OBSERVATION OF GREENHOUSE GASES AND AEROSOLS UNDER VARIABILITY OF INDONESIA CLIMATE

Prof. Dr. Edvin Aldrian
Agency for Assessment and Application on Technology
IPCC Working Group I Vice Chair

Land Cover/Land Use Changes (LC/LUC) and Impacts on Environment in South/Southeast Asia - International Regional Science Meeting, 28-30th May, 2018, Philippines
Observation of GHG in a GAW Station in Indonesia (in Bukit Koto Tabang)
Measurement of GHG reduction in Bali Island during Nyepi day
Aerosol Study during forest fire in Riau Province Sumatera
Aerosol Study during forest fire in central Kalimantan
Aerosol Study during forest fire in Jambi Province Sumatera
Trend = 2.67 ppm (logarithmic)
Est Dec 2020 + 399.06 ppm
Est Dec 2020 -26% = 392.63 ppm
Trend of CO₂ January 2014 - March 2018
GAW Station Bukit Kototabang
Trend of CH$_4$ January 2014 - March 2018
GAW Station Bukit Kototabang
Trend of SF$_6$ January 2014 - March 2018
GAW Station Bukit Kototabang
SEASONAL VARIABILITY

- CO₂ (ppm)
  - DJF
  - MAM
  - JJA
  - SON
  - Period

- CH₄ (ppm)
  - DJF
  - MAM
  - JJA
  - SON
  - Period

- N₂O (ppb)
  - DJF
  - MAM
  - JJA
  - SON
  - Period

- SF₆ (ppt)
  - DJF
  - MAM
  - JJA
  - SON
  - Period

Data range from 2004 to 2010.
INSTRUMENTS AT GAW STATION
BUKIT KOTO TABANG

Ozone Analyzer

CO Analyzer

Pyranometer

BAM 1020
INSTRUMENTS AT GAW STATION
BUKIT KOTO TABANG

Nephelometer

HVAS

Air Flask Sampler

Passive Air Sampler
# GHG Emission Reduction During Hindu Nyepi Day

## Locality
1. **Negara (Barat):** 8° 20’ 24”S, 114° 36’ 59”E
2. **Singaraja (Utara):** 8° 6’ 57,2”S, 115° 4’ 50,1”E
3. **Karangasem (Timur):** 8° 21’ 53,4”S, 115° 36’ 39,0”E
4. **Bedugul (Tengah):** 8° 15’ 1,8”S, 115° 9’ 8,2”E
5. **Denpasar (Selatan):** 8° 40’ 44,2”S, 115° 13’ 56,6”E

## Coordinates
- Negara (Barat): 8° 20’ 24”S, 114° 36’ 59”E
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## Method & Frequency of Data
- Indirect Measurement (Sampling); Daily Data (14.00 WITA)
- Direct Measurement; Continuous Monitoring; (Data tiap 5 menit)

## Equipment
- Flask Sampler
- Flask Sampler
- Flask Sampler
- Flask Sampler
- WolfPack® & IRIS 4600

## Data GRK
- CO₂, CH₄
- CO₂, CH₄
- CO₂, CH₄
- CO₂, CH₄
- CO₂, N₂O

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The map shows the locations of Negara, Singaraja, Karangasem, Bedugul, and Denpasar. The data was collected using various methods and equipment to measure GHG emissions during Hindu Nyepi Day.
GHG emission reduction during Hindu Nyepi day

**Average Reduction 33%**
Goal: reduction of anthropogenic emission during the absence of human activities.

There is none until nowadays such a quantitative direct measurement that could prove that statement.

The present method used by many are estimation, assumption and model that are qualitative. This is due to the difficulty of isolated an area clear of surrounding influences. In Indonesia there is a Bali island where the People stop their activities 30 hours during the Nyepi Holy day.

This is the first of a kind that prove of human activity shall increase the GHG concentration.
Nyepi day in Bali island is an ideal condition in the measurement of the amount of anthropogenic emissions as the entire island stop their activities in a day and being isolated from the outside. This is the real measurement of anthropogenic emissions without models, formulas and assumptions.

Given the unique circumstances in Bali Nyepi Day in which we believe it has no comparison in any other hemisphere (an island stopped its activity in a day), it is predicted that such measurement is the first time in the world.
Aqua MODIS satellite imagery on June 19th, 2013 (a); Hysplit forward trajectory model ran 24 h for June 2013 from hotspot in Riau (b).

Riau PSI in 5 monitoring sites (Rumbai, Minas, Duri Camp, Duri Field, and Dumai) vs hotspots (b).
PM2.5 concentration (a) and PSI in Singapore (b) vs hotspot detection in Riau Province in June 2013.
Daily AOD at wavelength 500 nm and daily hotspot number in June 2013 (a) and scatter plot of AOD versus AE (440–870 nm) (b). AE was determined using 440–870 nm, which are indicative of the general size distribution and the relative dominance of fine versus coarse mode particles.
Aerosol size distribution during June 2013 from Singapore AERONET site. There is significant shift between size distribution before the fire episode (solid rectangular/circle) and during fire episode (dashed rectangular/circle).
The sun photometer installed on the roof of the Tjilik Riwut Meteorology Station at Tjilik Riwut Airport Palangkaraya, Central Kalimantan – Indonesia
Monthly AOD, hotspot and rainfall relationship. AOD at wavelength 500 nm (a) and Visibility versus AOD and hotspot in 2012 (b) and 2014 fire episodes (c),
Histogram of AOD during fire episode 2012 and 2014 (a, b) and Histogram of SSA (c),
Certainly there is a clear relationship between particulate concentration and visibility, however, some reduction of visibility is due to fire in some other parts outside Jambi.
OCTOBER 2014 AOD VS AE

AOT vs AE

Small size aerosol from forest fire

Peatland source aerosol with high AOD above 4.5
MONTHLY AOD VS AE

AOD 500nm

Angstrom Exp 440-870nm

AOD 500nm

Angstrom Exp 440-870nm
1. IPCC Special Report on Climate Change and Land; an IPCC special Report on Climate Change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Expert Review on First Order Draft end of May 2018

2. IPCC Expert meeting on Short lived Climate Forcers (SLCF) Geneva 28 – 31 May 2018
CONCLUSIONS

1. GHG concentration is surely related to human activity as shown in Bali measurement.
2. Degraded land use change and deforestation in Jambi province have been studied and detected.
3. There is a significant relationship between forest fire as indicated with the hotspot number with climate annually or interannually.
4. PM10 and AOD during fire episodes increase significantly and eventually reduce visibility.
5. Significantly high AOD number above 6.0 in Kalimantan and above 5.0 in Jambi may related to peat fires in the eastern coast of Sumatera.
References


https://www.researchgate.net/profile/Edvin_Aldrian
https://www.youtube.com/channel/UCb6tHXKzSvP51WqQ8xyo7kQ