Implications of Transport Demand and Modal Shift Effect on GHG Emissions in Thailand

Achiraya Chaichaloempreecha[1], Tatsuya Hanaoka[1], Runsen Zhang[2], Bundit Limmeechokchai[3]

[1]Social Systems Division (Global Sustainability Integrated Assessment Section), National Institute for Environmental Studies (NIES), Tsukuba, Japan.

[2]Graduate School of Frontier Sciences, The University of Tokyo, Japan

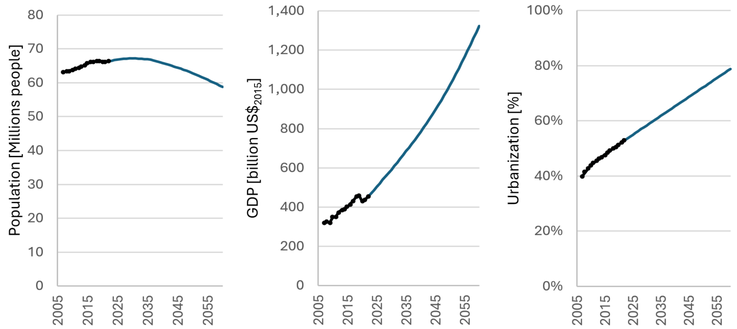
[3]Sustainable Energy and Built Environment Research Unit, Thammasat Design School, Faculty of Architecture and Planning, Thammasat University, Thailand

INTRODUCTION & OBJECTIVES

Thailand's economic success relies heavily on its transportation infrastructure, which is a major contributor to GHG emissions. To address these challenges, Thailand has developed transportation infrastructure plan focused on enhancing its transport system, promoting mass transit, and adopting advanced technologies to reduce energy consumption and GHG emissions.
This study developed AIM/Transport for Thailand to estimate future demand and to assess the impact of behavioral changes on modal shifts, considering mode-specific costs. The transport demand model was then linked with the AIM/Enduse to analyze long-term energy consumption and GHG emissions pathways.

STUDY AREAS & DATA

To estimate future passenger transport volume, this study considers trends in population, GDP, and urbanization. The statistical data on transport demand for this study was gathered from a variety of sources. Most of these sources include annual reports published by the government and organizations related to different modes of transport. This comprehensive collection of data ensures a robust analysis of transport demand trends

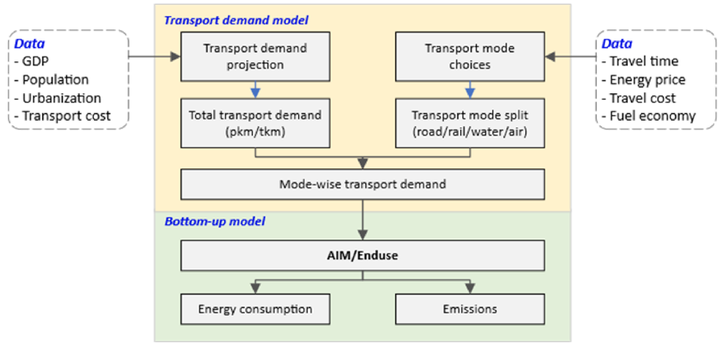


SCENARIOS

- Reference scenario – The REF serves as a baseline, assuming a continuation of current trends in population growth, economic development, and urbanization without introducing any significant policy changes. It represents the situation if COVID-19 had not occurred.
- COVID impact scenario – The COVID incorporates the effects of COVID-19, highlighting the changes in transport demand volume and patterns, particularly in public transportation. This scenario will involve adjustments to reflect potential changes in work-from-home practices, consumer behavior, and economic recovery.
- Transport modal shift policy scenario – The TP examines the impact of hypothetical policies aimed at achieving specific transport-related goals. The targets of public transport system such as intercity rail networks development, enhancing connectivity of road transport, and increasing water transport network are consider from Thailand Transport System Development Strategy.

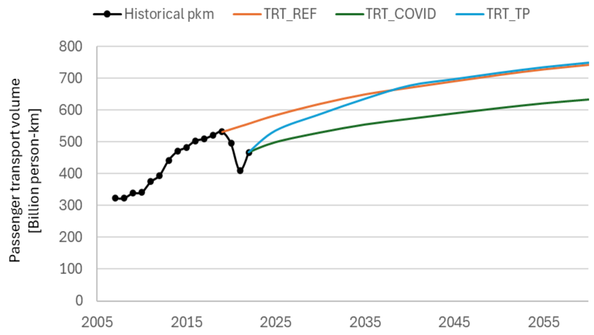
METHODOLOGY

The AIM/Transport consists of two modules: transport demand projection and transport mode choice. The transport demand module is used to forecast the future transport volumes for passenger transport in Thailand, considering socio-economic drivers. The transport mode choice module assesses the impact of behavior changes on modal shift in terms of mode-specific cost. The AIM/Enduse is used to analyze long-term energy consumption and GHG emissions. The transport volume projected by the transport demand model becomes an input value as the service demand to the AIM/Enduse. This study analyzes from 2010 to 2060 and covers various transport modes, including road, rail, and water transport.

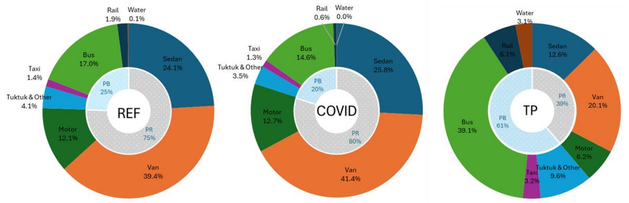


RESULTS & DISCUSSION

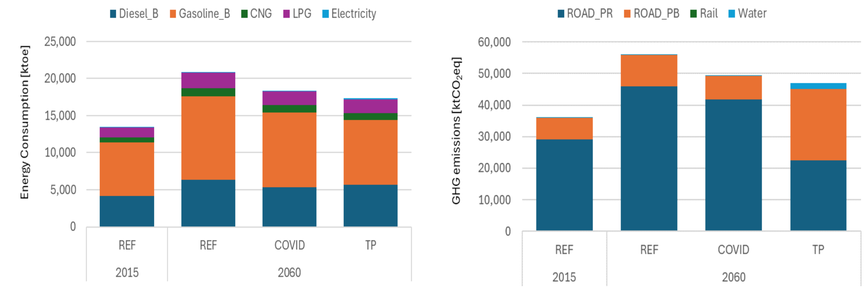
The REF scenario predicts a rise in total transport demand to 742.2 billion passenger-kilometers by 2060. In contrast, the COVID scenario forecasts a lower demand of 633.7 billion PKM due to the pandemic's impact on travel patterns. The TP scenario presents a different picture by promoting mass transit, anticipating a slight increase in total demand to 749.9 billion PKM, reflecting longer distances traveled by public transport users rather than an increase in individual trips. Regardless of the scenario, changes in transport demand significantly impact energy use and GHG emissions, making it crucial to understand these trends for developing sustainable transportation strategies.



In the REF scenario, public transport is expected to account for 24.5% of total transport demand by 2060. However, the COVID scenario has a lower share due to a shift towards private cars during the pandemic. The TP scenario, which prioritizes public transport infrastructure, projects a substantial increase in public transport use, reaching a 61.1%. Buses are expected to remain the primary mode of public transport, with rail and water transport seeing a modest rise.



This shift towards public transport in the TP scenario is more energy-efficient, leading to the most significant decrease in energy consumption and GHG emissions. In the REF and COVID scenarios, fuel consumption is dominated by gasoline with biofuel due to the prevalence of private vehicles. The TP scenario anticipates a decrease in gasoline use and introduces electricity for electric vehicles and electric trains. Although full EV implementation is not included, the study expects advanced technologies to further reduce energy consumption in the long run. By 2030, both the COVID and TP scenarios show lower GHG emissions than the REF scenario. The COVID scenario benefits from a temporary reduction in travel during the pandemic, while the TP scenario offers a long-term reduction through the promotion of public transport. The TP scenario achieves a 17.2% reduction in emissions by 2060 compared to the REF, due to the shift away from private vehicles. Currently, private vehicles dominate transport emissions, contributing over 80%. The TP scenario reduces this share to 47.9% by 2060, while public transport's emission share increases to 48.3%, significantly reducing overall emissions.



CONCLUSION

By prioritizing public transport infrastructure, Thailand will substantially increase its transport demand, however, energy consumption and GHG emissions will decrease by 16.6% and 17.2% in 2060 compared to reference scenario. In the short term, encouraging the use of mass transit and adopting advanced transport technologies will reduce energy consumption and GHG emissions from transportation. However, as many conventional vehicles remain, electric and hydrogen vehicles will be crucial for reducing energy use and emissions post-2030. Additionally, Thailand needs cleaner electricity for its transport sector. The transport sector is essential for achieving Thailand's carbon neutrality and net-zero emissions goals as part of its long-term low GHG development strategy.

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