



Update of Mercury Monitoring in Indonesia

**Ministry of Environment and Forestry
Republic of Indonesia**

**The Sixth Annual Meeting Asia Pacific Mercury Monitoring
Network Partners Meeting
May 15-16, 2017, Taoyuan-Taiwan,**



Contents

- Current Status
- Progress
- Update Status
- Future Plan on APMMN in Indonesia

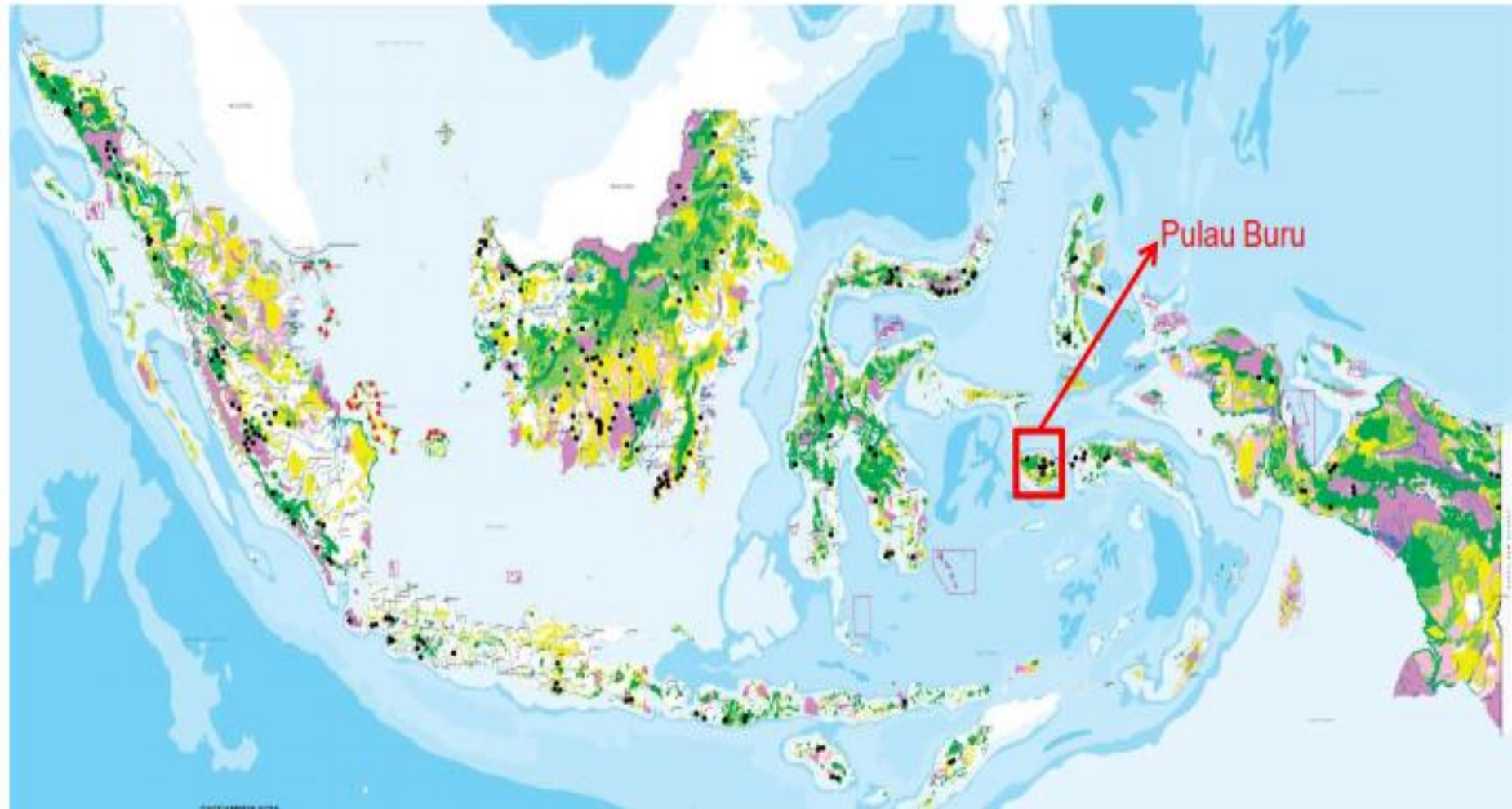


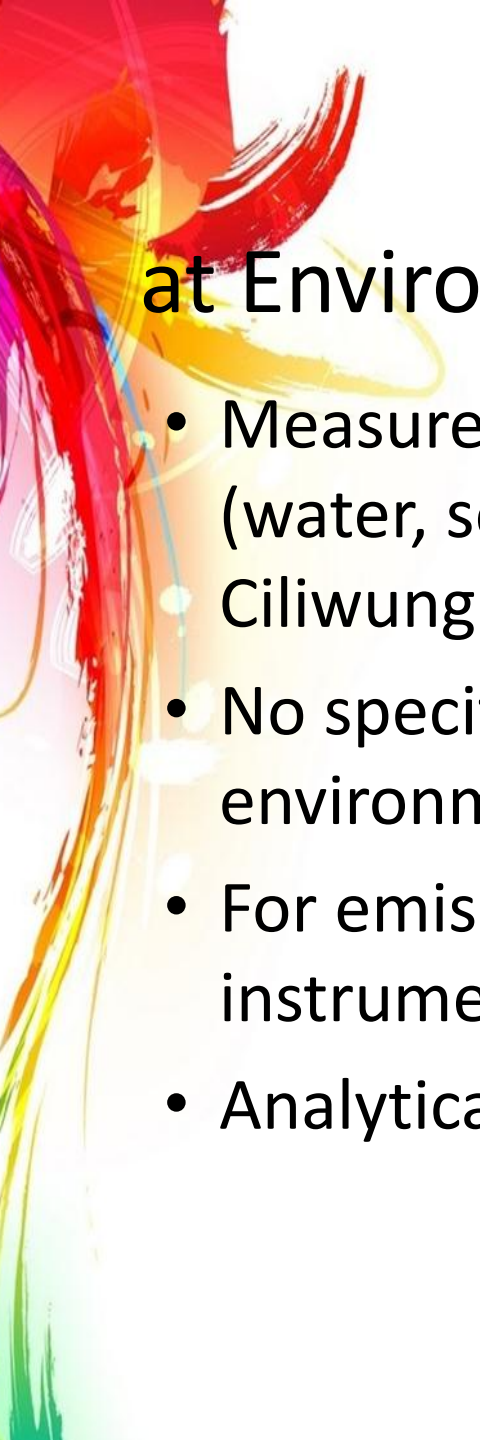
CURRENT STATUS

Mercury Issues in Indonesia

- Preparing for Minamata Convention Ratification
- National Priority Programme reducing mercury in ASGM (Artisanal Small-Scale Gold Mining)
- Pilot Project Plant for Non-Mercury Gold Processing
- Survey Result in gold mining location in Poboya (Central Sulawesi) and Sukabumi (West Java) show that mercury exposed in human hair (0.7 – 56.18 mg/L) and human nail (1.7- 16.3 mg/L).
- River pollution cases in Buru island. The pollution river flows is due to the use of tromol engines that reach thousands of units. Gold processing process using mercury 1 ton/day.

ASGM Hotspot in Indonesia (● > 2500)





Laboratory Capability at Environmental Monitoring Center (EMC)

- Measurement of Hg in environmental samples (water, solid, fish, emission air) (Cisadane dan Ciliwung river, 2014).
- No specific equipment was used to collect environmental Hg in water, fish, and solid samples.
- For emission air, it was collected using APEX instrument (USEPA Method 29).
- Analytical technique : Cold Vapor method.

Measurement in Env. Samples

- Water & solid samples were treated by:
 - Acid digestion
 - Microwave digestion
- Biological samples (biota) were analyzed using modified AOAC Official Method 999.10 (2005) – microwave digestion
- The Indonesian National Standard for Mercury analytical method for water and waste water: SNI 6989.78.2011. Adopted from APHA 2005 (Standard Methods for the Examination of Water and Wastewater).
- The Indonesian National Standard for Mercury analytical method for solid, biota and sediment samples: SNI 0606.6992.2-2004. Adopted from USEPA SOP#:2016, 1994

Hg Analyzer

Hg Laboratory Facility at Environmental Monitoring Center (EMC)

EMC has mercury preparation and analysis room. Located separately from other rooms.



Hg Analyzer ⁽¹⁾



- Hg Analyzer Hg-500. 1993
- Grant from JICA, Dr. Akagi
- The condition of equipment is good. Troubles sometimes occurred because the instruments is quite old, but it's still manageable

- Hg Analyzer Hiranuma. 2003
- Still used

Hg Analyzer ⁽²⁾



- Hg Analyzer Milestone. 2010
- Good condition, unstable for low concentration



- Hg Analyzer NIC.
- Arrived in Dec 2015



Mercury Monitoring Data In Indonesia

PROGRESS

Mercury Monitoring Conducted By Environmental Monitoring Center (EMC) 2012-2014

- To know the total mercury concentration at the several lakewater and seawater in Indonesia (15 lakes & seas priority)
 - Method of mercury analysis: JIS methode (Cold vapour) and measured with Mercury Analyser
- The results showed concentrations of total mercury in water at several lake in Indonesia were below of the method detection limit (MDL < 0.0004 mg/L) and also below the water pollution standard quality in Indonesia GR No 82 year 2001 (**0.002 mg/L**)
 - The concentrations of Total Hg in sea water in some location detected but still below than sea water standard quality (Ministerial decree no 51 year 2004) **0.003 mg/L**.

Mercury Monitoring in ASGM Hotspot

(conducted by MEMR, MoH, MOEF) (2012)

No	Lokasi		River	Sludge	Clean Water	Ambient	Fish
			BM: 0.002 mg/L	BM: 0.13 mg/Kg	BM: 0.001 mg/dL	BM: -	BM: 0.40 mg/Kg
1	South Solok District, West Sumatera	KESDM					
2	West Lombok District, West Nusa Tenggara	KESDM		0.13 mg/Kg			
3	Bolaang Mangondow District, North Sulawesi	KESDM		7.34 mg/Kg			
4	Palu City, Central Sulawesi	KESDM	0.0114 mg/L	9.09 mg/Kg			
5	Tasikmalaya District, West Java	KESDM	0,049 mg/L	5.54 mg/Kg			
6	Aceh Jaya District, Aceh	KLH					
7	Dharmasraya District, West Sumatera	KLH					
8	Palangkaraya District, Central Kalimantan	KLH					
9	Banyuwangi District, East Java	KLH					
10	Minahasa District, North Sulawesi	KLH					
11	Banyumas District, Central Java	KLH					
12	Lebak District, Banten	KLH					

Standards:

- River water : Government Regulation No. 82 Year 2001
- Clean Water : Monistry of Health Regulation No. 416 Year 1990
- Biota:
 - Provisional Standards for Mercury in Fish" (notification for Ministry of Health and Welfare, Japan in July of 1973)
- Sediment:
 - Canadian Sediment Quality Guidelines for Threshold Effect Level (TEL)
- Soil:
 - Canadian Soil Quality Guidelines for the Protection of Environment and Human Health (Residential/Parkland)

	Samples below the quality standard
	Samples over the quality standard
	Sample not taken

Mercury Monitoring in ASGM Hotspot

(conducted by MEMR, MoH, MOEF) (2013)

No	Lokasi		River	Sludge	Clean Water	Ambient	Soil	Fish
			BM: 0.002 mg/L	BM: 0.13 mg/Kg	BM: 0,001 mg/dL	BM: -	BM: 6.6 mg/Kg	BM: 0.40 mg/Kg
1	South Solok District, West Sumatera	KESDM						
2	West Lombok District, West Nusa Tenggara	KESDM						
3	Bolaang Mangondow District, North Sulawesi	KESDM						
4	Palu City, Central Sulawesi	KESDM						
5	Tasikmalaya District, West Java	KESDM						
6	Aceh Jaya District, Aceh	KLH		4.019 mg/Kg			10.368 mg/Kg	
7	Dharmasraya District, West Sumatera	KLH		86.669 mg/Kg				
8	Palangkaraya District, Central Kalimantan	KLH						
9	Banyuwangi District, East Java	KLH	0.002 mg/L					5.33 mg/Kg
10	Minahasa District, North Sulawesi	KLH		1 mg/Kg				
11	Banyumas District, Central Java	KLH						0.91 mg/Kg
12	Lebak District, Banten	KLH						

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3	Bolaang Mangondow District, North Sulawesi	KESDM						
4	Palu City, Central Sulawesi	KESDM						
5	Tasikmalaya District, West Java	KESDM						
6	Aceh Jaya District, Aceh	KLH						
7	Dharmasraya District, West Sumatera	KLH						
8	Palangkaraya District, Central Kalimantan	KLH						
9	Banyuwangi District, East Java	KLH						
10	Minahasa District, North Sulawesi	KLH						
11	Banyumas District, Central Java	KLH	0.0029 mg/L	0.28 mg/Kg				
12	Lebak District, Banten	KLH		7.00 mg/Kg				5.10 mg/Kg

Standards:

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Mercury Monitoring in ASGM Hotspot

Matrices	Analysis Method
River/Surface Water	US EPA 7470A-1994
Clean Water	US EPA 7470A-1994
Sediment	US EPA SW 846 3050B-1996 dan APHA SM 3120 B:2012
Sludge	US EPA SW 846 3050B-1996 dan APHA SM 3120 B:2012
Soil)	US EPA SW 846 3050B-1996 dan APHA SM 3120 B:2012
Ambient air	APHA SM 3120 B:2012
Benthos	US-EPA SW 846 3050B

Emission Monitoring in Energy Sector (Conducted by MoEF)

Monitoring in Coal-fired Power Sector (1 Power Plant)

Time of Sampling	Measurement Unit	Okt-11	Apr-12	Mei-15	Mar-17		
Power Plant Unit		Unit 6	Unit 6	Unit 6	Unit 2		
MERCURY		Hg total	Hg total	Hg total	Hg ⁰	Hg ²⁺	Hg total
Flue gases	ug/m ³	0.33-2.04	0.1-1.4	0.4-0.9	75%	25%	0.07-0.08
fly ashes	ug/g	0.6	0.37	0.23			*
bottom ashes	ug/g	0.88	0.05	> 0.01			*
coal	ug/g	0.24-0.34	0.01	0.05			*
Chlorine in coal	mg/g	0,5	0,03	0,01-0,02			*



APMMN in Indonesia

UPDATE STATUS

Status of Network Pilot Sites

- This sampler (AR-WS) was first handed over to Pusarpedal (EMC-MoEF), then handed over to Assistant Deputy on Hazardous Substances Management (MoEF)
- On May 2015, EMC handed over the sampler operational to Directorate of Hazardous Substances Management.



Installation

The initial phase of the instalation carried out on:

- Date : Monday, June 15, 2015
- Time : 01:32 pm
- Location : On the roof of B Building at the Ministry of Environment and Forestry Office, Kebon Nanas, East Jakarta
- Coordinates : S: 06 ° 13,994' E: 106 ° 52,643'
- Weather conditions : Sunny, Clear sky
- Note:
 - The location is close to several industrial estates (Pulogadung Industrial Estate, Nusantara Berikat Industrial Estate), which is about 10-25 KM.
 - The location is close to the highway
 - The distance to the nearest ASGM area (Pongkor, Bogor) approximately 90-100 KM

Final Installation



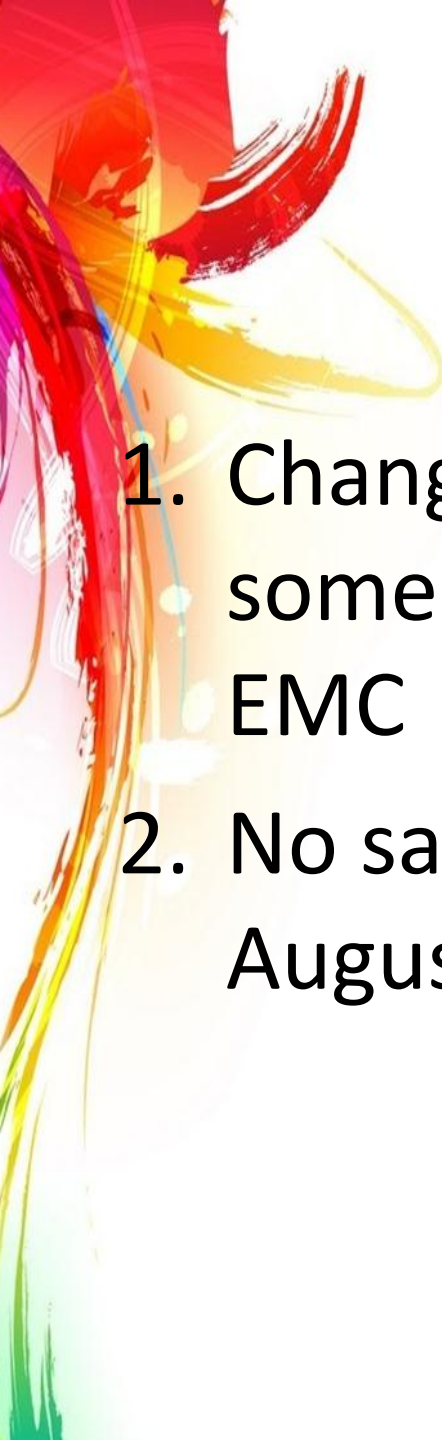
Total Hg in Rainwater (2016)

No	Site	Total Hg Cocentration (ng/L)	Rainfall (mm)
1	Indonesia	12.93	0.3
2	Indonesia	21.42	1.2
3	Indonesia	9.09	5.5
4	Indonesia	8.78	19.5
5	Indonesia	9.48	10.5
6	Indonesia	6.19	1
7	Indonesia	5.28	2.5
8	Indonesia	6.46	20.4
9	Indonesia	15.01	2.2
10	Indonesia	1.04	1

No	Site	Total Hg Cocentration (ng/L)	Rainfall (mm)
11	Indonesia	4.04	0.2
12	Indonesia	1.65	12.7
13	Indonesia	1.12	31
14	Indonesia	0.95	43.5
15	Indonesia	1.01	25.5
16	Indonesia	7.67	0.5
17	Indonesia	1.13	4.5
18	Indonesia	0.92	0.5
19	Indonesia	23.14	11.2



- The total Hg concentration range from 0.92 to 23.14 ng/L, mean value is 7.23 ng/L
- Min: 0.92 ng/L



Operation Problems

1. Changes in the duties and functions of some divisions or units, including the EMC
2. No sample were sent to Taiwan from August-December 2016

Operation Problems

3. Technical problem

- The sampler Lid Seal was broken (stuck in the middle of the sampler)
- The rotor is not working, and now being repaired by Sys Laboratorium Indonesia

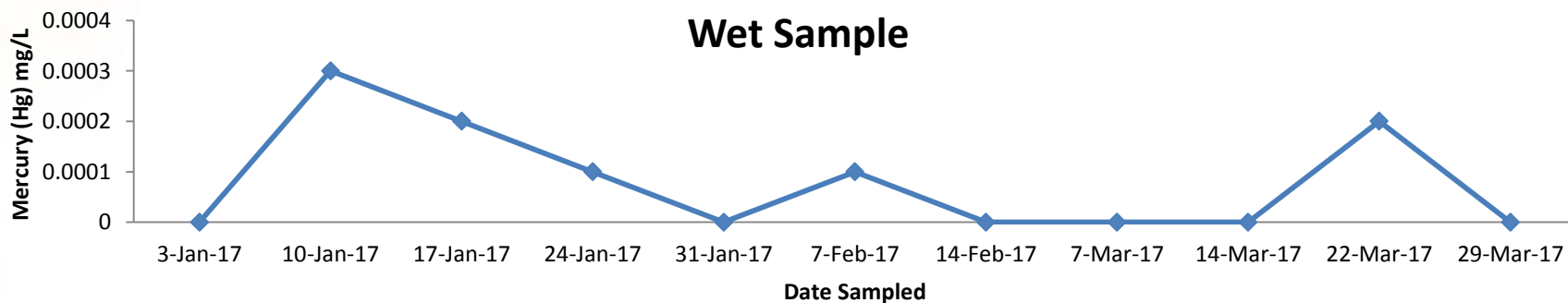


The Rotor and Sampler are being checked by SYS Laboratorium Indonesia



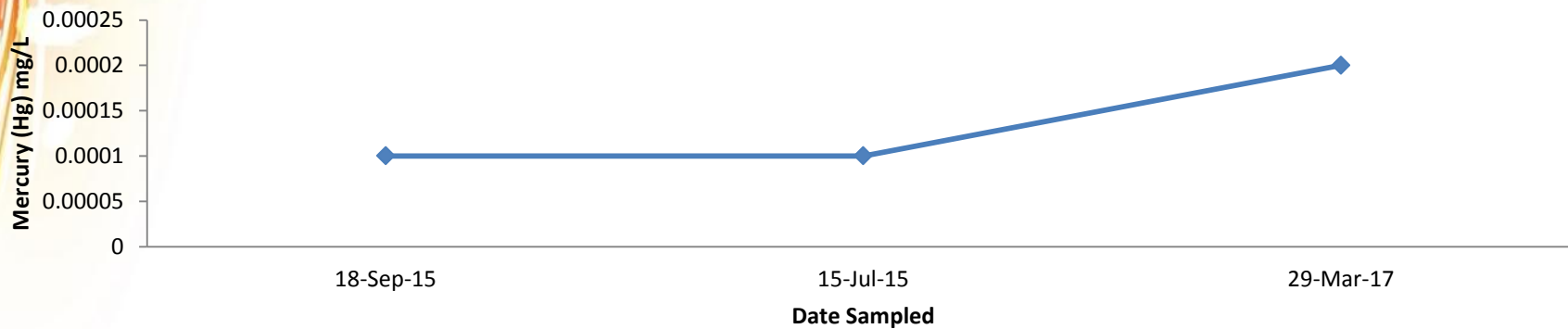
Result Sample Analysis January – March 2017 by SYS Laboratorium Indonesia

Wet Sample			
Date Sampled	Total Mercury Concentration (Hg) mg/L	Results	Methode
3-Jan-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
10-Jan-17	0.0003	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
17-Jan-17	0.0002	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
24-Jan-17	0.0001	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
31-Jan-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
7-Feb-17	0.0001	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
14-Feb-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
7-Mar-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
14-Mar-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
22-Mar-17	0.0002	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012
29-Mar-17	0	<0.0005	US EPA SW 3005A-1992 & APHA 3120B-2012



Dry Sample			
Date Sampled	Total Mercury Concentration (Hg) mg/L	Results	Methode
18-Sep-15	0,0001	<0,0005	US EPA SW 3005A-1992 & APHA 3120B-2012
15-Jul-15	0,0001	<0,0005	US EPA SW 3005A-1992 & APHA 3120B-2012
29-Mar-17	0,0002	<0,0005	US EPA SW 3005A-1992 & APHA 3120B-2012

Dry Sample





FUTURE PLAN ON APMMN in INDONESIA



Future Plan on APMMN

- Improve the internal mechanism in operating the sampler
- Conduct of sampler maintenance
- In 2017, Testing the samples at the national laboratory conducted by SYS Laboratorium Indonesia (support by government budget)
- Wet sample on automatic rain water sampler will be collected twice a month, while dry sample will be collected every three months



SYS Laboratorium Indonesia

Analysis Method & Result

- Using :
US EPA SW 3005A-1992 & APHA 3120B-2012

**Propose to Build Spots of Rain Water Sample
In Industrial Areas in Java Island as shown Below**

Java Island





Thank You...