



Status of Vehicle Emission Standards in the ASEAN Region

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ABSTRACT

Vietnam's air quality has declined over the past few decades, especially in urban areas. There is a noticeable decrease in air quality in certain areas due to vehicle emissions. This article aims to assess the automotive emission standards of Asian nations and draw comparisons with Vietnam's emission laws. However, there are significant differences between the present emission ceilings set by different countries. For instance, Korea's pollution regulations do not favor any particular fuel, and light-duty vehicles (LDVs) are not specifically categorized according to weight. Vietnam, Thailand, and Korea have different weight categories and emission limits for cars that run on gasoline and diesel. Consequently, it is imperative to conduct a more thorough investigation into the creation of globally applicable emission standards. This will guarantee uniformity in the public's access to information and policies.

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1. INTRODUCTION

In recent decades, the rapid growth of motorization in the ASEAN (Association of Southeast Asian Nations) region has brought about significant socio-economic benefits alongside profound environmental challenges [1-3]. Among these challenges, the impact of vehicular emissions on air quality and public health stands out prominently. Recognizing this, ASEAN member states have been actively developing and implementing vehicle emission standards to mitigate these detrimental effects and align with global environmental goals.

The implementation of effective emission standards is crucial not only for reducing local air pollution but also for addressing regional contributions to global climate change. As ASEAN nations continue to urbanize and industrialize, the demand for personal and commercial vehicles has surged, exacerbating the pressure on urban air quality and necessitating stringent regulatory measures.

This paper aims to provide a comprehensive overview of the current status of vehicle emission standards across the ASEAN region. By examining these standards' evolution, implementation strategies, and compliance

mechanisms, this study seeks to identify common trends, disparities, and challenges ASEAN member states face in achieving harmonized emission control objectives [4].

Furthermore, this paper will explore the impact of varying socio-economic conditions, technological capabilities, and political considerations on adopting and enforcing emission standards within ASEAN. Understanding these dynamics is essential for assessing current regulatory frameworks' effectiveness and proposing recommendations to enhance regional cooperation and environmental sustainability through harmonized emission standards [5-6].

In summary, this paper contributes to the broader discourse on environmental governance in ASEAN by offering insights into the evolution and implementation of vehicle emission standards, thereby highlighting the region's progress, challenges, and opportunities in achieving sustainable urban mobility and environmental quality.

2. EMISSION STANDARDS IN ASIA COUNTRIES

Adopting and enforcing emission standards play a critical role in mitigating air pollution and promoting environmental sustainability across Asia. As economic development accelerates in the region, the proliferation of vehicles has contributed significantly to urban air quality challenges. To address these concerns, countries in Asia have been implementing increasingly stringent emission standards tailored to local conditions, technological capabilities, and regulatory frameworks.

This section provides an overview of the emission standards landscape in select Asian countries, highlighting key developments, challenges, and future directions. By examining the evolution and effectiveness of these standards, this discussion aims to underscore the diversity of approaches and the shared commitment to improving air quality and public health. Fig.1 below shows the emission reduction roadmap for some Asian countries:

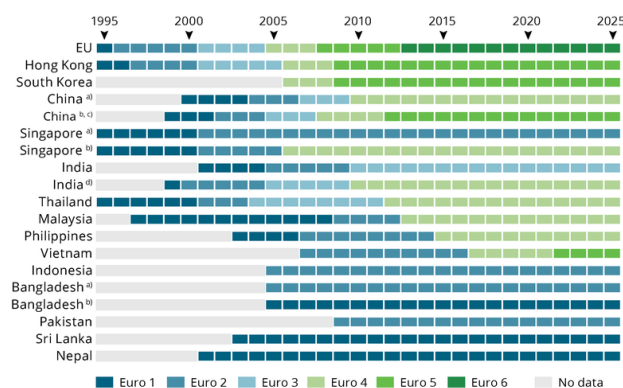


Fig. 1. Emission standards of some countries around the world.

2.1. Thailand's emission standards

Thailand's approach to emission standards has been evolving to address environmental concerns and align with global trends in reducing air pollution and promoting cleaner technologies. Thailand began implementing emission standards in the early 2000s to control vehicle emissions, focusing initially on particulate matter (PM) and nitrogen oxides (NOx).

Key Milestones and Updates:

Euro 4 Standards: In 2012, Thailand adopted Euro 4 standards for new vehicles, which set limits for PM and NOx emissions. This was a significant step towards reducing pollution from vehicles.

Euro 5 and Euro 6: There have been subsequent updates towards aligning with Euro 5 and Euro 6 standards, which are stricter and aim for lower emissions of pollutants such as particulates, NOx, carbon monoxide (CO), and hydrocarbons (HC).

Thailand has gradually phased in these standards, with stricter limits applying to newer vehicle models. This approach allows the automotive industry to adjust and invest in cleaner technologies.

In conclusion, Thailand's emission standards have evolved significantly, reflecting global trends and local environmental priorities. Continued efforts in enforcing and updating standards will be crucial for further improving air quality and public health in Thailand's urban areas.

2.2. Vietnam's emission standards

Vietnam began implementing emission standards in the early 2000s, initially focusing on aligning with European standards to control vehicle emissions. The key milestones include:

- Adopted in 2008, aimed at reducing emissions of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx) from vehicles.
- Implemented in 2017, further tightening limits on CO, HC, NOx, and particulate matter (PM).
- Future Directions: Vietnam is preparing to adopt Vietnam IV standards, which are expected to align more closely with Euro 4 standards, introducing stricter limits on emissions from both gasoline and diesel vehicles.

Enforcement of emission standards in Vietnam faces challenges, particularly concerning older vehicles and the availability of low-sulfur fuels necessary for compliance with stricter standards. Despite these challenges, there has been progress in urban centers like Hanoi and Ho Chi Minh City, where initiatives to improve air quality are gaining traction.

Stricter emission standards in Vietnam contribute significantly to improving air quality, which directly impacts public health by reducing respiratory illnesses and other health issues linked to air pollution. Vietnam's automotive industry is expected to continue adapting to meet increasingly stringent emission requirements, potentially spurring innovation in cleaner vehicle technologies and encouraging the adoption of electric and hybrid vehicles in the long term. Continued efforts in enforcement, infrastructure development for cleaner fuels, and public awareness campaigns will be crucial in achieving sustained improvements in air quality across Vietnam.

2.3. China's emission standards

China's emission standards have undergone significant evolution over the past few decades, reflecting the country's rapid industrialization, urbanization, and increasing concerns about

environmental pollution. The progression of China's emission standards can be traced through several key phases:

China's initial standards, starting from the early 2000s, focused on basic pollutants like carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx). As industrialization accelerated, so did the need for stricter regulations to mitigate air pollution, particularly in major cities where smog became a pressing issue. The introduction of more advanced standards, such as China IV and V, marked significant steps towards aligning with global benchmarks like Euro standards, targeting reductions in particulate matter (PM), particulate number (PN), and stringent limits on NOx emissions.

The most recent milestone, China VI, implemented in stages from 2019 to 2023, represents a leap forward in emission control, harmonizing with Euro 6 standards. China VI standards impose even stricter limits on pollutants from vehicles, promoting the use of cleaner fuels and accelerating the adoption of advanced emission control technologies. These standards aim to improve local air quality and contribute to global efforts in combating climate change by reducing greenhouse gas emissions.

Despite these advancements, challenges remain in enforcing these standards uniformly across the vast country and in ensuring that older vehicles meet newer emission requirements. Continued efforts in technological innovation, infrastructure development for cleaner fuels, and rigorous enforcement will be essential to sustain and further improve air quality in China's urban centers and beyond. As China continues to grow economically and technologically, its emission standards are likely to play an increasingly pivotal role in shaping the future of environmental sustainability and public health.

2.4. Japan's emission standards

A commitment to innovation, rigorous enforcement, and continuous improvement in environmental stewardship characterizes Japan's approach to emission standards. Over

the years, Japan has established a robust framework of emission standards aimed at reducing pollutants from vehicles and other sources, contributing to cleaner air and mitigating climate change impacts.

The evolution of Japan's emission standards began with the introduction of the first regulations in the 1970s, focusing primarily on controlling tailpipe emissions such as carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_x). These early standards laid the groundwork for subsequent updates that progressively tightened limits and introduced new parameters to address emerging environmental concerns.

Japan's current emission standards, known as the Japanese New Long-term Emission Regulations (2009), align closely with Euro 6 standards, featuring stringent limits on pollutants like particulate matter (PM), nitrogen oxides (NO_x), and hydrocarbons (HC). These regulations not only mandate cleaner emissions from gasoline and diesel vehicles but also promote the development and adoption of advanced emission control technologies, including hybrid and electric vehicles.

Japan's proactive stance on emission standards is driven by its dual objectives of environmental protection and technological leadership in the automotive sector. The country's stringent standards and proactive research and development efforts have positioned it as a global leader in promoting cleaner vehicles and reducing the environmental impact of transportation. Looking ahead, Japan continues to refine its emission standards in response to scientific advancements and international trends, ensuring that its regulations remain at the forefront of global efforts to improve air quality and sustainability.

3. CONCLUSION

In conclusion, the status of vehicle emission standards in the ASEAN region reflects a dynamic landscape shaped by diverse economic, environmental, and regulatory factors across

member countries. While some ASEAN nations have made significant strides in aligning with global emission norms, others face challenges in enforcement and infrastructure development. The evolution towards stricter standards, such as Euro 4 and Euro 5 equivalents, underscores a collective commitment to improving air quality and public health amidst rapid urbanization and industrial growth. Moving forward, harmonizing emission standards across ASEAN countries and enhancing regional cooperation will be crucial to achieving sustained reductions in vehicle emissions, fostering cleaner technologies, and contributing to global efforts in combating climate change. Addressing these challenges requires concerted efforts from governments, industries, and civil society to ensure a healthier and more sustainable future for the ASEAN region and beyond.

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