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

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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\textsubscript{3}OS) - 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 of BMKG working unit
• Obtain the official status as the GAW station in October 2004 (KEP. No. 006/KBMG/2004)
• BMKG has also 14 additional 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.
GHG Monitoring Network
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
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

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**Notes:**
- **MAWS** refers to Micro Atmospheric Wall System.
- **GAPS** refers to Ground Atmospheric Particle Sensor.
Started with...

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

>> Progress of Measurement Programme
Current 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)

and many others...
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
CO₂ Concentration data at Koto tabang can deny ALLEGATIONS THAT INDONESIAN IS THE THIRD LARGEST EMITTER
Comparison of CO2 concentration of Global, Mauna Loa and GAW-Bukit Kototabang

PERBANDINGAN KONSENTRASI CO₂

GAW (Indonesia)  Global  Mauna Loa (USA)

CO₂, ppm

04 05 06 07 08 09 10 11 12 13 14 15

Tahun
CO2 Concentration June 2015

KONSENTRASI CO$_2$
JUNI 2015

BMKG
BADAN METEOROLOGI KILIMATOGI DAN GEOFISIKA

Nilai Konsentrasi:
- < 380 ppm  Randah (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:
- Batos Propinsi
- Luar Negeri

Sumber Data:
1. Petu Ruca Buwu 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
- Develop the facilities and infrastructures
- Upgrading the instruments and monitoring system
- Man power
AIR QUALITY MONITORING IN BMKG
Air Quality Network

AIR QUALITY MONITORING NETWORK
INDONESIA

PARAMETER:
- SPM
- SPM + PCh
- SPM + PCh + PM$_{10}$

KETERANGAN:
- Batas Propinsi
- Luar Negeri

Sumber Data:
1. Peta Rupe Bumi BIG, Skala 1: 260,000
2. Data Lokasi Jaringan Pemantauan Kualitas Udara BMKG, 2014

BMKG
BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA
Level of Acidity

Monthly Average from 1985 to 2014
Level of PM$_{10}$
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

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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.
Thank You