Hub of Talents on Air Pollution and Climate

HTAPC Newsletter

Issue 10, November 2024

Highlights

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Image: Anthony
Source: https://manvsclock.com/living-in-bangkok-pros-and-cons/

Scoping Review Findings Presentation on Database System of Thailand National Emission Inventory (TNEI)

November 08, 2024, The Hub of Talents on Air Pollution and Climate (HTAPC), under the National Research Council of Thailand (NRCT), Ministry of Higher Education, Science, Research, and Innovation, together with the Collaborating Center for Clean Air and Climate Change (CCCACC), participated in the meeting to present findings from the scoping review on database system of Thailand National Emission Inventory (TNEI). The meeting was held at the Asia Hotel, Ratchathewi, Bangkok, and was also accessible online via Zoom Meeting for remote participants. The purpose of the meeting is to present the findings of the literature review, gather insights and suggestions from experts, and share relevant information, such as emission coefficients and activity data on air pollutant emissions.

Dr. Supat Wangwongwatana, Director of HTAPC, delivered the opening speech for the meeting and assigned researchers to present findings from the scoping review. The presentations covered air pollutant emission inventories for the household, agricultural, transportation, industrial sectors, and other sources. During the session for gathering feedback, participants gained new insights into updated methods for calculating emission coefficients and activity data. Additionally, the session fostered a network of academics experienced in air pollutant emission inventories in Thailand. Ultimately, those responses from the meeting will be used to refine the literature review findings, making them more comprehensive and providing a valuable guideline for the development of the TNEI.

Training on Air Pollution Management for Bangkok

Title: "Air Pollution and Air Quality Management"

On November 21, 2024, The Hub of Talents on Air Pollution and Climate (HTAPC), under the National Research Council of Thailand (NRCT), Ministry of Higher Education, Science, Research, and Innovation, organized a training session titled "Air Pollution and Air Quality Management." The training was held at the Golden Tulip Sovereign Hotel, Rama 9, Bangkok, aiming to enhance the understanding of air quality management among Bangkok's public officers. The training session covered topics including air pollution issues, sources of $PM_{2.5}$ particulate matter, meteorological factors influencing $PM_{2.5}$ concentration, forecasting short-term health impacts from $PM_{2.5}$ exposure, and evaluating air pollution management measures in Bangkok. Furthermore, participants acquired a knowledge of the use of meteorological and air quality models, along with strategies for addressing urban climate change. The knowledge gained aims to support the implementation of appropriate policies and measures for managing air pollution in Bangkok.

The final session of the training, the HTAPC and the participants engaged in a discussion about Bangkok's current air pollution challenges. They exchanged knowledge on strategies for addressing air pollution and explored collaborative approaches among agencies in Bangkok, aiming to enhance air pollution management and improve air quality in the future.

Meteorological Factors Affecting PM$_{2.5}$ Concentration in Thailand

Seasonal Distribution of PM$_{2.5}$ Mass

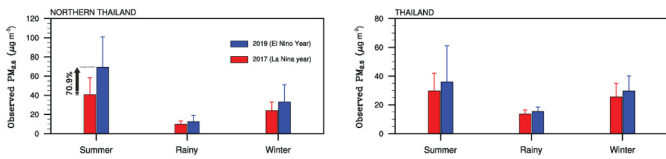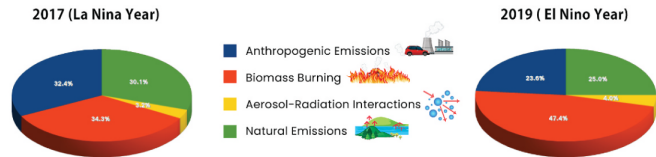**Source Attribution of PM$_{2.5}$ Mass**

Figure 1 Source Attribution of PM$_{2.5}$ showing the differences in ratios and levels of PM$_{2.5}$ concentrations in the Wet (La Nina) year comparing with those in the Dry year (El Nino) as studied over Northern Thailand and overall the country.

Reference: Bran et al. (Atmospheric Environment, 2024)

Particulate matter (PM$_{2.5}$) is the critical issue in the dry season particularly in Southeast Asia when there is El Nino. The Meteorology is the key factor affecting the concentration level of PM$_{2.5}$. Bran et al. has employed observations and Mathematical model i.e. Weather Research and Forecast with Chemistry (WRF-Chem) model to identify the differences in the spatial distribution of PM$_{2.5}$ above Thailand. They observed the significant shift in daily mean PM$_{2.5}$ mass from 2017 (Wet - La Nina year) to 2019 (Dry − El Nino year) across all seasons, with a pronounced increase of 70.9% over Northern Thailand during the summer, attributed to heightened biomass burning (BB) contributions. According to the study, in 2017, BB contributed only 34.3% of all emission sources, while the other anthropogenic emission sources like industry and traffic combined contributed 32.4%, and the other 30.1% were naturally formed as secondary particles. However, in year of El Nino event, BB contributed to the PM$_{2.5}$ concentration up to 47.4%, or almost half of all sources. Therefore, to control BB is the priority, especially during the dry-season.

The WRF-Chem model can identify the hourly percentage contribution of each sources, enabling a clearer understanding of which sources are most responsible for the ambient PM$_{2.5}$ (as illustrated in Figure 2). This research may pave the way towards the more effective Air Quality Management. At least in Northern Thailand and Bangkok, WRF-Chem installations for Chemical Weather forecasts are already readily accessible at the local administrative level. For example, Environmental Science Research Center (ESRC), Chiang Mai University has developed a modelling system to support the FireD application by the research funding support from the NRCT under the framework of the Haze-Free Thailand project, which involves policy making in the War Room of Chiang Mai Governor and team. The application of the mathematical modelling in Atmospheric Research on High Performance Computing System does help with the capability to solve all the equations involved in the real-time processes which cover the effect of meteorology during each different times. The model may be used for giving overall annual-averaged scenario representing gradual impact of climate changes. Currently, HTAPC is in charge of developing the community of experts focusing on various fields related to each aspect of air pollution and climate, including meteorology and mathematical models. It is anticipated that the tools will then be utilized up to state of the arts and meet the need of the country in particular.
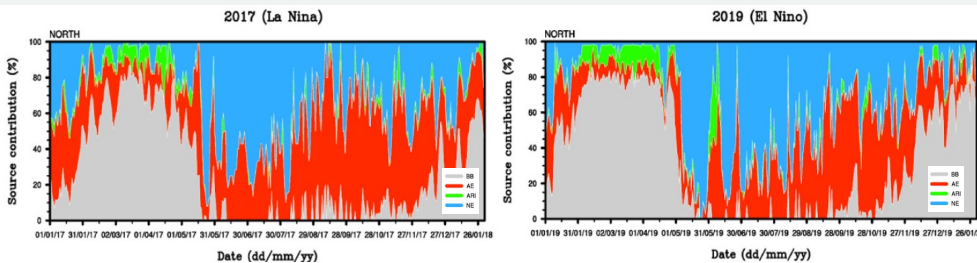

Figure 2 Time Series of WRF-Chem output representing the daily percentage contributions from different sources to PM$_{2.5}$ mass concentration across regions in Thailand for the La Niña Year (2017, left panel) and El Niño Year (2019, right panel). The legend denotes the source categories, including biomass burnings (BB), anthropogenic emissions (AE), aerosol-radiation interactions (ARI), and natural emissions (NE).
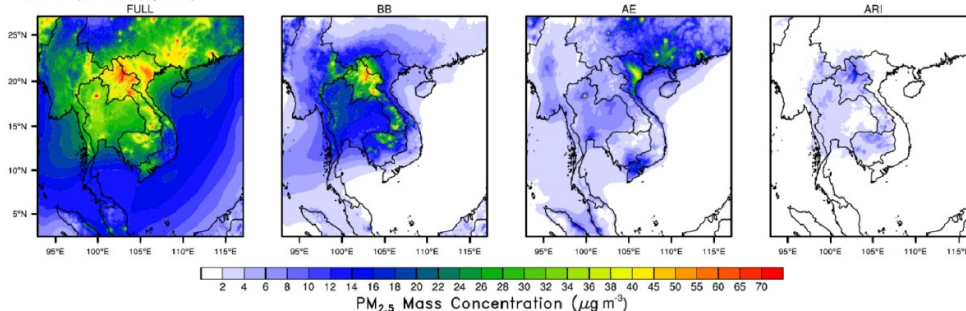

Figure 3 Spatial distribution of simulated PM$_{2.5}$ mass concentration and its potential sources across Thailand and neighbouring regions is depicted for the El Niño Year (2019). It can be seen clearly that biomass burning emissions (BB) added on top of all the other emissions from the other activities over Thailand and neighbouring countries, and resulted in the exceedances of National Ambient Air Quality standards of both Thailand and other countries.

Reference: Bran et al. (Atmospheric Environment, 2024)

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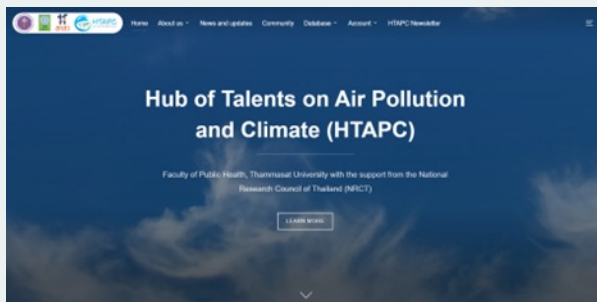
We cordially invite you to join us

Hub of Talents on Air Pollution and Climate

HTAPC Membership Form for Experts

Official website of Hub of Talents on Air Pollution and Climate (HTAPC)

https://www.htapc.info

This newsletter is part of the project for the Hub of Talents on Air Pollution and Climate under research funding support from National Research Council of Thailand (NRCT)

Monthly Newsletter

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