

HTAPC Newsletter

Issue 11, December 2024



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Accomplished Activities of Hub of Talents on Air Pollution and Climate (HTAPC)

Issue

11

Capacity-Building Workshop on the topic of “Strengthening Regional Actions to Address Transboundary Haze and Plastic Pollution in Southeast Asia”



From December 10–12, 2024, the Natural Resource and Environment Research Institute - Ministry of Natural Resource and Environment (NRERI-MoNRE) in Lao PDR, UNEP, and the Asian Institute of Technology (AIT), in collaboration with 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 (MHESI), organized a capacity-building workshop on the topic **“Strengthening Regional Actions to Address Transboundary Haze and Plastic Pollution in Southeast Asia.”** The workshop took place at the Crown Plaza Vientiane Hotel, Vientiane, Lao PDR, and was also conducted on an online platform, aiming to foster regional collaboration, exchange knowledge, and develop practical approaches to mitigate the impacts of transboundary pollution in Southeast Asia.

The workshop session on **“Transboundary Haze in Southeast Asia”** featured a presentation of the **“ASEAN Haze-Free Roadmap (2013–2030)”**, which sets the goal of achieving a haze-free Southeast Asia by 2030. It also addressed strategies for managing transboundary haze through the sustainable management of agricultural residues and presented successful case studies in managing transboundary haze issues. This workshop served as a critical opportunity to drive regional cooperation in addressing cross-border environmental challenges, emphasizing sustainable solutions and building a better future for Southeast Asia.

Academic Consultation and Feedback Meeting on National Action Plan for Addressing Air Pollution (2nd Edition) (2025–2027 and the Next 5-Year Period)



On December 12, 2024, HTAPC organized an **“Academic Consultation and Feedback Meeting on National Action Plan for Addressing Air Pollution (2nd Edition) (2025–2027 and the Next 5-Year Period).”** The meeting was held at the Mandarin Hotel Managed by Centre Point, Bangkok, and conducted via an online platform (Zoom Meeting). Experts and academics participated in the meeting to provide feedback and propose research questions that should be addressed to drive the draft action plan toward concrete implementation.

The meeting was divided into four breakout groups: measures for urban and industrial sectors, measures for forest and agricultural areas, measures for transboundary pollution, and measures to enhance management efficiency. The results, feedback, and suggestions from the meeting were compiled and summarized for submission to the Pollution Control Department. This step aims to refine the draft action plan before submitting it to the National Environment Board and the Cabinet for further consideration and approval.



Forecasting System for Short-Term Health Impacts of PM_{2.5} Concentration Levels in the Bangkok Metropolitan Area

Particulate Matter with a diameter of less than 2.5 microns (PM_{2.5}) is a significant public health concern due to its association with hospital admissions for respiratory and cardiovascular diseases. In addition to its health impacts, this issue results in considerable economic costs, such as increased healthcare expenses, reduced work productivity, and income losses from absenteeism. Although numerous studies have explored the relationship between PM_{2.5} exposure and health impacts, research on forecasting hospital admissions due to health effects remains limited. In particular, the application of Machine Learning (ML) techniques to enhance predictive accuracy and provide deeper insights into this issue is still underdeveloped.

This study aims to forecast the short-term health impacts of PM_{2.5} exposure on individuals seeking Outpatient Department (OPD) services in hospitals within the Bangkok Metropolitan Area (up to 3 days in advance). The focus is on Respiratory Diseases (RES), which are divided into two subcategories: upper respiratory tract diseases and lower respiratory tract diseases, and Circulatory Diseases (CIR), which include Cerebrovascular Diseases (CVD) and Ischemic Heart Diseases (IHD).

To develop the forecasting models, retrospective data from 2016 to 2019 were collected from the Pollution Control Department, the Meteorological Department, and the National Health Security Office. The datasets comprised daily average PM_{2.5} concentrations, Temperature (Temp), Relative Humidity (RH), Wind Speed (WS), days of the week, holidays, and OPD patient counts. These data were utilized as input variables for analysis using three modeling approaches: the Generalized Linear Model (GLM), Artificial Neural Networks (ANNs), and a combined model integrating GLM and ANNs (GLM-ANNs) to predict OPD patient numbers associated with the studied diseases.

The dataset was divided into two subsets: a training set and a testing set, at a ratio of 70:30. The study focused on the high-PM_{2.5} season (December to March) to analyze health impacts during periods of elevated risk. The findings demonstrated that the GLM, ANNs, and GLM-ANNs models exhibited high accuracy in forecasting the number of OPD patients for the CIR disease group, with R² values of 0.986, 0.960, and 0.986, respectively. For the RES disease group, the GLM and GLM-ANNs models outperformed others, both achieving R² values of 0.987, while the ANNs model recorded an R² value of 0.965. Comparing the two disease groups, the GLM-ANNs model yielded the highest forecasting accuracy for both CIR and RES patients, as illustrated in Figure 1-2.

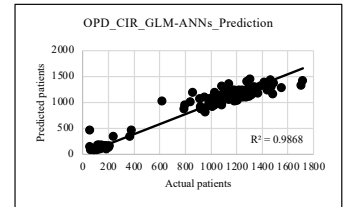


Figure 1: The forecasting capability of the GLM-ANNs model for patients with Circulatory Diseases (CIR)

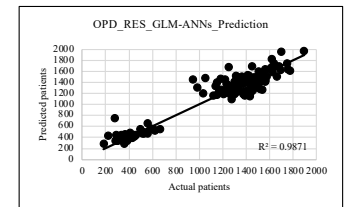


Figure 2: The forecasting capability of the GLM-ANNs model for patients with Respiratory Diseases (RES)

โปรดเลือกวันแสดงผลข้อมูล

วันที่: ประเภทโรค:

ข้อมูลการเจ็บป่วยของผู้ป่วยนอก (OPD)

ข้อมูลของผู้ป่วยนอก (รายชื่อ 1 ล้านประชากร)

โรคทางเดินหายใจรวม: 311	โรคหลอดเลือดหัวใจรวม	โรคหลอดเลือดสมอง
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ข้อมูลการเจ็บป่วยของผู้ป่วยใน (IPD)

ข้อมูลของผู้ป่วยใน (รายชื่อ 1 ล้านประชากร)

โรคมะเร็งปอดรวม: 9	โรคทางเดินหายใจรวม: 9
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ข้อมูลการเสียชีวิต

ข้อมูลของผู้เสียชีวิต (รายชื่อ 1 ล้านประชากร)

โรคมะเร็งปอดรวม: 2	โรคหลอดเลือดหัวใจและสมอง: 2
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ข้อมูลรายชื่อจำนวนผู้ป่วยนอก (รายชื่อ 1 ล้านประชากร) ประเภทโรค วันที่ (ปี/เดือน/วัน)

โรคทางเดินหายใจรวม	20241216
โรคหลอดเลือดหัวใจ	20241217
โรคหลอดเลือดสมอง	20241215

ข้อมูลรายชื่อจำนวนผู้ป่วยใน (รายชื่อ 1 ล้านประชากร) ประเภทโรค วันที่ (ปี/เดือน/วัน)

โรคมะเร็งปอดรวม	20241216
โรคทางเดินหายใจรวม	20241217
โรคทางเดินหายใจรวม	20241215

ข้อมูลรายชื่อจำนวนผู้เสียชีวิต (รายชื่อ 1 ล้านประชากร) ประเภทโรค วันที่ (ปี/เดือน/วัน)

โรคมะเร็งปอดรวม	20241215
โรคมะเร็งปอดรวม	20241217
โรคมะเร็งปอดรวม	20241216

As part of the development of the results presentation and the implementation of the forecasting system, collaboration was established with the Bangkok Metropolitan Administration (BMA) to utilize air quality forecasts processed from the Weather Research and Forecasting Model coupled with Chemistry (WRF-Chem). This initiative was conducted under the "Bangkok Air Quality Management Program," developed through the cooperation of the Collaborating Center for Clean Air and Climate Change (CCCACC). By applying near-real-time emission inventory data alongside Global Meteorological Forecasts (GFS), the system provided air quality forecasts for the Bangkok Metropolitan Area with a spatial resolution of 2x2 kilometers, forecasting PM_{2.5} concentrations up to three days in advance. These forecasts were deemed suitable as input data for the Health Impact Model, which aims to forecast health outcomes. This enabled forecasting of the number of individuals potentially affected by illnesses and mortality three days in advance, categorized by diseases such as cerebrovascular diseases, circulatory diseases, dermatitis, coronary artery diseases, and respiratory diseases, as illustrated in Figure 3.

The development of this forecasting system supports the advancement of health protection and early warning systems for public health agencies, such as the Ministry of Public Health and the Bangkok Metropolitan Administration. It aims to mitigate the harmful impacts of air pollution and safeguard public health.

Figure 3. Short-term health impact forecasting system for PM_{2.5} concentrations in the Bangkok Metropolitan Area

Source: HTAPC Website: <https://htapc.info/นិងสุขภาพ/>

Note: This project was funded by the Thai Health Promotion Foundation (ThaiHealth).

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>



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Monthly Newsletter

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