Global Atmospheric Watch (GAW) activities and Air Quality Monitoring in Indonesia

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International Workshop on Land Use/Cover Changes and Air Pollution in Asia
August 4-7th, 2015, Bogor-Indonesia Bogor, Indonesia

OUTLINE

- Introduction
- Measurement Networks:
  - GAW and Green House Gases Network;
  - Air Quality network;
- Monitoring Results;
- Concluding Remarks

Introduction

Brief History of GAW activities in Indonesia

Global Ozone Observing System (GO_3OS) – 1957
Background Air Pollution Monitoring Network (BAPMoN) – 1968

Global Atmosphere Watch (GAW) – 1989
Combining of these two programs, particularly regarding atmospheric monitoring and other matters related to the environment.

GAW Bukit Koto Tabang
- Established in 1996 at Bukit Kototabang, West Sumatra.
- As part ofBMKG working unit
- Obtain the official status as the GAW station in October 2004 (KEP. No. 006/KBMG/2004)
- BMKG has also 14 addtional regional GHG monitoring network

Brief History of Air Quality monitoring in BMKG

- BMKG as representatives of the Indonesian government for WMO, participated in **air quality monitoring** since 1976 at 5 (five) locations in **Jakarta, Ancol area, Bandengan, Glodok, Kemayoran and Monas**;
- In 1999, the program **Global Urban Research Meteorology and Environment** (GURME – Program) was established, the aims is to determine the influence of meteorological conditions to environmental changes;
- BMKG air quality monitoring now has 56 air quality monitoring stations, measure SPM (Suspended Particulate Matter) and 51 stations in addition to the SPM, also observed chemical precipitation.

NETWORK OF GLOBAL ATMOSPHERIC WATCH (GAW) STATIONS

GHG Monitoring Network

GREENHOUSE GASES MONITORING NETWORK INDONESIA

BMKG

BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

PARAMETER:	KETERANGAN:
Continuous Monitor	Batas Propinsi
Flask Sampling	Luar Negeri
Continuous Monitor + Flask Sampling	

N, W, E, S

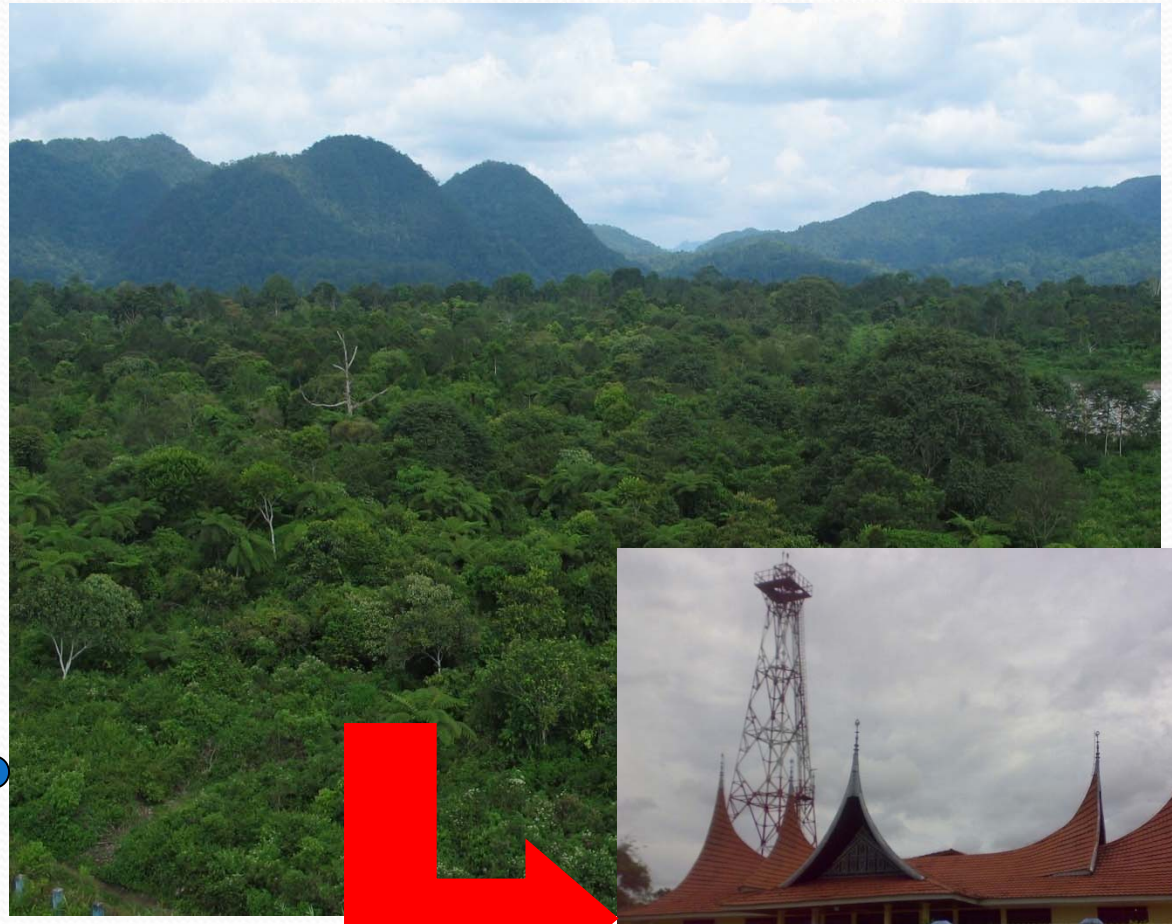
0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan GHG BMKG 2014

GAW Palu and Sorong are fully Indonesian initiative to support the global GAW WMO programs in order to be more representative of Indonesia region of the ambient of air pollution measurement as well as the GHG concentration as an indicator of Climate Change.

Site location

Bukit Kototabang (W. Sumatera) 0.2S 100.32E 864.5 m a.s.l.



>> Global GAW Station Bukit Kototabang

Site location

Bariri-Palu (Centl. Sulawesi 0.2S 100.32E 864.5 m a.s.l.

>> Regional GAW Station Bariri-Palu

Site Location

Sorong (West Papua) 0.2S 100.32E 864.5 m a.s.l.

Rolle of GAW in Indonesia

- To carry out the tasks assigned by WMO to monitor ambient air and atmospheric conditions.
- BMG -> BMKG (Klimatologi = Climatology). Indonesian concern to the problem of climate change as one of the measured parameters, namely the concentration of greenhouse gases as indicators of climate change.
- GAW Indonesia provide the air quality data as the reference regarding air quality in Indonesia.
- To support research activities primarily related atmospheric and environmental sciences.
- Involve a variety of international programs (WMO and non-WMO): Global Air Sampling Network on GHGs, Boundary Layer Radar, Intensive Observation Period, Global Water Passive Sampler

Development of monitoring program

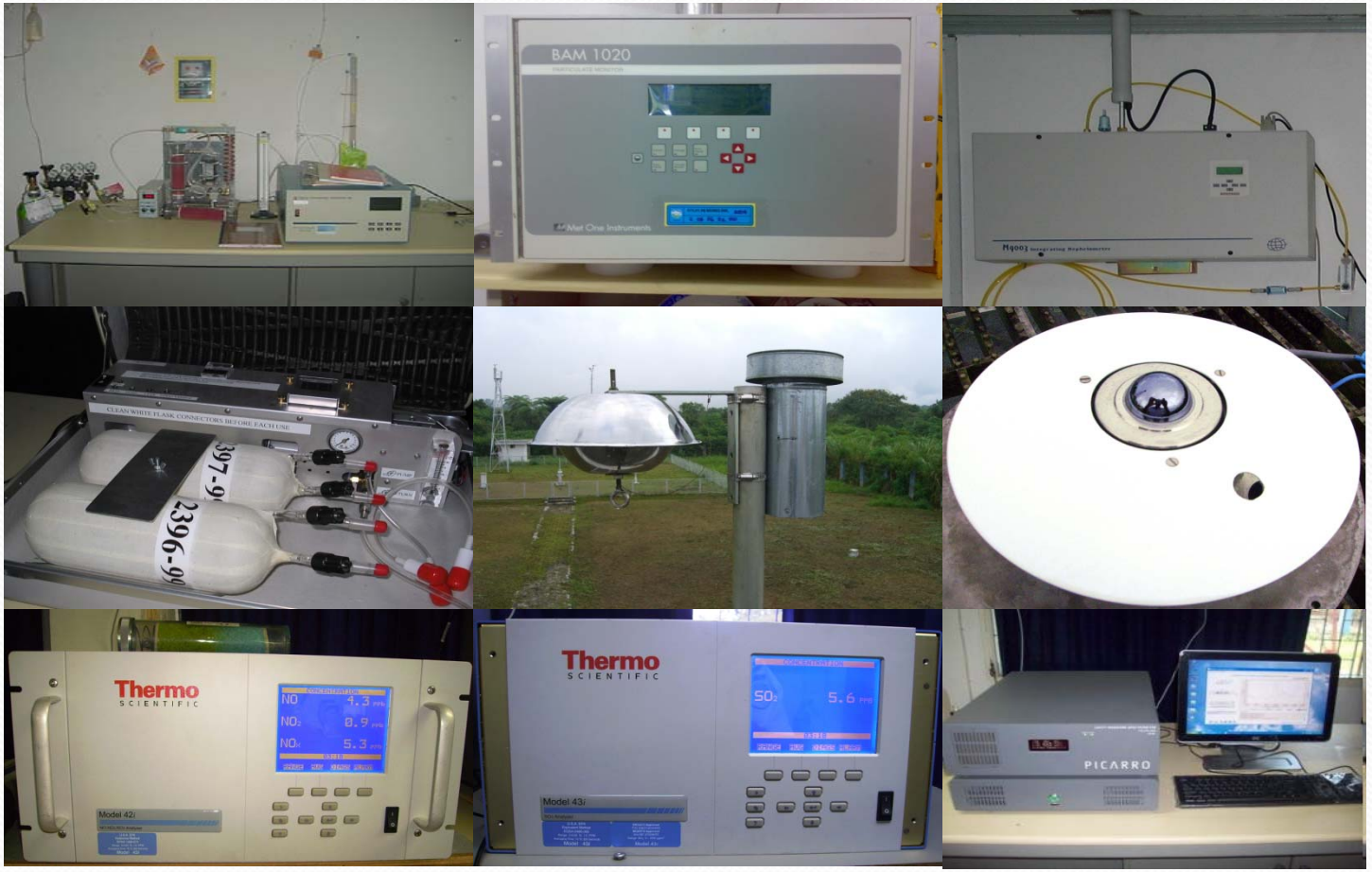
1996	1999	2001	2004	2008	2010
HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas	HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas MAWS	HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas MAWS CO Analyzer	HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas MAWS CO Analyzer PM_{10} Monitoring Aerosol Scattering Flask Samplers GAPS	HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas MAWS CO Analyzer PM_{10} Monitoring Mass Scattering Flask Sampler GAPS SO_2 Analyzer NO_2 Analyzer CO_2 Analyzer Infrared Radiation pH meter Conductivity meter	HVAS RWS Radiometer Ozone Analyzer Synoptic Observations Passive Gas MAWS CO Analyzer PM_{10} Monitoring Mass Scattering Flask Sampler GAPS SO_2 Analyzer NO_2 Analyzer CO_2 Analyzer Infrared Radiation pH meter Conductivity meter Portable devices

Started with...

HVAS • Pyranometer • Pyrheliometer • Spec.Pyranometer
Ozone Analyzer • Passive Gas Holder • Synoptic Obs.

>> Progress of Measurement Programme

Curent equipments...



Carbon Monoxide • PM_{10} mass concentration • aerosol scattering coefficient • GHGs flask sampler • POPs sampler • Pyrgeometer • NO_x analyzer • SO_2 analyzer • CO_2/CH_4 analyzer

>> Progress of Measurement Programme

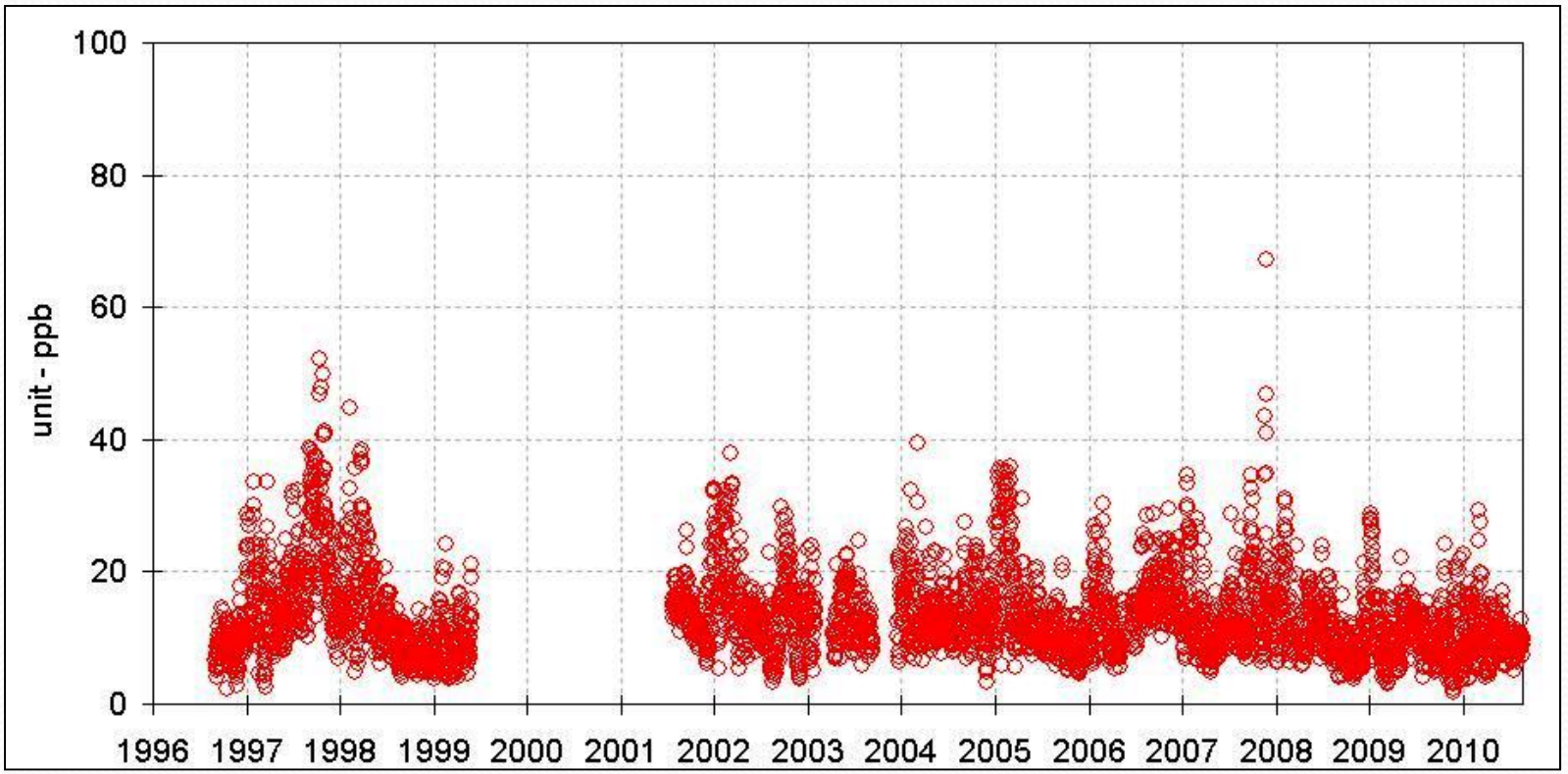
Data

1. Surface Ozone (1996-present)
2. Solar Radiation (1996-present)
3. Meteorological parameters (1996-present)
4. CO (2000-present)
5. PM_{10} (2004-present)
6. Greenhouse Gases (2004-present)

and many others...

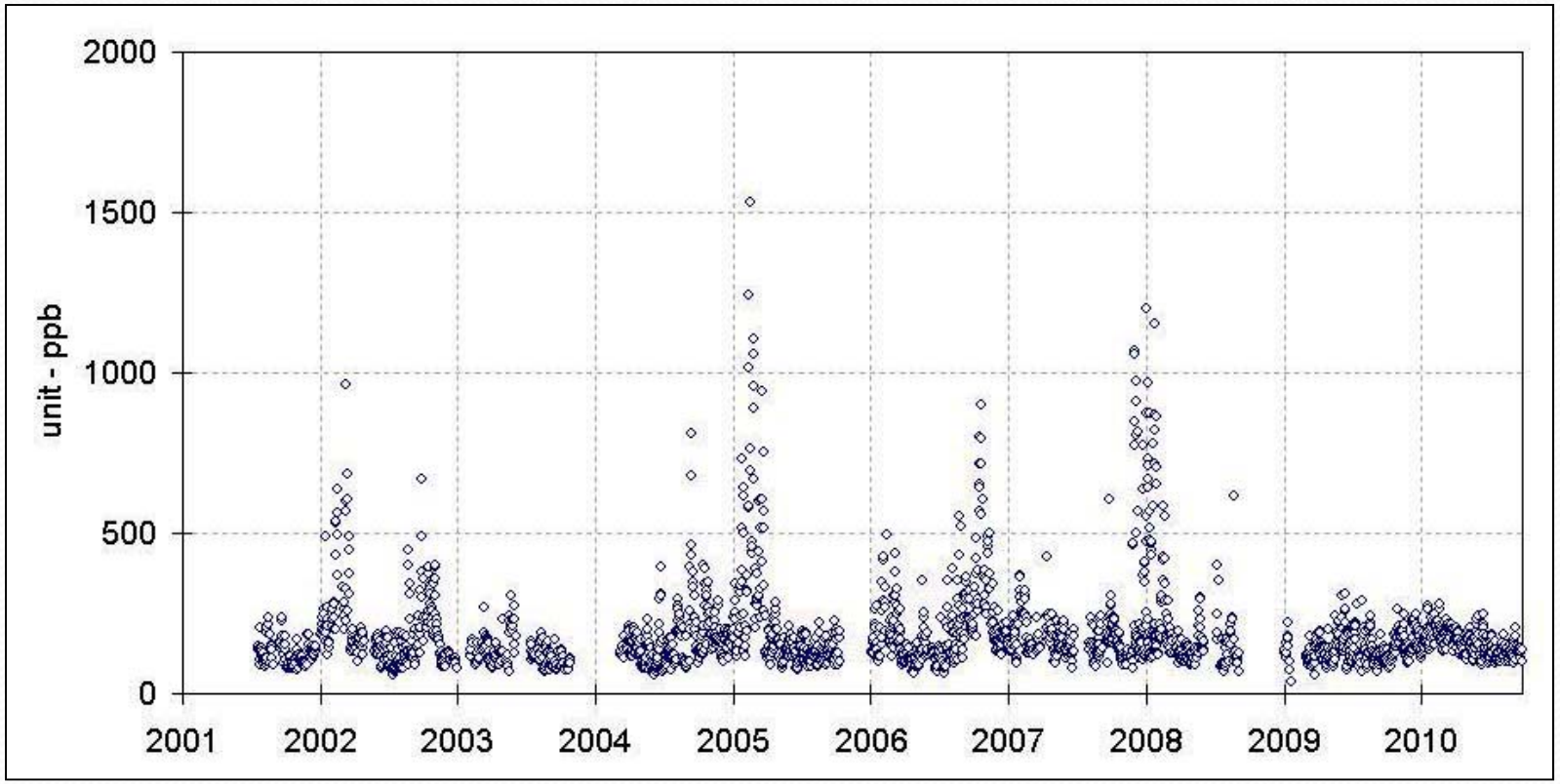
>> Progress of Measurement Programme

Surface Ozone at GAW Kototabang



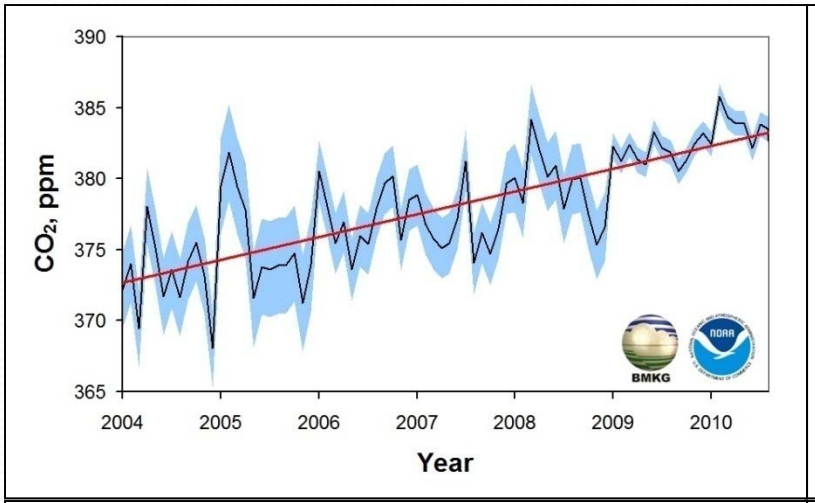
>> Progress of Measurement Programme

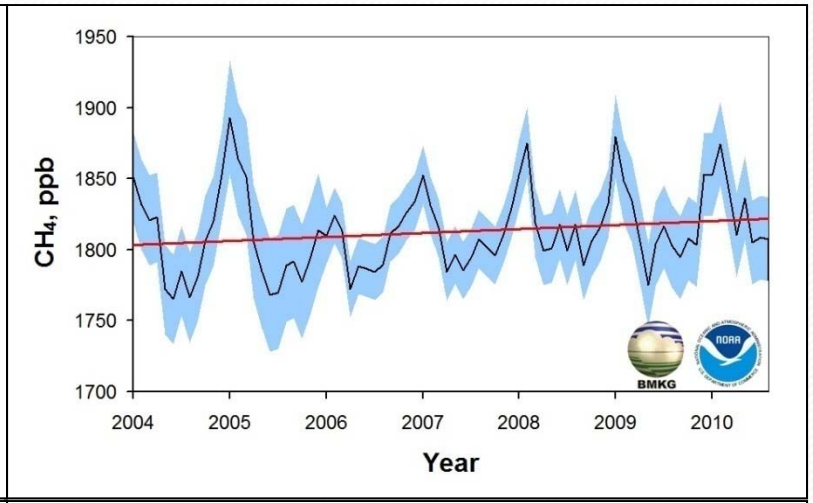
Carbon Monoxide at GAW Kototabang

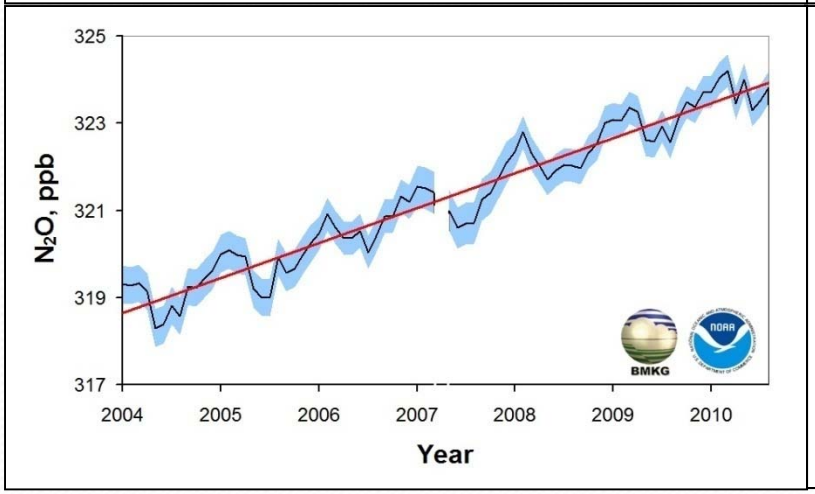


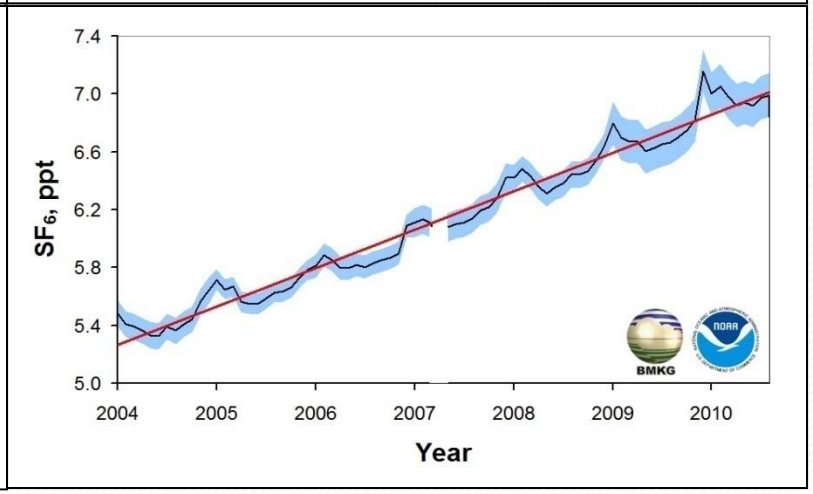
>> Progress of Measurement Programme

Green House Gases





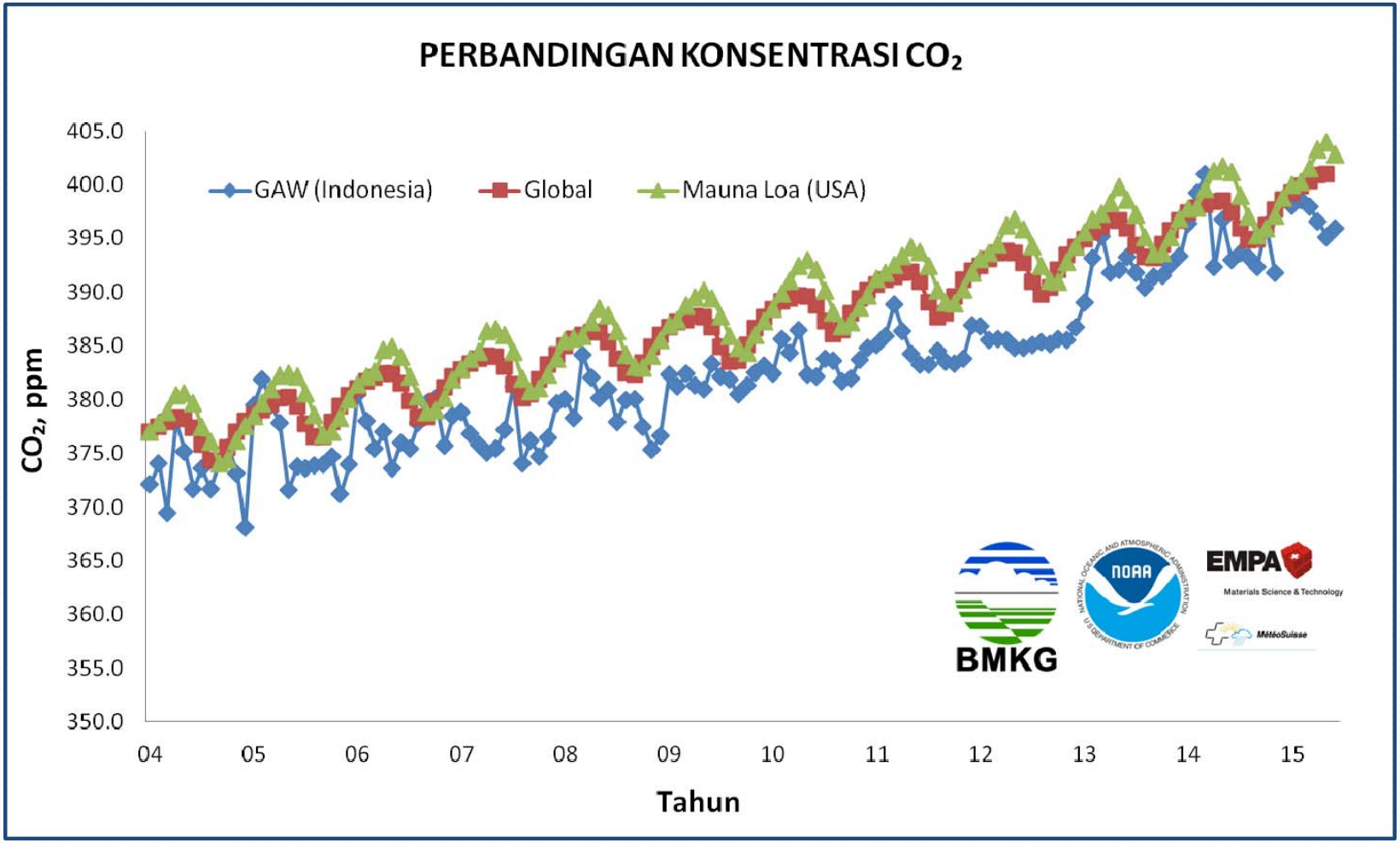




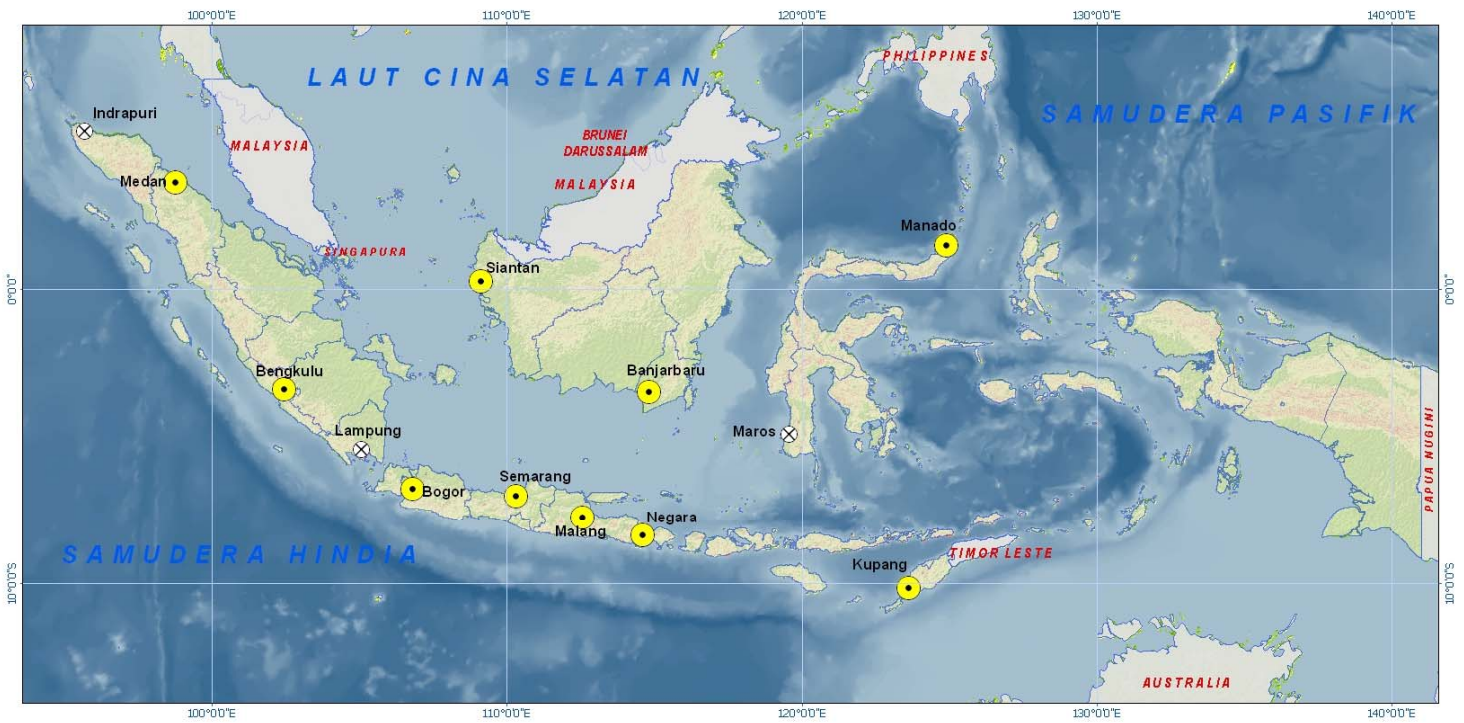
>> Progress of Measurement Programme

CO_2 Concentration data at Koto tabang can deny ALLEGATIONS THAT INDONESIAN IS THE THIRD LARGEST EMMITER

Comparison of CO2 concentration of Global, Mauna Loa and GAW-Bukit Kototabang



CO2 Concentration June 2015



KONSENTRASI CO_2
JUNI 2015

BMKG
BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

Nilai Konsentrasi:		
< 380 ppm	Rendah (*Low*)	
380 - 400 ppm	Sedang (*Moderate*)	
401 - 425 ppm	Tinggi (*High*)	
426 - 450 ppm	Sangat Tinggi (*Very High*)	
> 450 ppm	Ekstrim (*Extremely High*)	
Tidak Ada Data		

Keterangan:

Batas Propinsi

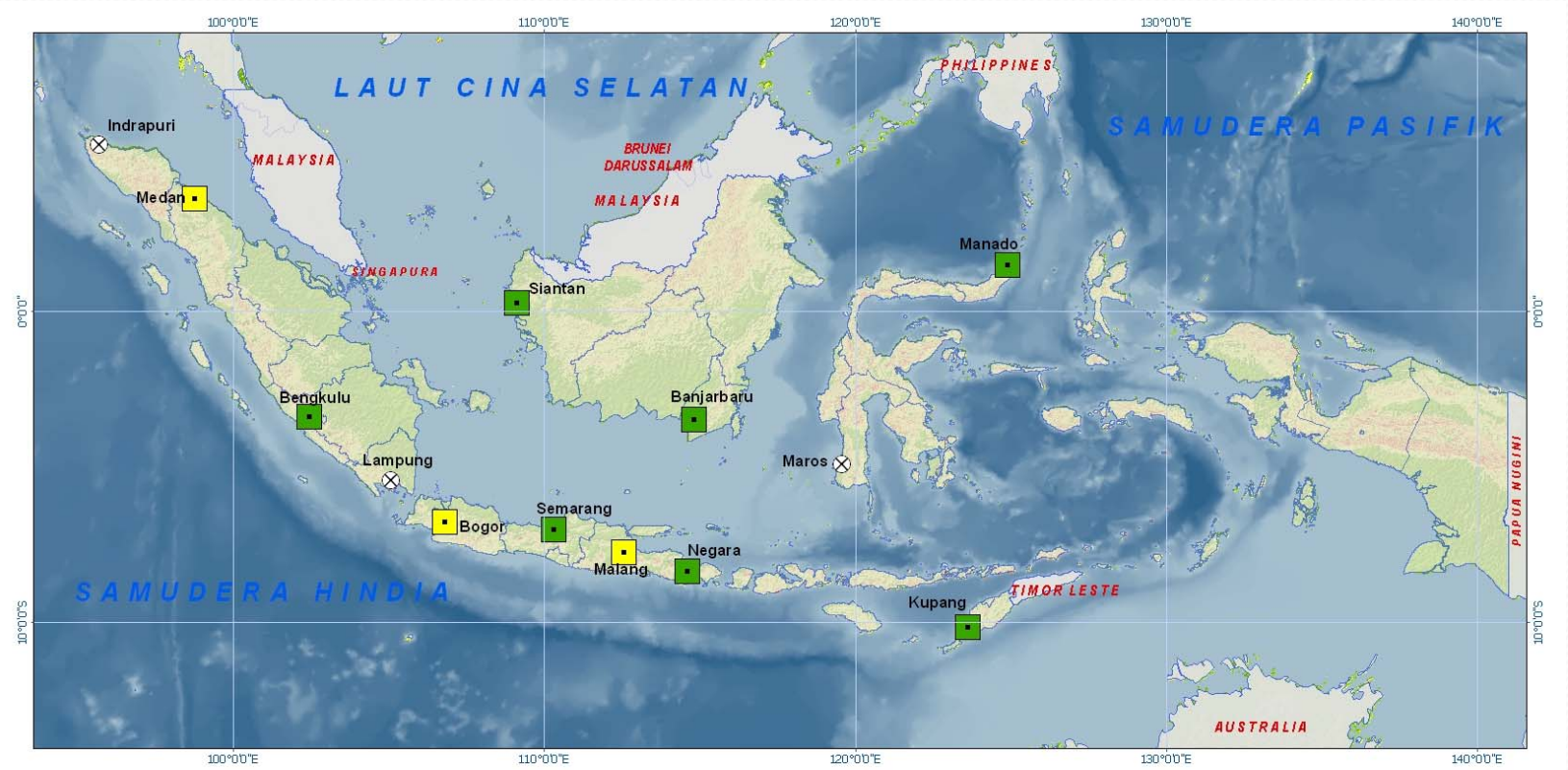
Luar Negeri

N
W E
S

0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan GHG BMKG 2015

CH4 Concentration June 2015



KONSENTRASI CH_4
JUNI 2015

BMKG
BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

Nilai Konsentrasi:		
< 1.85 ppm	Rendah (*Low*)	
1.85 - 2.0 ppm	Sedang (*Moderate*)	
2.1 - 2.25 ppm	Tinggi (*High*)	
2.26 - 2.50 ppm	Sangat Tinggi (*Very High*)	
> 2.50 ppm	Ekstrim (*Extremely High*)	
Tidak Ada Data (*Not Available*)		

Keterangan:

Batas Propinsi

Luar Negeri

N
W E
S
0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan GHG BMKG 2015

Contribution

>Data
WDCGG for Surface Ozone and CO, WRDC for Solar Radiation, NCDC for Rain Water Chemistry

>Research Place / Laboratory / Scientific Excursion
Scientists, Lecturers, Teachers, Students

>Workshops/Seminars
Andalas University, BMKG West Sumatra

>Publications
Bulletin (MEGASAINS), Magazine (Suara Bukit Kototabang), Webblog

>International and National Affiliations
EMPA, NOAA, NREL, Env. Canada, CMAR CSIRO, JAMSTEC, Kyoto University, LAPAN, BPPT, LIPI, PUSARPEDAL, Bandung Institute of Technology, Andalas University, Padang State University, Riau University.

Challenges...

- Maintaining the location from any land use changes
- Develope the facilities and infra structures
- Upgrading the instruments and monitoring system
- Man power

AIR QUALITY MONITORING IN BMKG

Air Quality Network

AIR QUALITY MONITORING NETWORK
INDONESIA

BMKG

BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

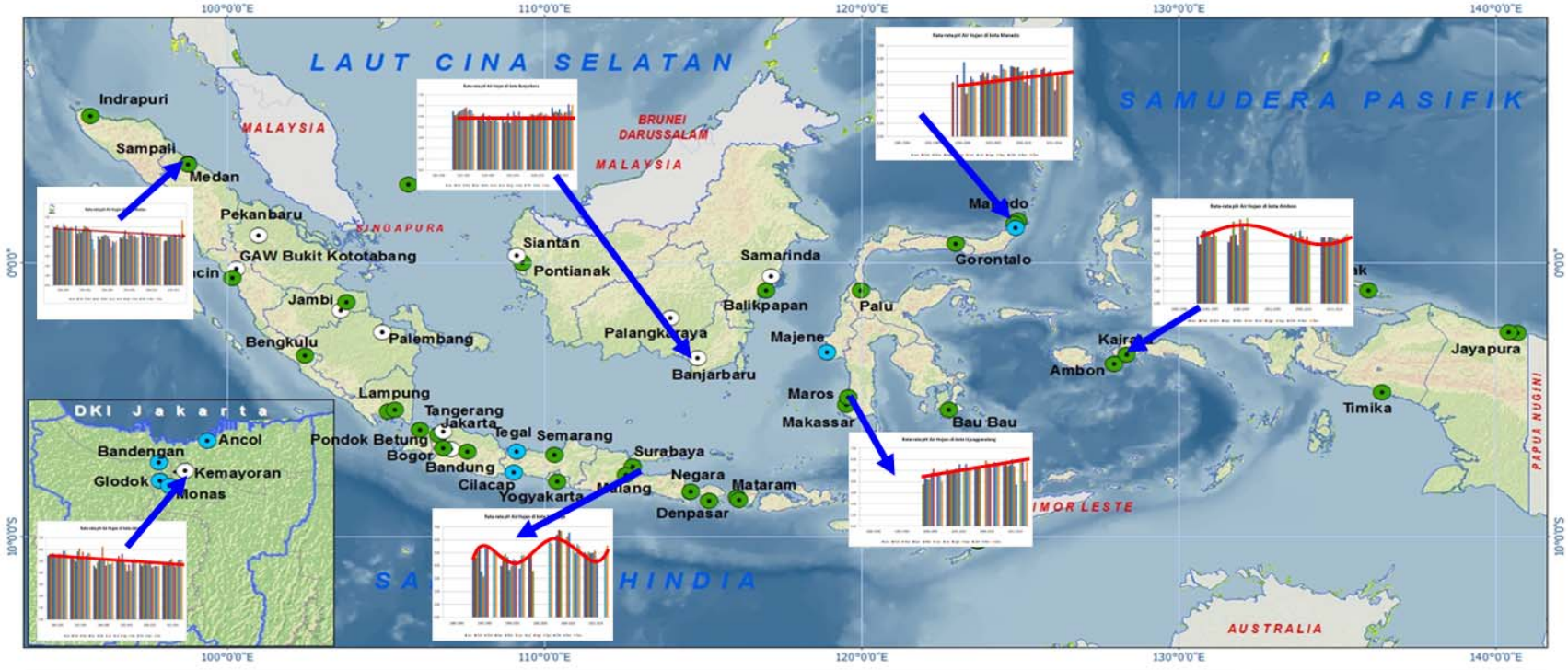
PARAMETER:	KETERANGAN:
SPM	Batas Propinsi
SPM + PCh	Luar Negeri
SPM + PCh + PM_{10}	

N
W E
S
0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan Pemantauan Kualitas Udara BMKG, 2014

Measurement Results

Level of Acidity



AIR QUALITY MONITORING NETWORK
INDONESIA

BMKG

BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

PARAMETER:	KETERANGAN:
SPM	Batas Propinsi
SPM + PCh	Luar Negeri
SPM + PCh + PM_{10}	

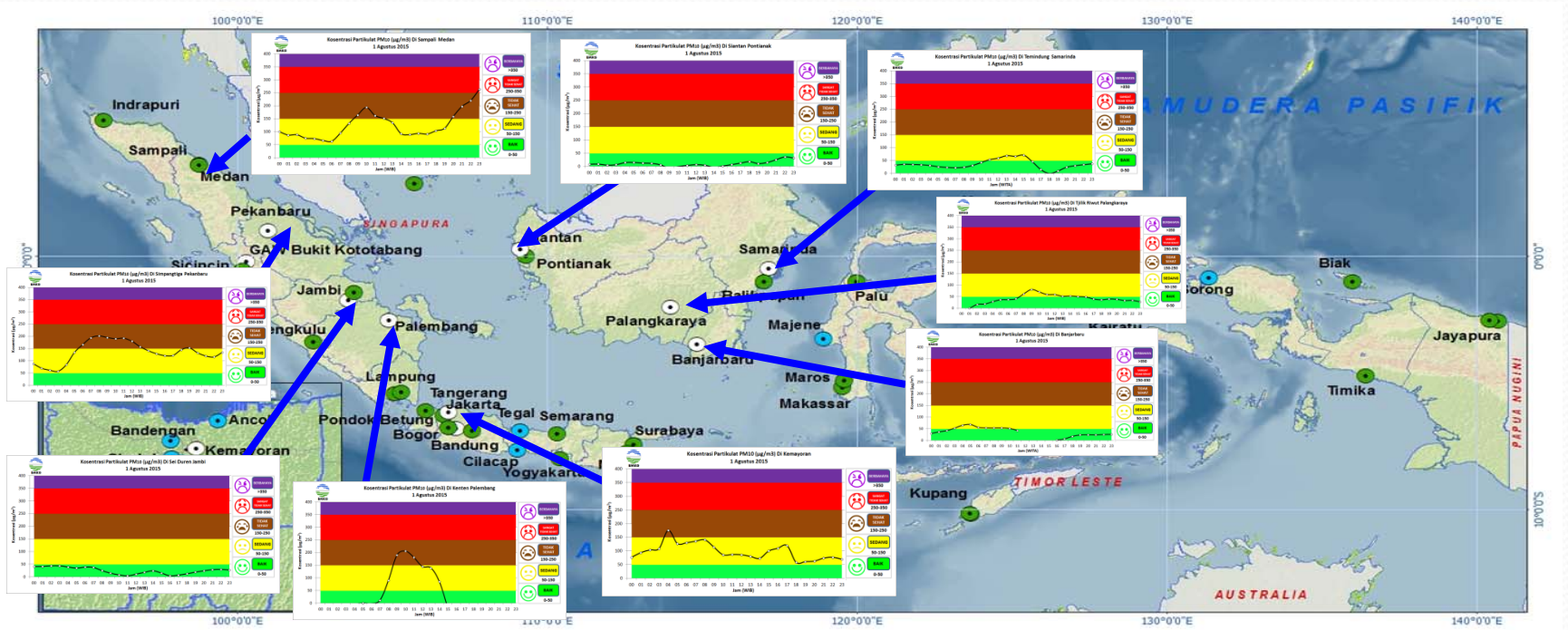
N W E S

0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan Pemantauan Kualitas Udara BMKG, 2014

Monthly Average from 1985 to 2014

Level of PM_{10}



AIR QUALITY MONITORING NETWORK
INDONESIA

BMKG
BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

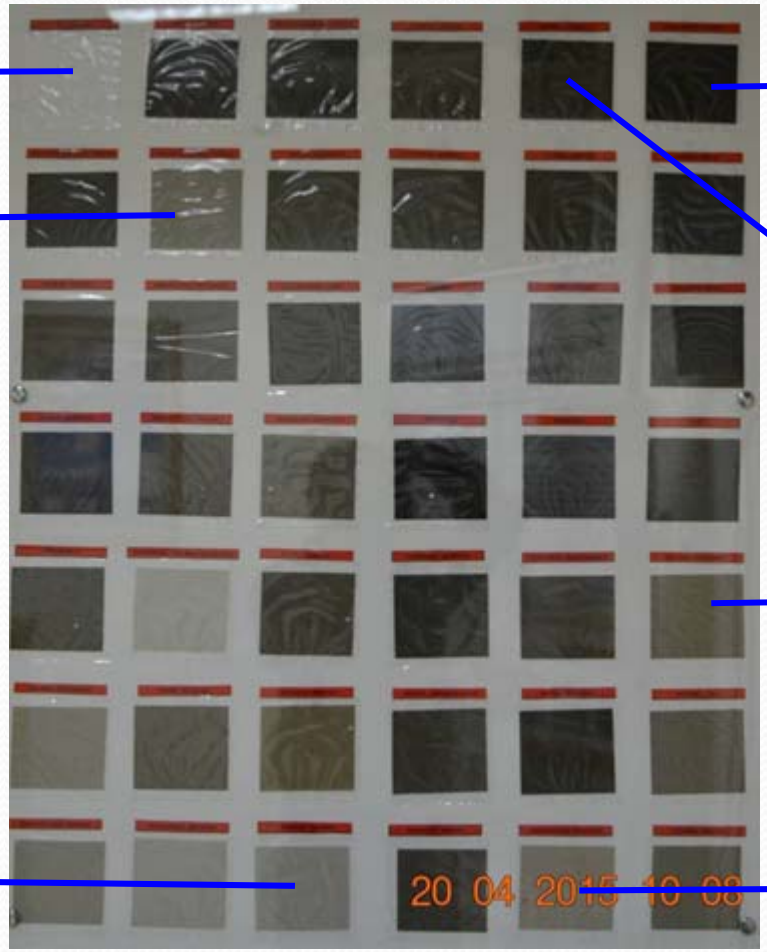
PARAMETER:	KETERANGAN:
SPM	Batas Propinsi
SPM + PCh	Luar Negeri
SPM + PCh + PM_{10}	

N
W E
S
0 90 180 360 540 720 KM

Sumber Data:
1. Peta Rupa Bumi BIG, Skala 1: 250.000
2. Data Lokasi Jaringan Pemantauan Kualitas Udara BMKG, 2014

GOOD	MODERATE	UNHEALTHY	VERY UNHEALTHY	HAZARDOUS
0 - 50	50 - 150	150 - 250	250 - 350	> 350

Lung of Ours (Dust Particles)



Blank Filter

GAW Koto Tabang

Tondano / North Sulawesi Smallest ~ 23,62 µg/Nm³ (2014)

Glodok – Jkt

Ancol, Bandengan, Delta, Kemayoran

Cisarua, Bogor

Biak, Papua

Concluding Remarks

- GAW Station at Bukit Kototabang and additional two sites in Palu and Sorong are the WMO implementation of its global program in Indonesia; a program on monitoring air quality and the atmosphere of the ambient air.
- BMKG plays an important role and highly visible in supporting climate change issues with continuous GHG observing.

Concluding Remarks

- Air Quality measurement shows local characteristics phenomena (acidity, SPM and Dust Particle);
- Forest fire appears regularly at certain location and triggers increasing of PM10;
- Healthy air correlates strongly with industrial activities and also incidentally with fires.

BMKG

Thank You