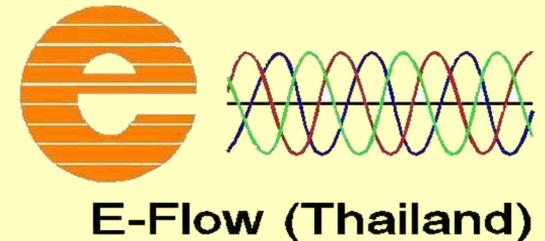


Power and Pollution

Jay Babin

Managing Director
E-Flow (Thailand) Company, Ltd.



Mr. Babin has been working in SE Asia for approximately 22 years; the last 18 based in Thailand. He has over 25 years' experience in energy savings work, landfill gas-to-energy projects including modelling, designing, construction, and construction management. He also has significant expertise in conducting environmental/health and safety due diligence and compliance audits as well as designing and construction supervision for wastewater treatment plants.

Power Generation and Air Pollution

By Jay Babin

E-Flow (Thailand) Co. Ltd.

Thailand the “HUB” of smog

World AQI Ranking



11:34, Mar 12

MAJOR CITY

US AQI

1		Chiang Mai , Thailand	234
2		Ulaanbaatar , Mongolia	200
3		Lahore , Pakistan	197
4		Kathmandu , Nepal	191
5		Dhaka , Bangladesh	190
6		Hanoi , Vietnam	182
7		Chengdu , China	171
8		Seoul , South Korea	166
9		Bangkok , Thailand	165
10		Shanghai , China	163



Another study by AirVisual, an independent monitoring organization, ranked Thailand the 23rd worst-polluted country in 2018 with average concentrations of PM2.5, the smallest and most harmful particles, at 26.4 micrograms per cubic meter.

The WHO's target is 10 micrograms per cubic meter.

Definition of Air Pollution

- Chemicals (e.g. NO_x, SO_x, CO, O₃, lead), or substances (dust) that deleteriously impact the air quality
- Severity must take into account the concentration and the “toxicity” of the contaminant of concern

- The focus of this presentation will be on PM (particulate matter)
- PM₁₀ Particulate matter less than 10 μm
- PM_{2.5} Particulate matter less than 2.5 μm

Why is PM important?

- In 2013, a study revealed that there was no safe level of particulates
- For **every increase of 10 $\mu\text{g}/\text{m}^3$ in PM_{10} , the lung cancer rate rose 22%.** The smaller **$\text{PM}_{2.5}$ were particularly deadly, with a 36% increase in lung cancer per 10 $\mu\text{g}/\text{m}^3$** as it can penetrate deeper into the lungs.^[9]
 - ⁹Ole Raaschou-Nielsen; et al. (July 10, 2013). "[Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects \(ESCAPE\)](#)". *The Lancet Oncology*. **14** (9): 813–22. doi:[10.1016/S1470-2045\(13\)70279-1](#)

Even though the department's stations can measure both particulate matter 10 (PM10) and PM2.5 levels, the latter is not factored into the national measuring standard despite the fact that the miniscule particles can burrow deep into the lungs and pose a health risk.

Phaisan Thanyawinitchakun, an official at the Ministry of Public Health's Health Zone 1, claimed northerners have the lowest life span in the country.

Statistics for lung cancer patients in Chiang Mai are a a cause for concern. According to the Public Health Ministry, the province has 40 patients per 100,000 people, which is **double the national average.**

Source Bangkok Post 3 April 2018

On average, Bangkokians will live 2.4 years less, while people in Chiang Mai and Chiang Rai will respectively see 3.6 and 3.9 fewer summers, according to the **Air Quality Life Index report** published Wednesday by the University of Chicago. The index assesses the impact of particulate air pollution on life expectancy.

national March 19, 2019 15:55

By Natthawat Laping,
Kriangkrai Rattana
The Nation

2,050 Viewed

Chiang Mai finally lost top spot but remained very polluted on Tuesday as it fell to the fourth most polluted city on the planet, scoring 182 in the air quality index (AQI) at airvisual.com.

The website as of 10am reported that the northern city, with a 182 AQI and a PM2.5 level of 114.7 micrograms per cubic metre (mcg) of air, had been headed by Delhi (208mcg), Beijing (198mcg) and Lahore in Pakistan (186mcg).

Meanwhile, the Pollution Control Department cited lower but still unsafe levels of PM2.5 – airborne particulates 2.5 microns or less in diameter – in most parts of the nine northern provinces, ranging from 43-143mcg.

Sources of PM

- Geological (dust/volcanoes)
- Construction
- Mining
- Factories
- Automobiles
- Agriculture
- Electricity production

Electricity Production in Thailand and PM

- Focus is operation (not construction/demolition)
- Natural gas (exhaust)
- Coal (exhaust and mining)
- Waste to energy (exhaust)
 - Incinerators
 - Landfill gas
- Hydro power (no exhaust)
- Solar (no exhaust)
- Wind (no exhaust)

Emission Limits Particulate Matter (mg/m³)

(http://www.pcd.go.th/info_serv/reg_std_airsnd03.html)

	Fuel Type	New (2010)	Old (pre 2010)
	Oil	120	120
Power Generation	Coal	80	120
	Natural Gas	60	60
	biomass	120	
	Incinerator (<50 TPD)	400	
	Incinerator (>50 TPD)	120	
Industry	Steel/aluminum factory	300	
	General Production factory	400	
	Steel Mills (production)	120	240

Thailand Emission Limits

(http://www.pcd.go.th/info_serv/reg_std_airsnd03.html)

	mg/m ³		mg/m ³
Bangpakong (thermal power) unit 1-4	120	Nong Chok	60
Bangpakong (Combined Heat Power) UNIT 1-4	60	Sai Noi	60
Phra Nakhon Tai (Thermal Power) Unit 1 and 2	120	Wang Noi	60
Phra Nakhon Tai (CHP Unit 1 and 2)	60	Nam Phong	60
North Bangkok	150	Other power plants	
Surat Thani	320	Coal	320
Lan Krabue	60	Oil	240
		Gas	60

PM Standards

- Have 2 standards
 - Daily (acute-short term)
 - Yearly (chronic-long-term)
- WHO-

	PM 2.5	PM 10
Daily (24 hr)	25	50
Yearly	10	20

World Wide Standards ($\mu\text{g}/\text{m}^3$)

		Daily	Yearly
PM 10	US	150	50 (revoked in 1997)
	China (2012) (urban/industrial)	150	70
	Thailand	120	50
	European Commission	50	40
	World Health Organization	50	20
PM 2.5	China (2012)	75	35
	Thailand	50	25
	European Commission	NA	25
	US	35	12
	World Health Organization	25	10







Bangkok Post

Bangkok Post

Bangkok Post



A large fire is burning in a sugarcane field at night. The fire is bright orange and yellow, with thick black smoke rising from it. The sugarcane stalks are visible in the foreground, silhouetted against the fire.

Sugarcane farmer dies in fire while burning ...

bangkokpost.com

KANCHANABURI - A 49-year-old sugarcane farmer died from serious burns received while clearing his field of trash to make the cane harvest easier in Tha Muang district on Thursday night.



Thailand Factory

This is an exception, have never seen this



Mae Moh
2001













The Wujjata Open Pit Coal Mine near Ulan Moron, China, fills the air with coal dust.

Photo by Qui Bo/Greenpeace.

Coal Plants and PM2.5 in Thailand

GREENPEACE and Harvard

The Nation, 9 Feb. 2018

Greenpeace Southeast Asia director Tara Buakamsri said city traffic and drifting air pollution from the industrial zone in the East were responsible for the harmful PM2.5 levels in the capital.

Tara cited calculation results from the Atmospheric Chemistry Modelling Team at Harvard University, which showed that air pollution from coal-fired power plants operated by BLCP Power Limited and GHECO-One Co Ltd in Rayong's Map Ta Phut Industrial Estate had affected air quality in nearby tourist destinations such as Pattaya and Koh Samet.

He said the Harvard research showed that PM2.5 generated from both the coal-fired power plants in the East contributed to 40 per cent of the annual PM2.5 level in Pattaya and Koh Samet and made up 20 per cent of the annual PM2.5 level in Bangkok.

How to Control PM

NOT







Other Countries Responses to High Pollution Levels

- China closes factories.
- Madrid bans old cars
- Japan has an age limit on cars
- Canada has “enforced” vehicle emission limits
- Hong Kong has the “report a squid” program
- Most countries restrict/ban agricultural burning
- Tighten regulatory emission limits

Candidate for the report a squid program



Thailand Closes Schools

"We decided to eliminate the problem by closing down the schools," said Governor Asawin. "We're afraid that it can be dangerous for the children."

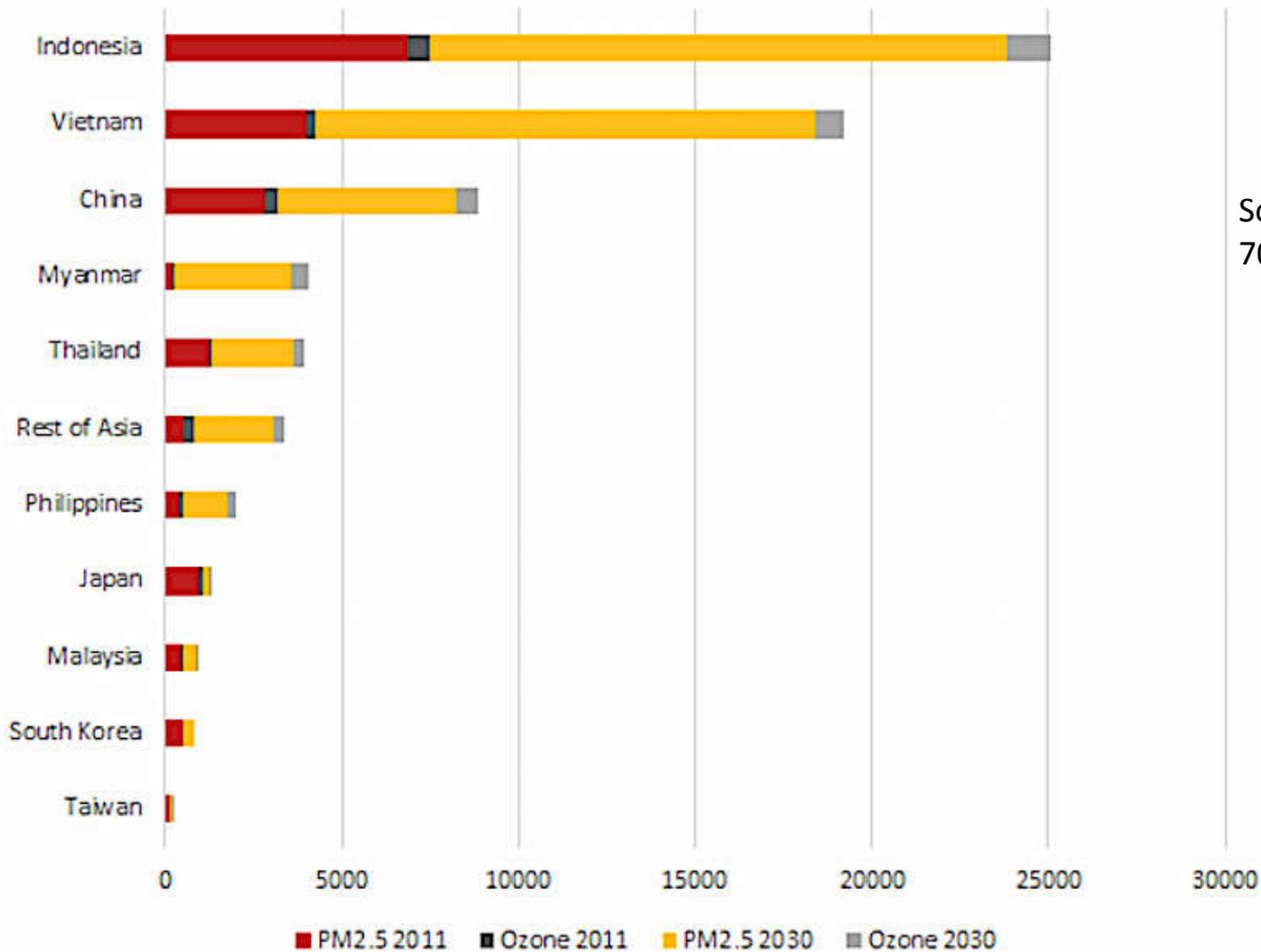
Source Al Jazeera 30 Jan 2019



Summary

- Electricity production contributes to PM problems in Thailand
- Other sources are more important than electricity production
 - Agricultural burning, vehicles
- Coal is the “worst” fuel supply for electricity production
 - Both mining and burning
 - How much does it affect PM overall??
 - Greenpeace says 20%
- Thailand can start to enforce existing limits (vehicles) and laws (agriculture)
 - For the past 15 years every Jan-April Chiang Mai has air pollution problems
- Can adopt more stringent emission levels for all sources
- Phase out/ban coal plants

Current and predicted premature deaths by country



Southeast Asia's coal boom could cause 70,000 deaths per year by 2030,
16 January 2017, MONGABAY