

# ***HARMONIZING TRANSPORTATION FUEL QUALITY STANDARDS TO RESOLVE OIL TRADE AND ENVIRONMENTAL ISSUES IN APEC***

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## **Overview**

Exhaust gases emitted from motor vehicles, like carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), and particulate matter (PM), harm human health as well as the environment. To reduce the pollutants from vehicles, leading to improved air quality, with benefits to health and the environment, and to alleviate the undesirable side effects of automobile utilization, every APEC economy has adopted fuel quality standards, which set emission limits for car pollutants. However, it seems unavoidable that in different APEC economies, a variety of specifications have been implemented and utilized. At the same time, the APEC oil market, and particularly oil trade, finds itself in a state of uncertainty and flux because it is hampered by the differences in quality specifications. Among several key factors sustaining the APEC trade flows, the harmonization of APEC fuel quality standards stands out as one of the possible long-term transitions to support the APEC oil trade market, minimize environmental emissions, and reduce unnecessary oil movement and its excessive logistics costs.

This research seeks to highlight the emerging threat of vast differences of qualities among petroleum products especially diesel and gasoline in APEC which have considerably limited trade among APEC economies and analyses the transition opportunities to harmonize the fuel quality standards in its oil market. This study also aims to help policymakers across APEC in improving the sustainability and security of their energy systems and integrating these indications into policy strategies by comparing the economic benefits of improving or harmonizing the quality standards with the investment costs to upgrade the quality standards to meet the specifications required by the government and industry.

## **Methods**

The approach used in this research is Gap Analysis, SWOT Analysis (Strengths, S; Weaknesses, W; Opportunities, O; and Threats, T), and the Asia Pacific Energy Research Centre (APERC) Financial and Economic Model.

The data on transportation fuel consumption and standards for APEC is from the Expert Group on Energy Data and Analysis (EGEDA) and the inputs from economy representatives at APERC. The gap analysis is used to assess the differences in a variety of diesel and gasoline quality standards in APEC. The SWOT analysis identifies the key factors (both internal and external) associated with the harmonization and improvement of the product quality standards within APEC. Based on the results from the SWOT analysis, the APERC Financial and Economic Model is used to evaluate the economic costs and benefits to APEC in upgrading and harmonizing the product quality standards. In this analysis, the economic costs and benefits to Thailand if it changes its diesel and gasoline specifications from Euro 4 to Euro 5 are calculated. The results obtained from the model are then evaluated to investigate whether Thailand's drive to Euro 5 quality in 2022-2023 is justifiable and beneficial to its economy. Repeatedly, the same approach is carried out for other APEC economies and the results are consolidated into an estimate of APEC costs and benefits for the cases that APEC's quality standards are harmonized to resolve the oil trade and environmental issues.

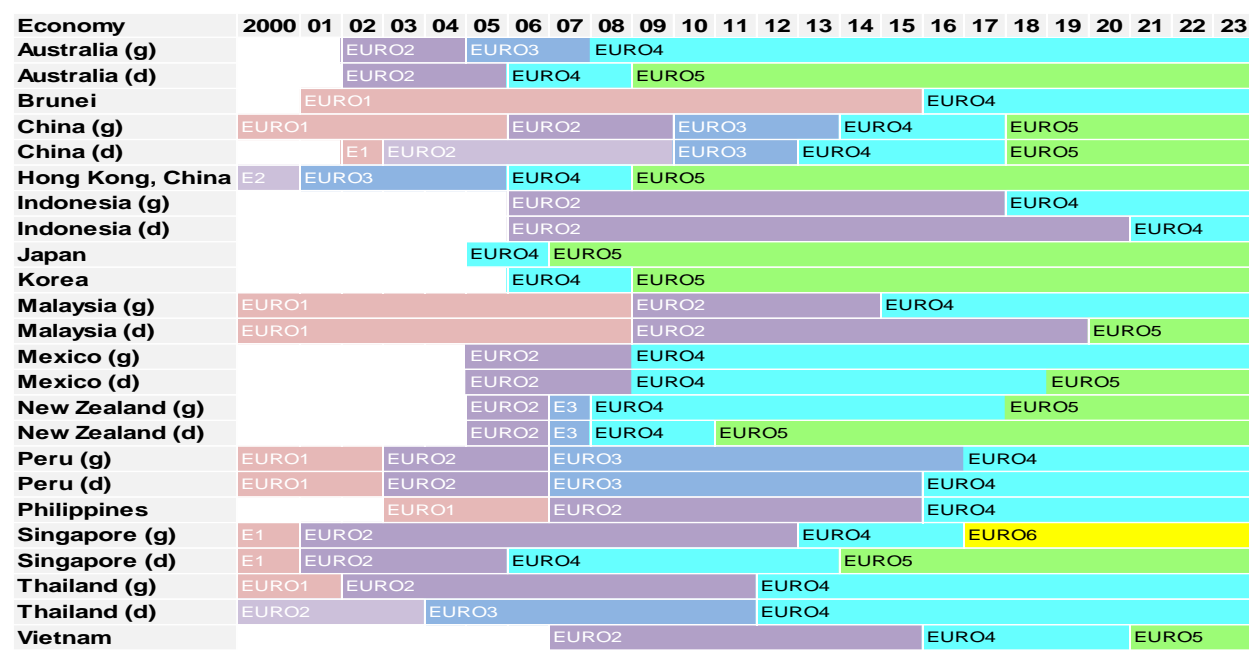
## **Results**

The gap analysis for fuel quality standards in APEC (Figure 1) summarizes the differences in fuel quality standards for diesel and gasoline in the APEC region. The fuel quality standards utilized in some APEC economies are behind those in Europe and widely vary among economies. While passenger cars in many APEC economies such as Canada, China, Japan, Korea, New Zealand, Russia, and the USA are already subject to the Euro 5 standard or above, other APEC economies have adopted only Euro 2-4. For example, Indonesia progressed two levels from Euro 2 to Euro 4 for gasoline vehicles in 2018 and plans for Euro 4 diesel in 2021 while Thailand shifted from Euro 3 to Euro 4 for both diesel and gasoline in early 2016 and plans to upgrade to Euro 5 in the 2022-2023 timeframe, and Australia plans to upgrade its petrol to Euro 5 in 2027.

Utilizing fuels with common standards in APEC could contribute to more flexible product trade since differences in their qualities may hinder their active trade. That translates into extra costs when developing trade in the region. Should this barrier be resolved, more dynamic trade will strengthen APEC energy security. This is particularly true in Southeast Asia APEC, with significant intra-product trade flows and yet different quality standards in the region.

The SWOT analysis on APEC economies shows that the health benefits to the community from cleaner air (S), market expansion (S), supply security (O), and petroleum product trading (O) are advantages but refinery investment (W) and differences in environmental policies (T) are barriers to the attempt to harmonize the quality standards in APEC. The identified factors from the strengths and opportunity categories can be used to evaluate the economic benefits while the factors from the weakness and threats categories can be used to calculate the economic costs associated with upgrading fuel specifications.

**Figure 1: Gap analysis of fuel standards in APEC**



Note: (g) = gasoline, (d) = diesel

Sources: PTIT (2016), European Environment Agency (2015), APERC Oil Report 2019 (2019)

The APERC Financial and Economic Model is then applied to evaluate Thailand’s economic costs and environmental benefits in the transportation fuel transition from Euro 4 to Euro 5 as a case study. The benefit to Thailand in implementing Euro 5 diesel oil was calculated to be USD 540 million based on cleaner air with sulfur limits reduced from 50 ppm to 10 ppm. Besides, less CO, NOx, and PM emissions would be realized in addition to the savings from health care cost reduction. On the other hand, the economic cost derived from refinery investment in de-sulfurization units to remove sulfur in the diesel, was equivalent to USD 201 million. The model was also applied to estimate the economic costs and benefits to upgrade the gasoline from Euro 4 (50 ppm sulfur) to Euro 5 (10 ppm sulfur). In this case, the economic benefit in implementing Euro 5 gasoline was calculated to be USD 202 million and the cost in adopting the Euro 5 gasoline standard was equivalent to USD 54 million. When comparing the costs (USD 201 million for diesel and USD 54 million for gasoline) to the benefits (USD 540 million for diesel and USD 202 million for gasoline), it is, therefore, justifiable for Thailand to advance to Euro 5.

This systematic economic costs and benefits evaluation technique can also be applied to upgrading the product specifications in other APEC economies that lag behind Euro 5 gasoline and/or diesel specifications. It was estimated that the total APEC investment cost was USD 2.2 billion and the environmental economic benefits were USD 6.7 billion. Additional economic benefits can also be realized in the APEC trade, as mentioned in the SWOT analysis, where APEC trade flows can be smoother and consequentially larger when the specifications are harmonized. Improving the quality standards in the economies will subsequently help to support APEC product trade flows in the big picture.

One possible application of this technique includes the evaluation of costs and benefits of APEC economies that plan to have their oil markets restructured, to install facilities, or to evaluate the supply security when disruption takes place.

## Conclusions

The costs and environmental economics of upgrading the diesel and gasoline quality standards in several APEC economies, namely, APEC Southeast Asia economies, Peru, Papua New Guinea, Australia, and Mexico from Euro 4 to Euro 5 were analyzed using the APERC Financial and Economic Model. The environmental benefit is USD 6.7 billion versus an economic cost of USD 2.2 billion including the Thailand case with a benefit of USD 742 million versus an economic cost of USD 255 million. Following this systematic approach, it is possible to expand the technique to evaluate any economy that plans to upgrade its transportation fuel quality standards. Last but not least, the technique can be applied to evaluate the economic costs and benefits of oil market transition, oil trading, transportation pipelines, and oil supply disruptions.

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