



LCLUC, Environment and Emissions in South/Southeast Asia
- An International Regional Science Meeting
22-24 July 2019 Johor Baru, Malaysia



Mapping the Health Impact of Atmospheric Pollution: opportunities in Metro Manila, Philippines

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**Adjunct Research Professor, International
Environmental Research Institute
Gwangju Institute of Science and Technology,
South Korea**

**Balik-Scientist Fellow (2012-2017), Department of
Science and Technology**

Air Quality Specialist (2012-2013), Clean Air Asia



**over 15 years
experience in the
environment sector**

Educational Background

- 2016-present: Adjunct Research Professor, (IERI)
- 2017: DOST Balik-Scientist Fellow
- 2012: PhD Environmental Science and Engineering (GIST)
- 2007: MS Environmental Science (UPD)
- 2001: BS Chemistry (UPD)



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- 1. Review of 2018 LCLUC Science Meeting outputs**
- 2. Post 2018 LCLUC Science Meeting Projects**
- 3. Air Pollution and Health Data Analysis**
- 4. Results**
- 5. Opportunities**



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Atmospheric Science and Land Use Cover Change: Panel Discussion

Pressing issue facing the region

- Population density, fast development
- Urban air pollution
- Transboundary pollution
- Aerosol-gas experiment observations
- Long term reduction of GHG
- El Nino implications to forest fire aerosols
- Public awareness: daily forecast
- Air pollution-health impacts
- Energy use for space heating and electricity
- Indochina peninsular comprehensive research
- Biomass Burning
- Industries
- Megacities pollution

1st LCLUC SARI Meeting, Philippines, May 28-30, 2018, Eastwood Richmond Hotel



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Atmospheric Science and Land Use Cover Change: Panel Discussion Research Priorities

- Air pollution is highly complex, **multi faceted problem**.
- **How to reduce air quality for us to live longer.**
- **Find evidence-based standards, rather than US EPA standards.**
- **Health, modeling, measurement community of practise come together (strong linkage)**
- How and what extent can the **researcher reach the decision makers.**
Good quality impact. Community to implement the mitigation.
- Air pollution data sharing platform depends on Gov policies. **AQI depends on different objectives.**

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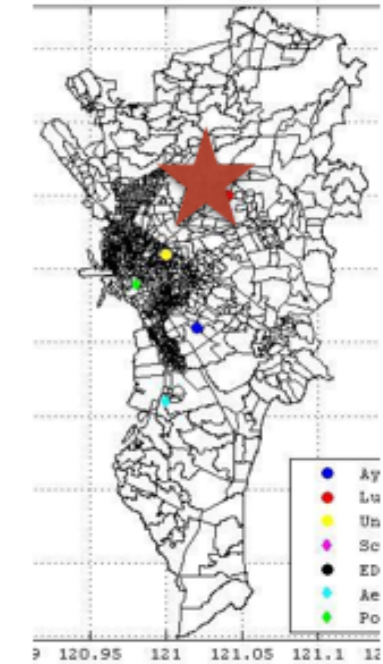
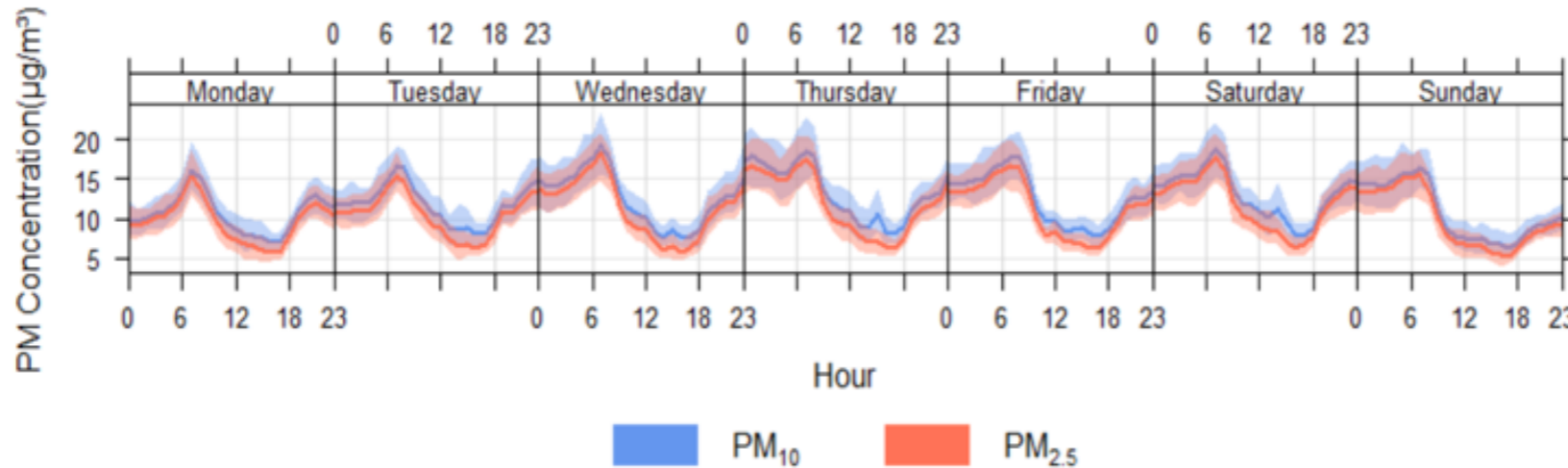


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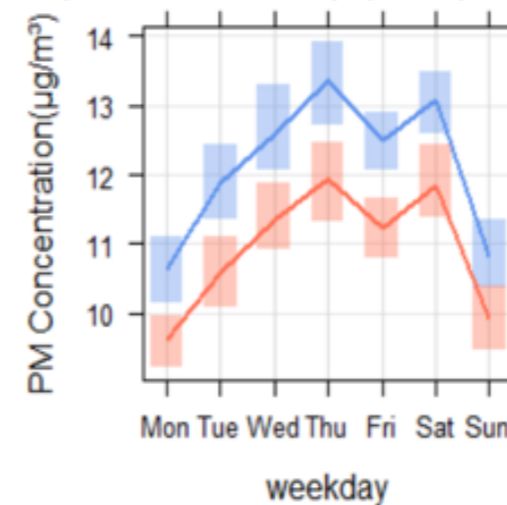
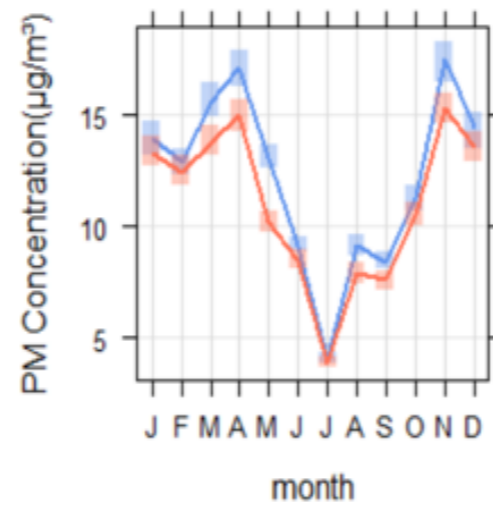
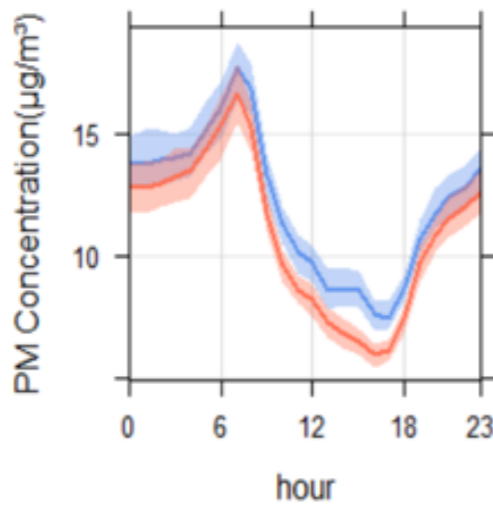


2.3 Results of Long-term monitoring in LCP (Quezon City)

Day-of-the-Week Diurnal Variation of PM₁₀ and PM_{2.5}



Source: Perdigones, et al. 2018 (paper in progress)



mean and 95% confidence interval in mean

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Spatial and Temporal Distribution of APM Over the NCR, Philippines

1st LCLUC SARI Meeting, Philippines, May 28-30, 2018, Eastwood Richmond Hotel

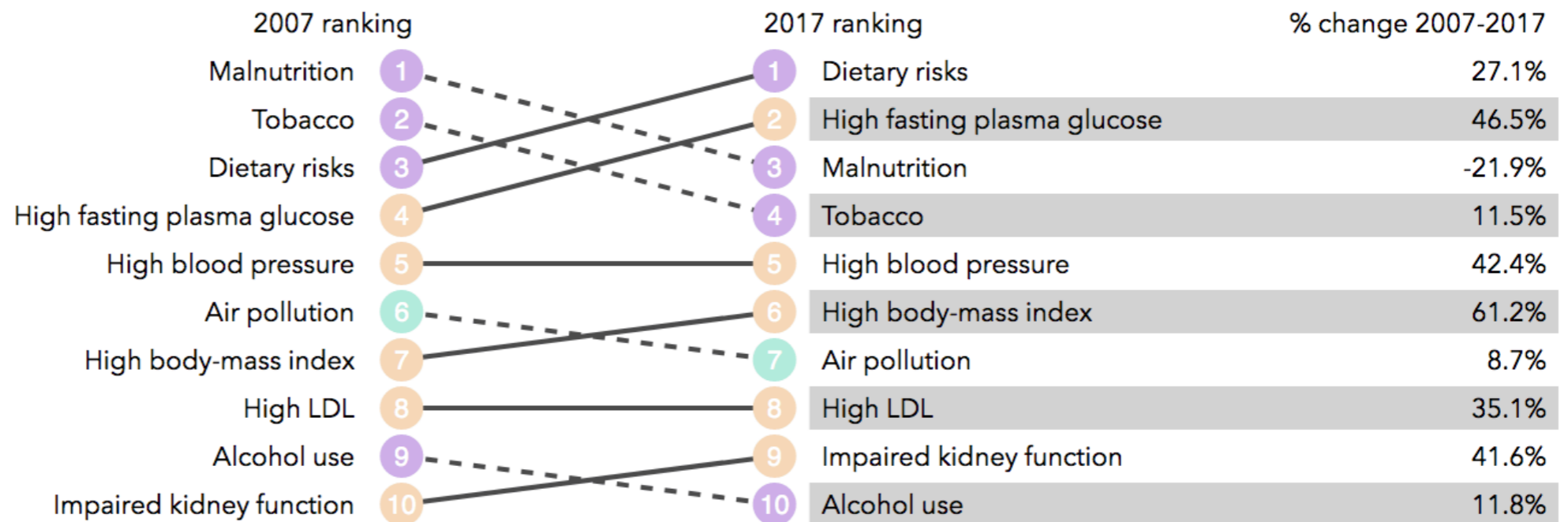


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What risk factors drive the most death and disability combined?

- Metabolic risks
- Environmental/occupational risks
- Behavioral risks



IHME for Philippines, accessed 2019



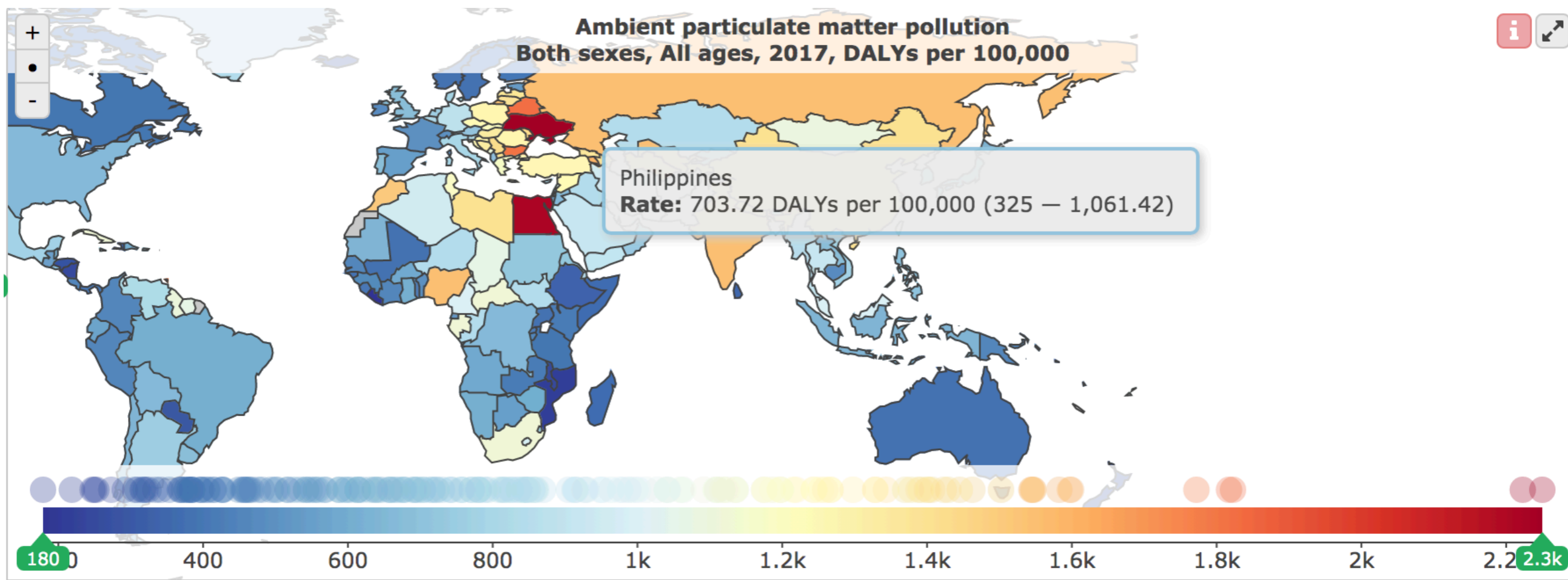
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2. Post 2018 LCLUC Science Meeting Projects



IHME for Philippines, accessed 2019



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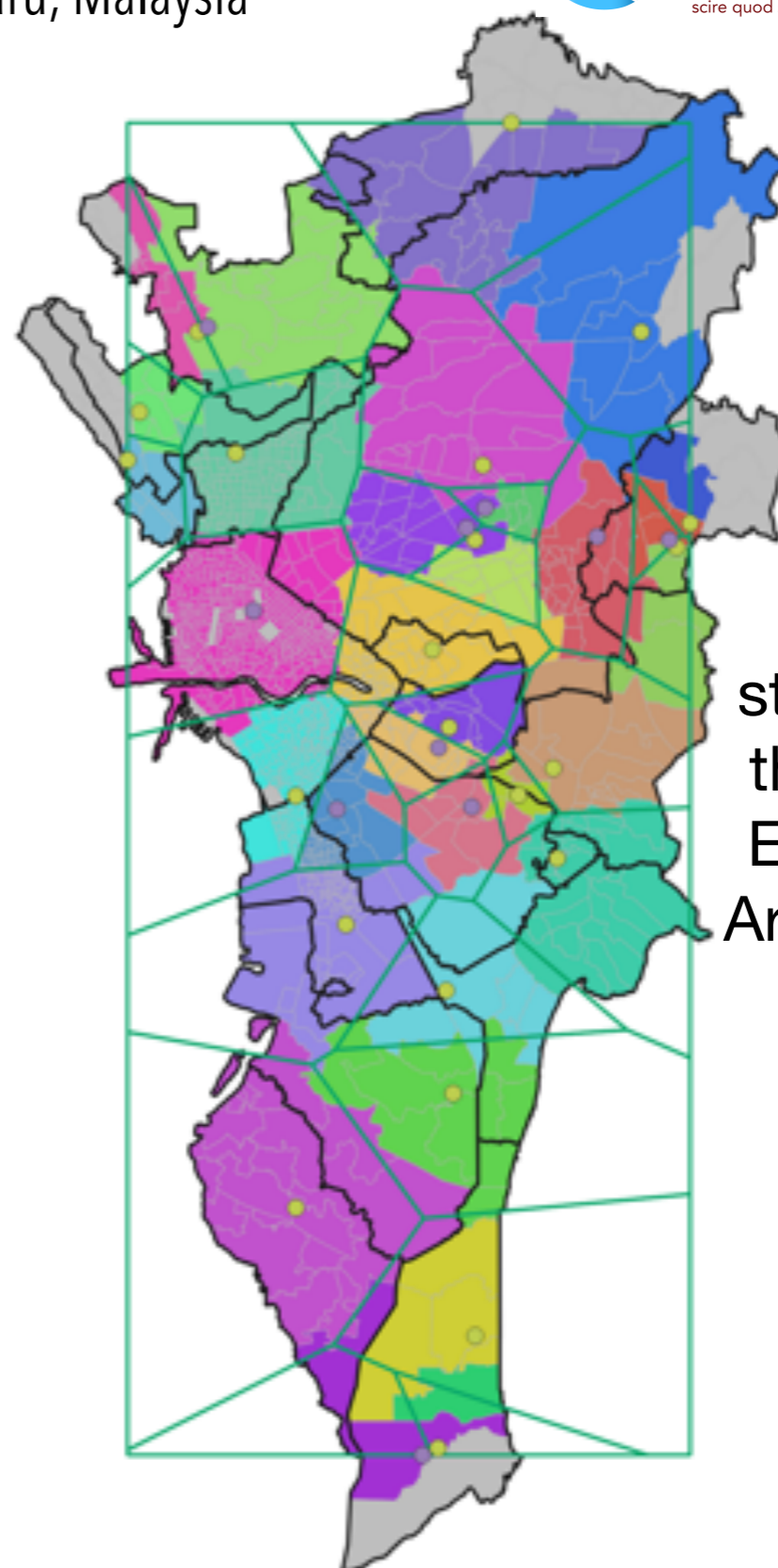


2. Post 2018 LCLUC Science Meeting Projects

Improving the Air Quality and Health Monitoring System in Metro Manila

Mylene G. Cayetano

Edited by:
 Bonifacio B. Magtibay



AQMS stations by the DENR-EMB, with Area served analysis

Legend

- Manual Stations
- Automatic Stations
- Thiessen polygons (Areas Served)
- City Boundaries



World Health Organization
 Western Pacific Region
 Manila Philippines
 2018



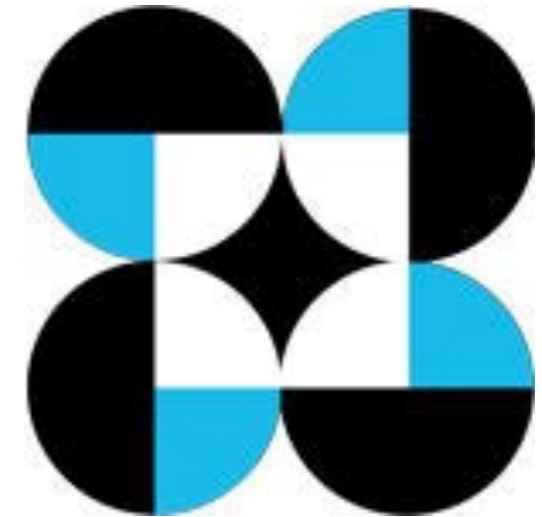
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Department of Science and Technology (DOST)

Road map on Air Quality Research

INDUSTRY/SECTOR/DISCIPLINE FOCUS: ENVIRONMENT SECTOR



PROGRAM: Environmental Pollution and Control Program

GOALS:

1. To establish an Air Quality R&D Center
2. To develop new, cleaner and improved technologies that would respond to the pressing concerns on air quality



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2. Post 2018 LCLUC Science Meeting Projects

Department of Health (DOH)

Department of Environment and Natural Resources (DENR)

Inter-Agency Committee of Environment and Health (IACEH)



**Development of the AQI Breakpoints for PM_{2.5} Using NCR Data
 (Solicited research from the 2018 IACEH TWG Meeting)**

Dec 2018 IACEH TWG
 (DENR Requested
 to Develop AQI
 breakpoints)

IACEH **TWG** 2019
 (Consultation Meeting 2)
 DENR, March, 2019

IACEH 2019
 (Consultation Meeting 4)
 Solo Hotel, May 2019

DENR MANCOM
 (Consultation Meeting 6)
 TBD 2019

IACEH **TWG** 2019
 (Consultation Meeting 1)
 DENR-AQMTC, Feb, 2019

DENR **Committee**
 (Consultation Meeting 3)
 DENR, April, 2019

Public Consultation
 (Meeting 5)
 IESM, June, 2019

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Philippines' National Ambient Air Quality Guideline Values (PM_{2.5})

Guideline Value for PM _{2.5}		Short term (24-hour)	Long term (Annual)	Unit	Implementation
NAAQGV		75 ^(a)	35 ^(b)	µg/Nm ³	Upon effectivity date of the DAO until Dec 31, 2015
		50 ^(a)	25 ^(b)	µg/Nm ³	January 1, 2016
WHO ^(c)	IT-1	75	35	µg/m ³	Not applicable
	IT-2	50	25	µg/m ³	
	IT-3	37.5	15	µg/m ³	
	Air Quality Guideline (AQG)	25	10	µg/m ³	

^(a) Maximum limits represented by 98 percentile values and not to be exceeded more than once a year.

^(b) Annual geometric mean

^(c) Annual mean

Reference: DAO 2013-13

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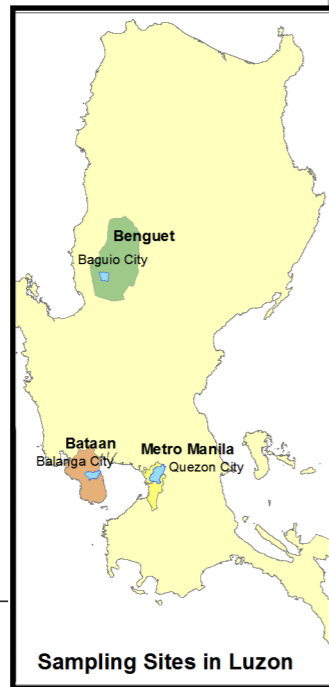
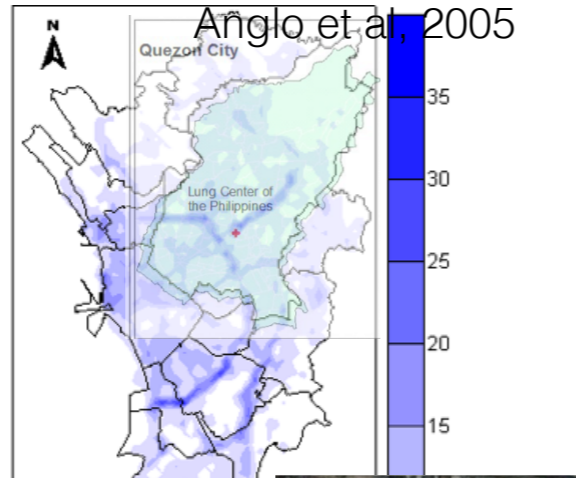


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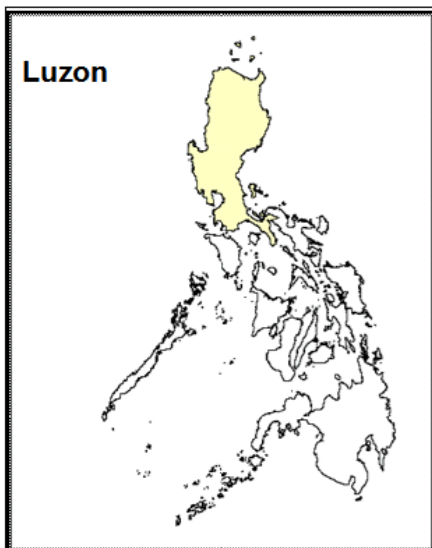


Mobile emissions: Largest in Philippine cities

4. Results



10000m 20
 Estimated particulate emissions from mobile sources in tons per year
 Max = 35.1 tpy, Total = 1



One (1) motor vehicle for every 12 people in the Philippines (as of 2013) Motor vehicle exhausts produces visible pollution, tiny airborne particulate matter and other pollutants. These produce the haze which shrouds our cities.

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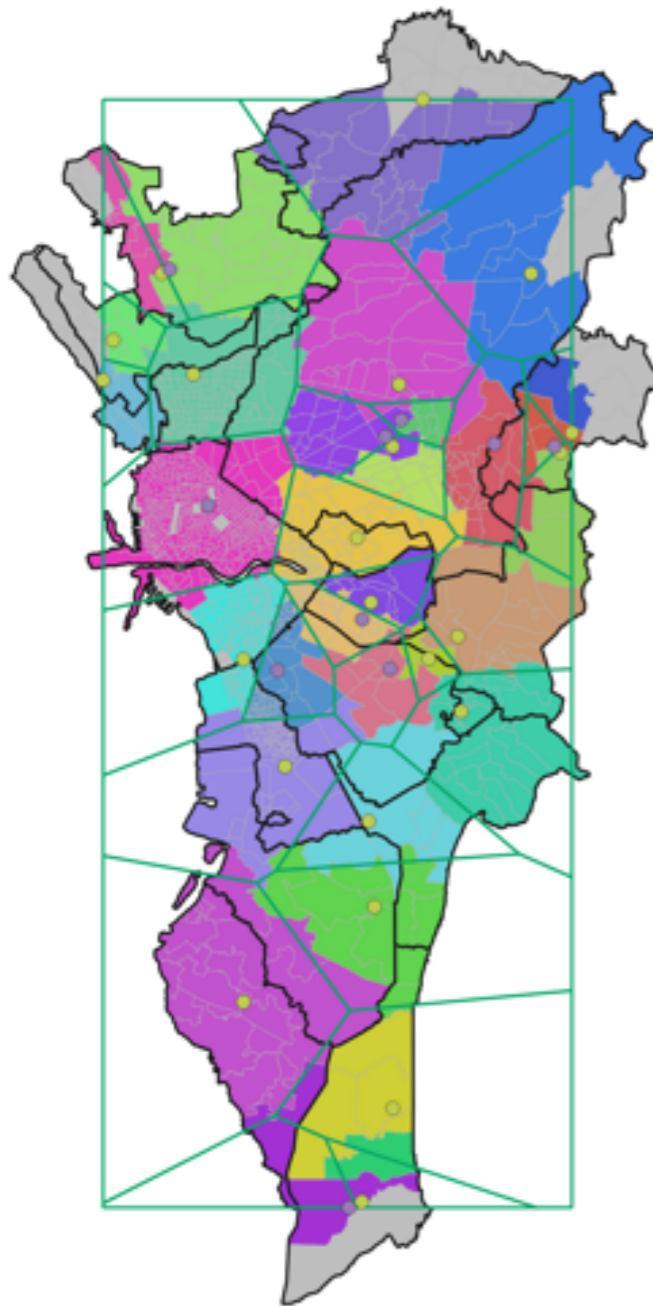
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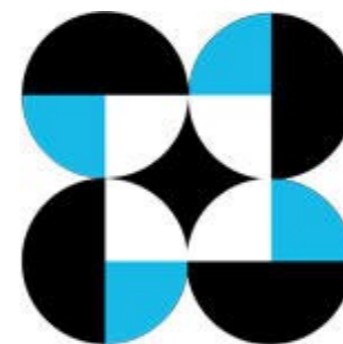


4. Opportunities



- 8,900 plus health data on lung-related diseases
 - ✓ (Aug 2015 to August 2017)
- Health data can be geo-tagged
- Ground validation of satellite derived PM_{2.5}
 - ✓ 3-point (triangulation) in a City Site (2 years daily data)
 - ✓ 17 plus point in a regional site (2012-2018 daily data)
 - ✓ 88 plus points in the Philippines country (~5-10 years daily data)

Partnership with Government Agencies



Legend
 • Manual Stations
 • Automatic Stations
 □ Thiessen polygons (All Stations)
 □ City Boundaries
 Areas Served

- Science to policy outputs
- Societal outcome

ACKNOWLEDGEMENT

- **Rotary Club of Makati**
- **Lung Center of the Philippines (Dr. Daphne Bate)**
- **World Health Organisation (Engr. Boni Magtibay)**
- **DENR-EMB-EQD-AQMS (Engr. Renato Cruz, Engr. Jundy Del Socorro and team)**
- **IACEH TWG and DOH (Engr. Sonabel Anarna)**