656	283	0	0	0
Syria	5 974	866	2 514	936	429	1 230	0
Burkina Faso	728	266	230	232	0	0	0
Madagascar	3 497	1 115	1 408	542	0	433	0
Total (kg)	138 955	83 201	19 172	17 454	718	18 384	26

1.5.2 Output data per country and category

Table 6: Output data per country and category - Philippines

no	Sub category name	Min values (kg)								Max values (kg)							
		output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
511	Coal combustion in large power plants	539	485	0	0	0	54	0	0	5 386	4	0	0	0	539	0	0
513	Mineral oils - extraction, refining and use	0	0	0	0	0	0	0	0	37	34	0	0	0	4	0	0
514	Natural gas - extraction, refining and use	6	6	0	0	0	0	0	0	577	577	0	0	0	0	0	0
517	Geothermal power production	31 395	31 395	0	0	0	0	0	0	41 860	41 860	0	0	0	0	0	0
522	Gold and silver extraction with mercury amalgamation processes	65 824	39 494	13 165	13 165	0	0	0	0	65 824	39 494	13 165	13 165	0	0	0	0
524	Copper extraction and initial processing	16	3	6	6	0	0	0	0	244	49	98	98	0	0	0	0
525	Lead extraction and initial processing	87	9	0	26	26	0	26	26	8 700	870	0	2 610	2 610	0	2 610	2610
531	Cement production (a)	241	24	0	0	217	0	0	0	1 203	120	0	0	1 083	0	0	0
532	Pulp and paper production	6	6	0	0	0	0	0	0	6	6	0	0	0	0	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
552	Electrical switches and relays with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	Light sources with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	Dental mercury-amalgam fillings (b)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
563	Laboratory chemicals and equipment with mercury	2 184	218	0	1 310	0	655	0	0	13 105	1	0	7 863	0	3 932	0	0
565	Miscellaneous product uses, mercury metal uses, and other sources	22 800	6 840	0	0	0	15 960	0	0	22 800	6 840	0	0	0	15 960	0	0
591	Controlled landfills/deposits (a)	458	0	46	412	0	0	0	0	4 577	0	458	4 119	0	0	0	0
593	Informal local disposal of industrial production waste	458	46	137	183	46	46	0	0	4 577	458	1 373	1 831	458	458	0	0
595	Waste water system/treatment	981	0	981	0	0	0	0	0	19 615	0	19	615	0	0	0	0
5101	Crematoria	38	38	0	0	0	0	0	0	153	153	0	0	0	0	0	0
5102	Cemetaries	344	0	0	344	0	0	0	0	1 377	0	0	1 377	0	0	0	0

Table 7: Output data per country and category - Yemen

no	Sub category name	output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
513	Mineral oils - extraction, refining and use	1 564	1 564	0	0	0	0	0	0	5	5	0	0	0	0	0	0
516	Biomass fired power and heat production	3	3	0	0	0	0	0	0	3	3	0	0	0	0	0	0
529	Primary ferrous metal production	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
531	Cement production (a	52	52	0	0	0	0	0	0	11	11	0	0	0	0	0	0
533	Production of lime and light weight aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
552	Electrical switches and relays with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	Light sources with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	Batteries with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
556	Paints with mercury	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0
558	Cosmetics and related products with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	Dental mercury-amalgam fillings (b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
562	Manometers and gauges with mercury	3	0	2	0	0	2	0	0	3	0	2	0	0	2	0	0
583	Incineration of medical waste	8	8	0	0	0	0	0	0	3	3	0	0	0	0	0	0
594	Informal dumping of general waste (b	47	0	28	14	0	5	0	0	4 745	0	2 847	1 424	0	475	0	0

Table 8: Output data per country and category - Cambodia

no	Sub category name	Min values (kg)								Max values (kg)							
		output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
513	Mineral oils - extraction, refining and use	3	3	0	0	0	0	0	0	119	112	0	0	0	8	0	0
514	Natural gas - extraction, refining and use	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
516	Biomass fired power and heat production	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
522	Gold and silver extraction with mercury amalgamation processes	1 182	709	236	236	0	0	0	0	1 182	709	236	236	0	0	0	0
533	Production of lime and light weight aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	Batteries with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	Dental mercury-amalgam fillings (b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
581	Incineration of municipal/general waste	4	4	0	0	0	0	0	0	35	35	0	0	0	0	0	0
583	Incineration of medical waste	6	6	0	0	0	0	0	0	32	32	0	0	0	0	0	0
591	Controlled landfills/deposits (a	467	0	420	47	0	0	0	0	4 670	2	4 201	467	0	0	0	0
5101	Crematoria	41	41	0	0	0	0	0	0	162	162	0	0	0	0	0	0

Table 9: Output data per country and category - Syria

no	Sub category name	Min values (kg)								Max values (kg)							
		output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
513	Mineral oils - extraction, refining and use	138	79	0	0	0	59	0	0	5 542	3 780	0	0	0	1 762	0	0
514	Natural gas - extraction, refining and use	33	17	0	0	17	0	0	0	3 320	1 660	0	0	1 660	0	0	0
516	Biomass fired power and heat production	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
531	Cement production (a	104	18	0	0	87	0	0	0	521	10	0	0	511	0	0	0
541	Chlor-alkali production with mercury- technology	100	0	2	0	0	98	0	0	1 500	0	30	0	0	1 470	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	Light sources with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	Batteries with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
557	Production of pharmaceuticals for human and veterinary uses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	Dental mercury-amalgam fillings (b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
562	Manometers and gauges with mercury	345	35	173	0	0	138	0	0	0	0	0	0	0	0	0	0
563	Laboratory chemicals	326	0	0	0	326	0	0	0	326	0	0	0	326	0	0	0
583	Incineration of medical waste	8	8	0	0	0	0	0	0	40	40	0	0	0	0	0	0
585	Informal waste incineration	242	242	0	0	0	0	0	0	2 422	2 422	0	0	0	0	0	0
591	Controlled landfills/deposits (a	4 678	468	2 339	936	0	936	0	0	4 678	468	2 339	936	0	936	0	0

Table 10: Output data per country and category - Burkina Faso

no	Sub category name	Min values (kg)								Max values (kg)							
		output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
512	Other coal use	13	13	0	0	0	0	0	0	132	132	0	0	0	0	0	0
513	Mineral oils - extraction, refining and use	1	1	0	0	0	0	0	0	62	62	0	0	0	0	0	0
516	Biomass fired power and heat production	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
522	Gold and silver extraction with mercury amalgamation processes	400	240	80	80	0	0	0	0	400	240	80	80	0	0	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	Light sources with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	Batteries with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
558	Cosmetics and related products with mercury	0	0	0	0	0	0	0	0	100	2	98	0	0	0	0	0
561	Dental mercury-amalgam fillings (b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
583	Incineration of medical waste	8	2	3	3	0	0	0	0	41	8	16	16	0	0	0	0
585	Informal waste incineration	33	10	10	13	0	0	0	0	326	98	98	131	0	0	0	0
591	Controlled landfills/deposits (a	199	0	99	99	0	0	0	0	1 985	1	992	993	0	0	0	0
594	Informal dumping of general waste (b	73	0	36	37	0	0	0	0	730	0	365	365	0	0	0	0
595	Waste water system/treatment	1	0	1	0	0	0	0	0	25	0	20	5	0	0	0	0

Table 11: Output data per country and category - Madagascar

no	Sub category name	Min values (kg)								Max values (kg)							
		output	Air	Water	Land	Product	Waste	Dispos	Disp	output	Air	Water	Land	Product	Waste	Dispos	Disp
511	Coal combustion in large power plants	2	2	0	0	0	0	0	0	17	17	0	0	0	0	0	0
513	Mineral oils - extraction, refining and use	45	45	0	0	0	0	0	0	46	46	0	0	0	0	0	0
516	Biomass fired power and heat production	182	182	0	0	0	0	0	0	182	182	0	0	0	0	0	0
522	Gold and silver extraction with mercury amalgamation processes	36	36	0	0	0	0	0	0	180	108	36	36	0	0	0	0
529	Primary ferrous metal production	8	8	0	0	0	0	0	0	40	40	0	0	0	0	0	0
531	Cement production (a	8	8	0	0	0	0	0	0	40	40	0	0	0	0	0	0
533	Production of lime and light weight aggregates	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
551	Thermometers with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
552	Electrical switches and relays with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
553	Light sources with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
554	Batteries with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
555	Biocides and pesticides with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
556	Paints with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
558	Cosmetics and related products with mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
561	Dental mercury-amalgam fillings (b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
583	Incineration of medical waste	101	101	0	0	0	0	0	0	507	507	0	0	0	0	0	0
585	Informal waste incineration	733	733	0	0	0	0	0	0	7 332	332	0	0	0	0	0	0
593	Informal local disposal of industrial production waste	2 164	0	1 298	433	0	433	0	0	21 573	0	12	4	944	315	0	4 315
595	Waste water system/treatment	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0
5102	Cemetaries	218	0	109	109	0	0	0	0	872	0	436	436	0	0	0	0

1.5.3 Mass balance between input and output

The results are based on the mass balance principal. This is convenient as mercury is an element and can not be changed in form. Therefore, 100 % of the amount of input should be distributed in the different media.

The following table shows the balance between inputs and outputs. The highlight fields indicate a positive mass balance corresponding to category 55, illustrating that this aspect has proven challenging in areas with more than one life cycle, such as for mercury in products.

Table 12: Mass balance between input and output

Country	no	Sub category name	Min values			Max values		
			input	otput	Dif	input	otput	diff
Philippines	511	Coal combustion in large power plants	539	539	0	5 386	5 386	0
	513	Mineral oils - extraction, refining and use	0	0	0	37	37	0
	514	Natural gas - extraction, refining and use	6	6	0	577	577	0
	517	Geothermal power production	31 395	395	0	41	41	0
	522	Gold and silver extraction with mercury amalgamation processes	65 824	824	0	65	65	0
	524	Copper extraction and initial processing	16	16	0	244	244	0
	525	Lead extraction and initial processing	87	87	0	8 700	8 700	0
	531	Cement production (a	241	241	0	1 203	1 203	0
	532	Pulp and paper production	6	6	0	6	6	0
	551	Thermometers with mercury	66	0	66	198	0	198
	552	Electrical switches and relays with mercury	1 774	0	1 774	22	0	22 177
	553	Light sources with mercury	280	0	280	177	0	343
	561	Dental mercury-amalgam fillings (b	4 435	0	4 435	17	0	17 741
	563	Laboratory chemicals and equipment with mercury	2 184	2 184	0	13	13	0
	565	Miscellaneous product uses, mercury metal uses, and other sources	22 800	800	0	105	105	0
	591	Controlled landfills/deposits (a	458	458	0	22	22	0
	593	Informal local disposal of industrial production waste	458	458	0	800	800	0
	595	Waste water system/treatment	981	981	0	4 577	4 577	0
	5101	Crematoria	38	38	0	19	19	0
	5102	Cemetaries	344	344	0	615	615	0
Yemen	513	Mineral oils - extraction, refining and use	1 564	1 564	0	5	5	0
	516	Biomass fired power and heat production	3	3	0	3	3	0
	529	Primary ferrous metal production	0	0	0	0	0	0
	531	Cement production (a	52	52	0	11	11	0
	533	Production of lime and light weight aggregates	0	0	0	0	0	0
	551	Thermometers with mercury	3	0	3	1	0	1
	552	Electrical switches and relays with mercury	1 610	0	1 610	460		460
	553	Light sources with mercury	0	0	0	0	0	0
	554	Batteries with mercury	483	0	483	483	0	483
	556	Paints with mercury	25	0	25	5	5	0

	558	Cosmetics and related products with mercury	250	0	250	50	0	50	
	561	Dental mercury-amalgam fillings (b	5	0	5	1	0	1	
	562	Manometers and gauges with mercury	3	3	0	3	3	0	
	583	Incineration of medical waste	8	8	0	3	3	0	
	594	Informal dumping of general waste (b	47	47	0	4 745	4 745	0	
Cambodia	513	Mineral oils - extraction, refining and use	3	3	0	119	119	0	
	514	Natural gas - extraction, refining and use	0	0	0	0	0	0	
	516	Biomass fired power and heat production	0	0	0	0	0	0	
	522	Gold and silver extraction with mercury amalgamation processes	1 182	1 182	0	1 182	1 182	0	
	533	Production of lime and light weight aggregates	0	0	0	0	0	0	
	551	Thermometers with mercury	7	0	7	21	0	21	
	554	Batteries with mercury	204	0	204	8 470	0	8 470	
	561	Dental mercury-amalgam fillings (b	113	0	113	113	0	113	
	581	Incineration of municipal/general waste	4	4	0	35	35	0	
	583	Incineration of medical waste	6	6	0	32	32	0	
	591	Controlled landfills/deposits (a	467	467	0	4 670	4 670	0	
	5101	Crematoria	41	41	0	162	162	0	
	Syria	513	Mineral oils - extraction, refining and use	138	138	0	5 542	5 542	0
		514	Natural gas - extraction, refining and use	33	33	0	3 320	3 320	0
516		Biomass fired power and heat production	0	0	0	0	0	0	
531		Cement production (a	104	104	0	521	521	0	
541		Chlor-alkali production with mercury-technology	100	100	0	1 500	1 500	0	
551		Thermometers with mercury	250	0	250	750	0	750	
553		Light sources with mercury	15	0	15	15	0	15	
554		Batteries with mercury	18	0	18	18	0	18	
557		Production of pharmaceuticals for human and veterinary uses	0	0	0	0	0	0	
561		Dental mercury-amalgam fillings (b	4 200	0	4 200	4 200	0	4 200	
562		Manometers and gauges with mercury	345	345	0	1 464	0	1 464	
563		Laboratory chemicals	326	326	0	326	326	0	
583		Incineration of medical waste	8	8	0	40	40	0	
585		Informal waste incineration	242	242	0	2 422	2 422	0	
591		Controlled landfills/deposits (a	4 678	4 678	0	4 678	4 678	0	
Burkina Faso		512	Other coal use	13	13	0	132	132	0
	513	Mineral oils - extraction, refining and use	1	1	0	62	62	0	
	516	Biomass fired power and heat production	0	0	0	1	1	0	
	522	Gold and silver extraction with mercury amalgamation processes	400	400	0	400	400	0	
	551	Thermometers with mercury	148	0	148	445	0	445	
	553	Light sources with mercury	6	0	6	11	0	11	
	554	Batteries with mercury	281	0	281	281	0	281	
	558	Cosmetics and related products with mercury	50	0	50	100	100	0	
	561	Dental mercury-amalgam fillings (b	25	0	25	25	0	25	
	583	Incineration of medical waste	8	8	0	41	41	0	
	585	Informal waste incineration	33	33	0	326	326	0	
	591	Controlled landfills/deposits (a	199	199	0	1 985	1 985	0	
	594	Informal dumping of general waste (b	73	73	0	730	730	0	
	595	Waste water system/treatment	1	1	0	25	25	0	
Madagascar	511	Coal combustion in large power plants	2	2	0	17	17	0	
	513	Mineral oils - extraction, refining and use	45	45	0	46	46	0	
	516	Biomass fired power and heat production	182	182	0	182	182	0	
	522	Gold and silver extraction with mercury amalgamation processes	60	36	24	180	180	0	

529	Primary ferrous metal production	8	8	0	40	40	0
531	Cement production (a)	8	8	0	40	40	0
533	Production of lime and light weight aggregates	0	0	0	0	0	0
551	Thermometers with mercury	22	0	22	476	0	476
552	Electrical switches and relays with mercury	359	0	359	4 486	0	4 486
553	Light sources with mercury	1	0	1	2	0	2
554	Batteries with mercury	21 888	0	888	21 888	0	21 888
555	Biocides and pesticides with mercury	0	0	0	10 100	0	10 100
556	Paints with mercury	70	0	70	1 165	0	1 165
558	Cosmetics and related products with mercury	2 090	0	2 090	10 450	0	10 450
561	Dental mercury-amalgam fillings (b)	0	0	0	3 588	0	3 588
583	Incineration of medical waste	101	101	0	507	507	0
585	Informal waste incineration	733	733	0	7 332	7 332	0
593	Informal local disposal of industrial production waste	2 164	2 164	0	21 573	21 573	0
595	Waste water system/treatment	0	0	0	5	5	0
5102	Cemetaries	218	218	0	872	872	0

The difference between min input and min output is:

Min Input	Min output	diff
177 656	138 955	38 701

2.0 Observations and lessons learned in applying the toolkit methodology

2.1 Understanding, Structure and Language

Overall feedback on the understanding and structure of the toolkit has been positive. It was noted that it would be helpful to have brief sector specific information to communicate with sectors in information gathering, including in some cases better definitions (such as for batteries).

Countries generally noted appreciation for the translated versions of the toolkit; however, there is room for improvement in the quality of translations.

2.2 Toolkit Categories, Emission factors

It has been noted that the sub-categories sometimes do not relate to national situations and that emission factors should be more relevant for developing countries. Overall it is felt that reducing the emission factor range would improve usefulness of results. A need has been identified to improve the emission factors for batteries – currently thought to be too high.

2.3 Data gathering

Estimating activity and accessing data is challenging. It has been noted that the toolkit could benefit from including more strategies to access data, such as simple sample questionnaires.

Generally, the information used by the countries are the following: customs data, inventory of dioxins in the Stockholm Convention, climate change (emission of CO₂) and the country profile of SAICM.

For mercury in products, questionnaires can be overwhelming; a market analysis may be a better starting point to explore.

In some cases (eg, fever thermometers) import data is crucial because information on actual breakage/ disposal of products cannot be found. Section 5.5 requires a better description and labeling for mercury in products, such as batteries, skin products, lighting, electronic devices in order to assist in data gathering (particularly at the customs level). The Prior Informed Consent Procedure of the Rotterdam Convention could assist in providing information on mercury and its compounds used as pesticides, but currently, industrial uses of mercury are not covered under the Rotterdam Convention.

2.4 –Double Recording

As noted in section 1.5.3, Category 55 (Consumer products containing mercury) has presented some challenges for countries in terms of double counting in the use/disposal phase.

The tables below gives the categories for the 2 groups of categories which are concerned by the double recording. Consideration to this area will be given in the toolkit review process.

Category 55 : Consumer products containing mercury

Table 13: Category 55 : Consumer products containing mercury

no	Sub category name	Phase 1	Phase 2
551	Thermometers with mercury	/Use+disposal :	Medical thermometers
551	Thermometers with mercury	/Use+disposal :	Ambient air thermom.
551	Thermometers with mercury	/Use+disposal :	Industrial and special th.
551	Thermometers with mercury	/Use+disposal :	Other glass Hg thermometers
552	Electrical switches and relays with mercury	/Use+disposal :	
553	Light sources with mercury	/Use+disposal :	Fluorescent tubes (double end)
553	Light sources with mercury	/Use+disposal :	Compact fluorescent lamp (CFL single end)
553	Light sources with mercury	/Use+disposal :	High pressure mercury vapour
553	Light sources with mercury	/Use+disposal :	High-pressure sodium lamps
553	Light sources with mercury	/Use+disposal :	UV light for tanning
553	Light sources with mercury	/Use+disposal :	Metal halide lamps
554	Batteries with mercury	/Use+disposal :	Mercury oxide (all sizes); also called mercury-zinc cells
554	Batteries with mercury	/Use+disposal :	Zinc-air button cells
554	Batteries with mercury	/Use+disposal :	Alkaline button cells
554	Batteries with mercury	/Use+disposal :	Silver oxide button cells
554	Batteries with mercury	/Use+disposal :	Alkaline, other than button cell shapes
555	Biocides and pesticides with mercury	/Use+disposal	
556	Paints with mercury	/Use+disposal	
558	Cosmetics and related products with mercury	/Use+disposal	
557	Production of pharmaceuticals for human and veterinary uses		
554	Batteries with mercury	/Use+disposal :	

Table 14: Areas where double counting can come up in categories 58 & 59

No Cat	Category name	Sub cat no	Sub category name	Output scenario
58	Waste incineration	581	Incineration of municipal/general waste	No emission reduction devices
58		581		PM reduc, simple ESP, or similar
58		581		Acid gas control with limestone (or similar acid gas absorbent) and downstream high efficiency FF or ESP PM retention
58		581		Mercury specific absorbents and downstream FF
58		582	Incineration of hazardous waste	No emission reduction devices
58		582		PM reduc, simple ESP, or similar
58		582		Acid gas control with limestone (or similar acid gas absorbent) and downstream high efficiency FF or ESP PM retention
58		582		Mercury specific absorbents and downstream FF
58		583	Incineration of medical waste	No emission reduction devices
58		583		PM reduc, simple ESP, or similar
58		583		Acid gas control with limestone (or similar acid gas absorbent) and downstream high efficiency FF or ESP PM retention
58		583		Mercury specific absorbents and downstream FF
58		584	Sewage sludge incineration	
58		585	Informal waste incineration	
59		Waste deposition landfilling and waste water treatment	591	Controlled landfills/deposits (a)
59	592		Diffuse disposal under some control	
59	593		Informal local disposal of industrial production waste	
59	594		Informal dumping of general waste (b)	
59	595		Waste water system/treatment	No treatment; direct release from sewage pipe
59	595			Mechanical treatment only
59	595			Mechanical and biological (activated sludge) treatment; no land application of sludge
59	595			Mechanical and biological (activated sludge) treatment; 40% of sludge used for land application