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Thailand Policies for PM 2.5 and the Hidden Problems

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ABSTRACT

The PM 2.5 pollution problem in Thailand is intensifying in major cities and across the country, significantly impacting public health. According to surveys in Thailand, PM 2.5 originates from three primary factors: automobiles, outdoor biomass burning/factories, and the inversion phenomenon or stagnant air conditions. Although Thailand has implemented policies to address these three key causes, their practical execution has fallen short of achieving the desired outcomes. A deeper analysis reveals hidden problems within these policies, which hinder their effectiveness. This presentation aims to highlight these hidden issues and propose preliminary solutions to mitigate them, thereby contributing to more successful PM 2.5 management in the future.

Keywords*: Thailand; PM 2.5 pollution; Inversion; Automobiles; Autdoor biomass burning*.

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Perspectives

The PM 2.5 pollution problem in Thailand has now become a critical national issue requiring urgent resolution. Many people think this is a new problem, but in reality, reports dating back to 2002 indicated PM 2.5 levels in Chiang Mai rising significantly from normal levels during December 1998 to March 1999, with the highest levels reaching 6.5 times the usual amount (Vinitketkumnuen et al., 2002). Furthermore, in 2017, a report revealed the presence of 44 types of heavy metals associated with PM 2.5 in Bangkok, with vehicle emissions being the primary contributor (Pongpiachan et al., 2017). In 2019, Thailand had faced a critical PM 2.5 pollution enveloped Bangkok and surrounding cities, marking a year when both the public and government agencies became highly aware of this issue.

Previously Thai people unfamiliar with the term PM 2.5, the public learned that PM 2.5 stands for "Particulate Matter with a diameter of less than 2.5 microns." It is one of eight air quality standards, and its danger lies in its ability to penetrate deep into the lungs. While some individuals may not experience immediate health effects, long-term exposure over decades can lead to significant health issues. Studies have indicated that prolonged exposure to PM 2.5 increases the burden of various diseases in Thailand, including Ischemic heart disease, COPD, lung cancer, stroke, and lower respiratory infections (Mueller et al., 2021).

Studies in Thailand have identified three main sources of PM 2.5 (Figure 1): automobiles, outdoor biomass burning/factories (Ponsawansong et al., 2023), and atmospheric inversion — a phenomenon where low air ventilation rates occur due to cooler winter temperatures and weaker atmospheric pressure, resulting in stagnant air masses. This prevents air from rising vertically, leading to calm winds and prolonged pollutant accumulation in the air for days to weeks (Bangkok International Affairs Office, 2022). While inversion is a natural occurrence and cannot be controlled, it can be predicted, and measures can be implemented to mitigate its effects. Therefore, policy planning to manage controllable sources, such as automobile emissions and outdoor biomass burning, should align with periods of uncontrollable inversion.

Biomass Burning

Thailand has a long-standing tradition of burning agricultural fields after harvest. However, with increasingly closed atmospheric conditions and urbanization, such as in Bangkok with its numerous high-rise buildings, air circulation has become more challenging. Smoke from surrounding agricultural areas often drifts into and accumulates in Bangkok. Additionally, in border regions, smoke from agricultural burning in neighboring countries contributes to the problem. Despite regulations to control open burning and air pollution, enforcement remains weak in some areas. Cremation and construction activities are generally well-regulated and have not been found to be major contributors according to various studies and surveys. In contrast, agricultural burning consistently ranks as a top cause of PM 2.5 pollution in research and reports. The difficulty in addressing this issue lies in the traditional and low-cost nature of post-harvest agricultural waste disposal. Although there have been campaigns and legal measures to ban open burning, farmers face challenges in disposing of agricultural residues, as Thailand lacks efficient, cost-effective methods for handling this waste. Researchers from several institutions are seeking optimal solutions to address this issue.

Automobile Emissions

Thailand has made the most progress in addressing vehicle-related PM 2.5 pollution compared to other sources. However, existing measures have not significantly reduced PM 2.5 levels. While laws and regulations clearly mandate emission testing, banning black-smoke vehicles, and engine maintenance to prevent black smoke, enforcement remains weak and inconsistent. Traffic management to reduce congestion and prevent idling engines has only been strictly enforced in certain areas. Although mass transit systems have been promoted, only some of Thailand's public transportation options meet safety and convenience standards, particularly for the elderly or those with mobility challenges. This results in a preference for private vehicles. Water spraying on trees and roads has been implemented across various areas, but its impact is minimal and short-term.

Health Awareness and Waste Management

Surveys indicate that nearly 60% of respondents have moderate knowledge about PM 2.5. Attitudes toward prevention are the most significant factor influencing behavior adjustments to cope with PM 2.5. Health agencies in Thailand have used various channels, including paper, mass media, and social media, to educate the public on living healthily despite PM 2.5 pollution. One essential tool for combating PM 2.5 is air filtration devices, including masks and air filters. However, these have created environmental issues, as mask waste disposal in Thailand remains poorly managed even after COVID-19. Reports indicate that nearly 80% of masks are discarded with general waste, leading to improper disposal. Most people also lack knowledge about proper waste management (Wiwattanapaisarn, 2023). Therefore, public education on proper mask disposal should accompany efforts to promote mask usage for PM 2.5 protection.

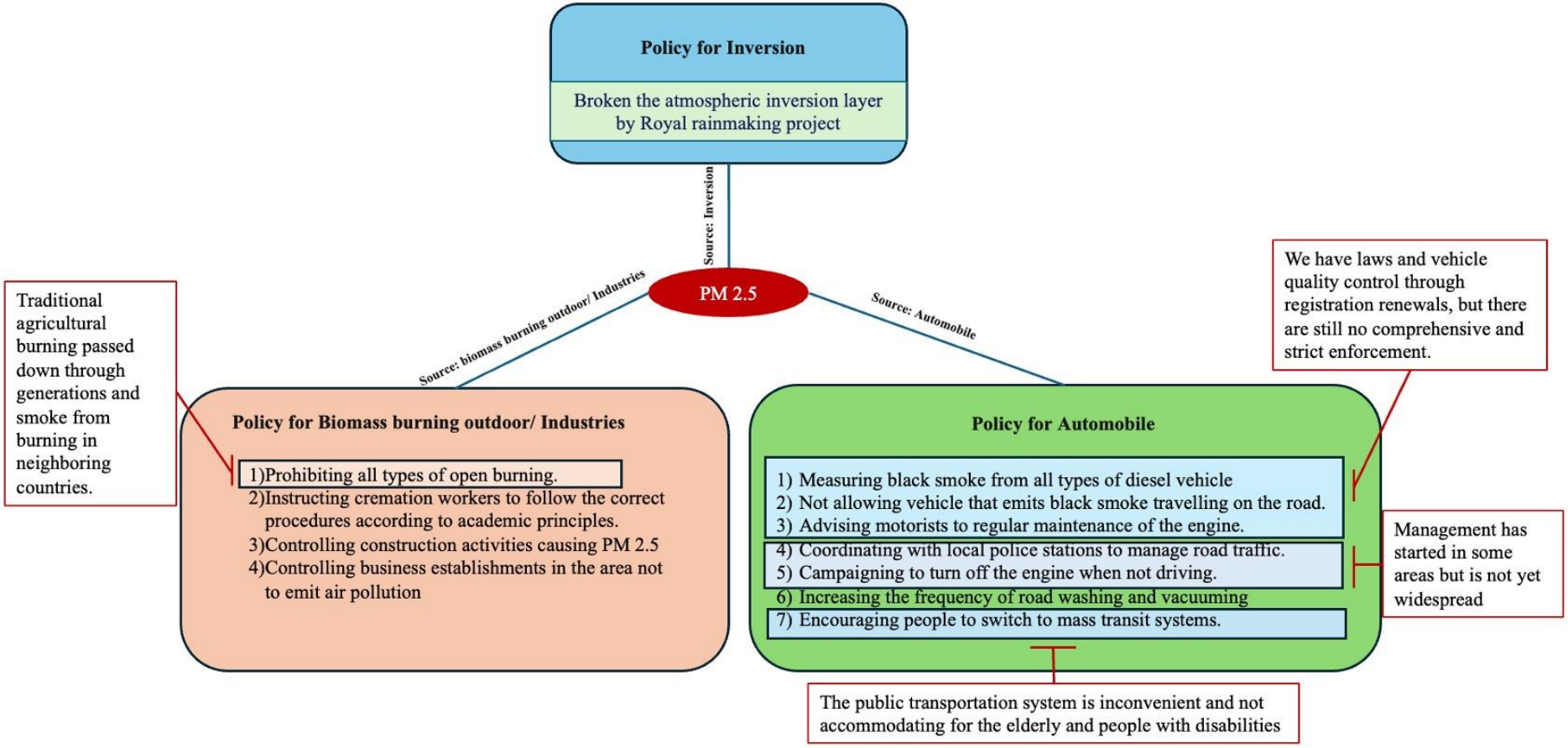

Figure 1. A conceptual overview of the main sources of PM 2.5, policy solutions, and the hidden problems in policy implementation.

Hidden Problems in Policies

Many policies aimed at addressing the PM 2.5 issue in Thailand face hidden problems that hinder their effectiveness. To tackle the urgent PM 2.5 problem, these hidden issues must be resolved alongside strict and comprehensive law enforcement. Moreover, public education and attitude-building toward health prevention and waste reduction should be prioritized to achieve sustainable long-term solutions for coping with PM 2.5 pollution.

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