Asia-Pacific Economic Cooperation

APERC Asia Pacific Energy Research Centre

# 3-2. Fossil fuels quality standards

**APERC Workshop**
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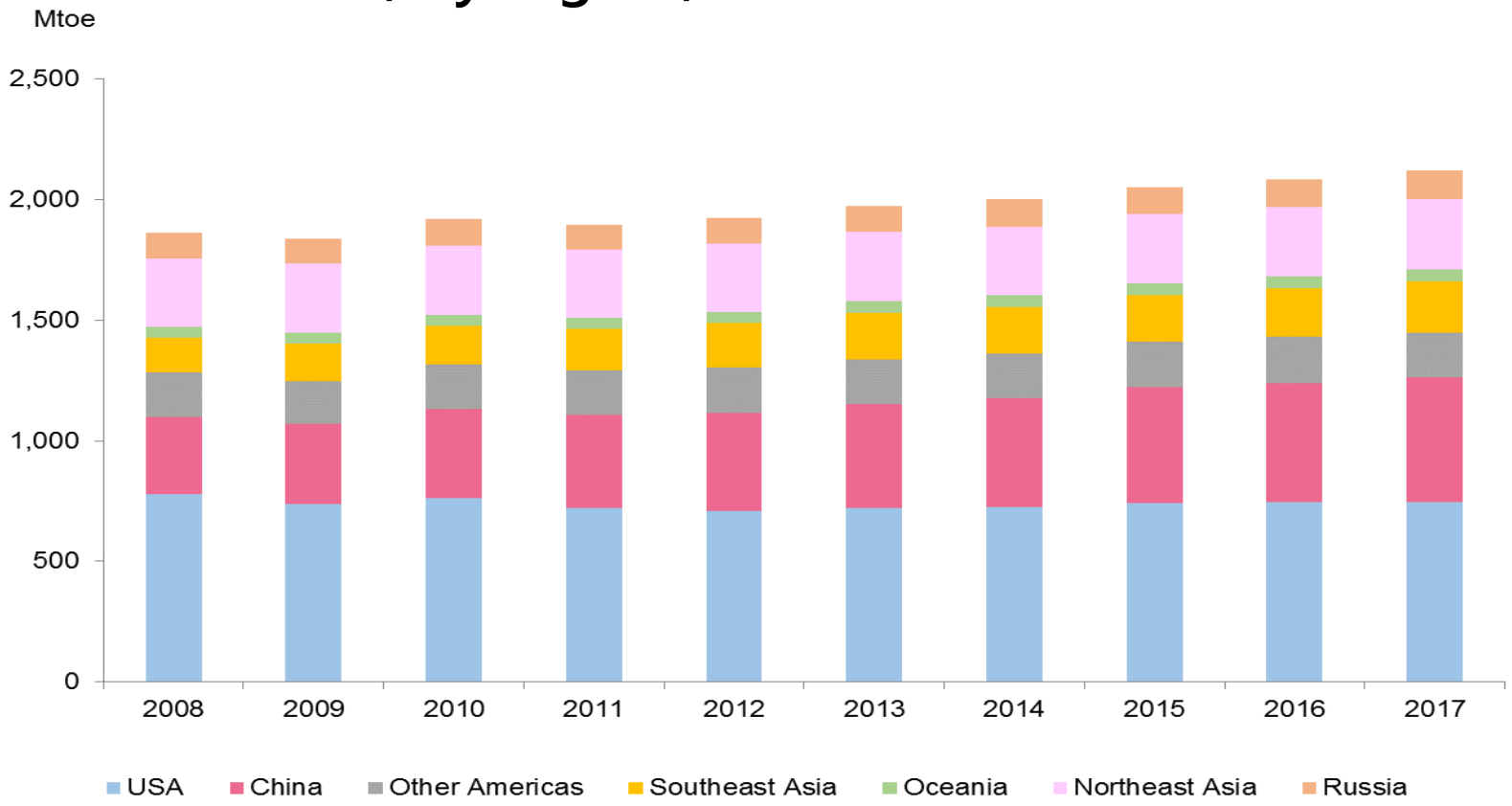
# Outline of presentation

- APEC oil consumption in transport sector
- Vehicle population and pollution in APEC economies
- Harmonization of fuel standards in APEC economies
- SWOT analysis of the harmonization of fuel standards in APEC economies
- Case Study: Evaluation of cost and benefits to upgrade transportation fuel from Euro III to Euro IV in Thailand
- Conclusions

# APEC oil consumption has been growing strongly for the past decade

## APEC oil demand, by region, 2008-2017

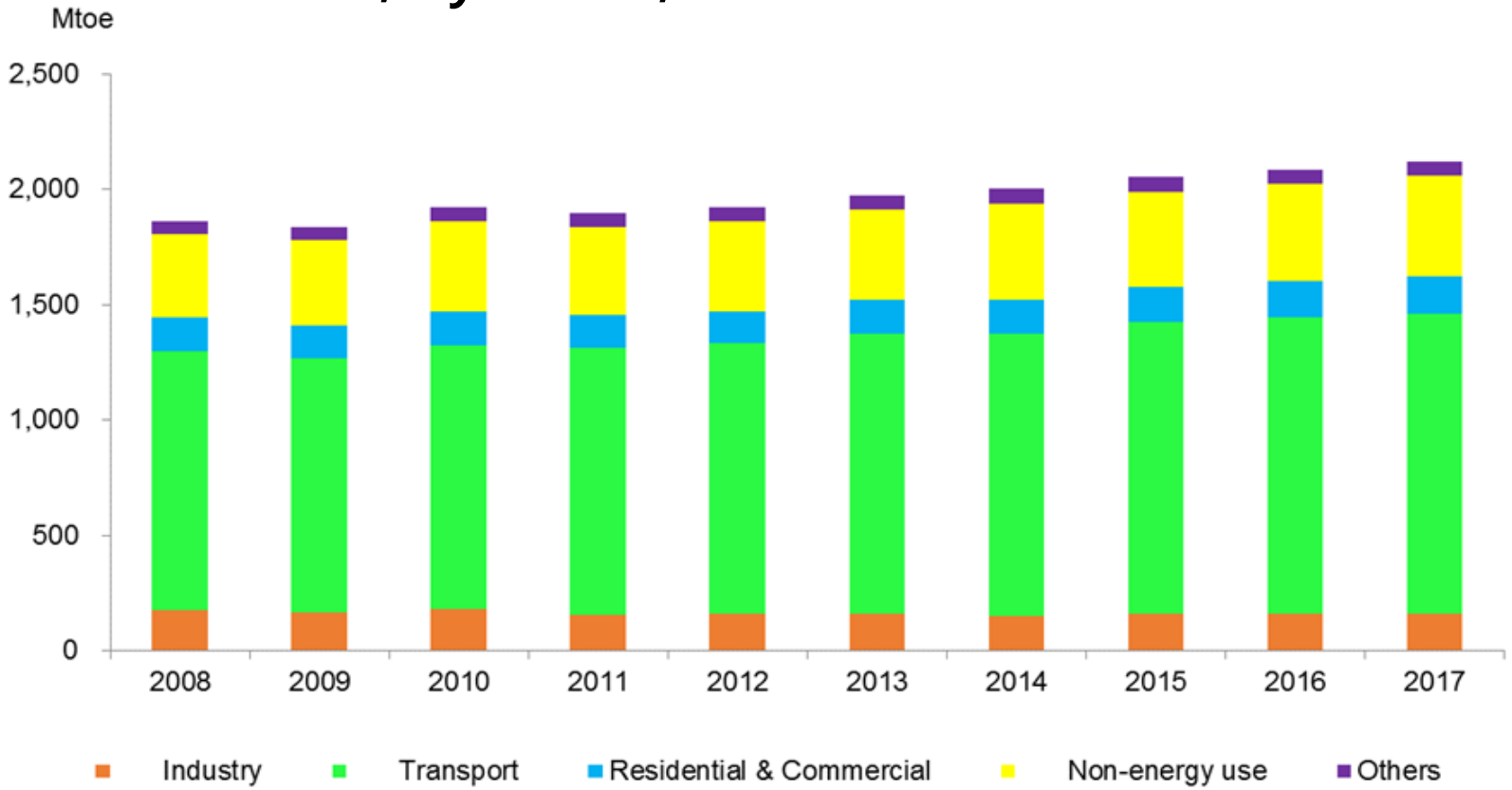



*Source: APERC analysis and IEA (2019)*

***APEC high growth (1.7% p.a.) was mainly due to the contribution of China and southeast Asia.***

# Transport sector has the largest share of APEC oil consumption

## APEC oil demand, by sector, 2008-2017

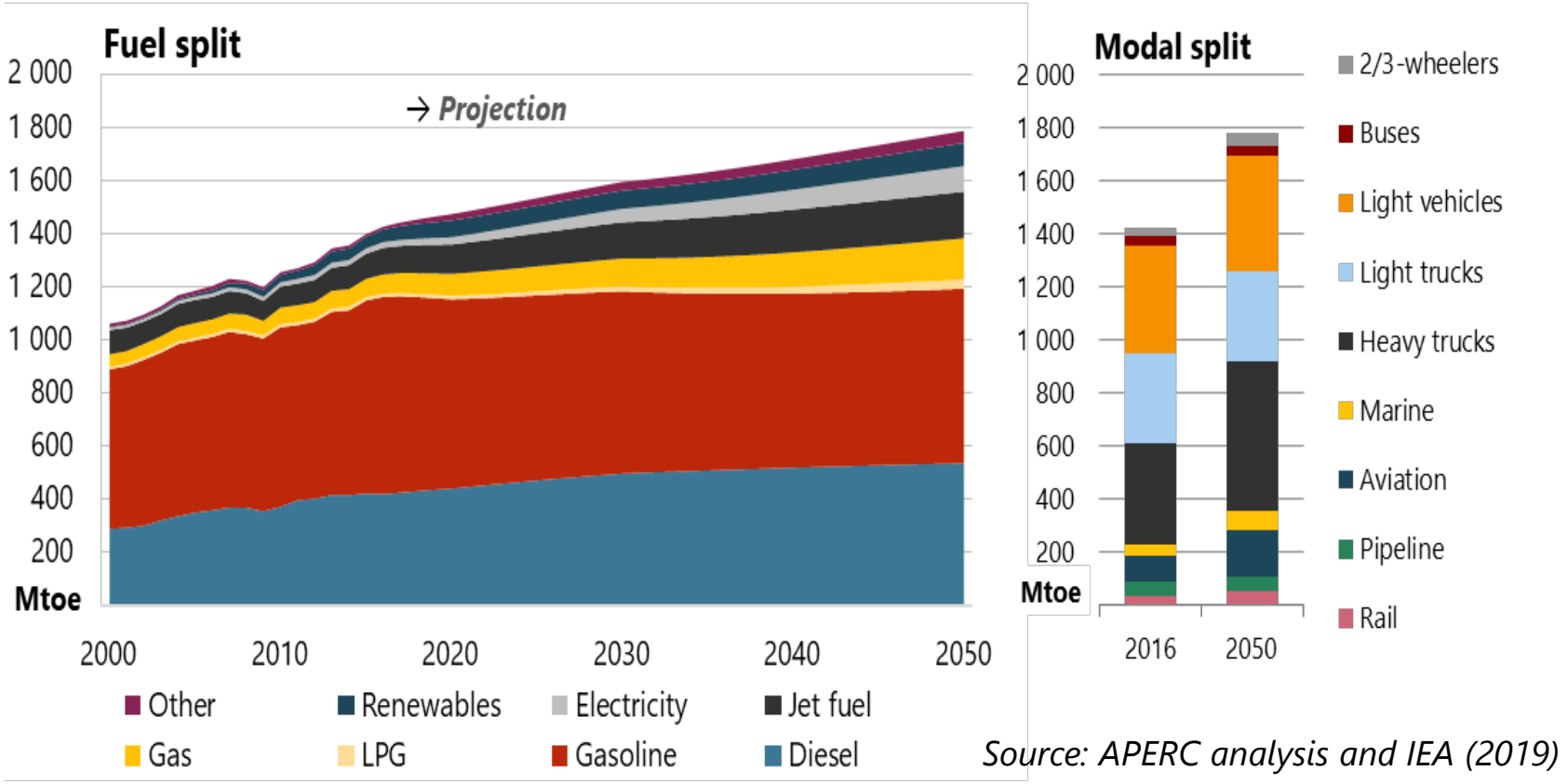



*Source: APERC analysis and IEA (2019)*

**Transportation has been the dominant sector in APEC and contributes to increasing the number of vehicles in the region.**

# ...and maintains its growth towards 2050...

## APEC transportation demand, by fuel, 2000-2050



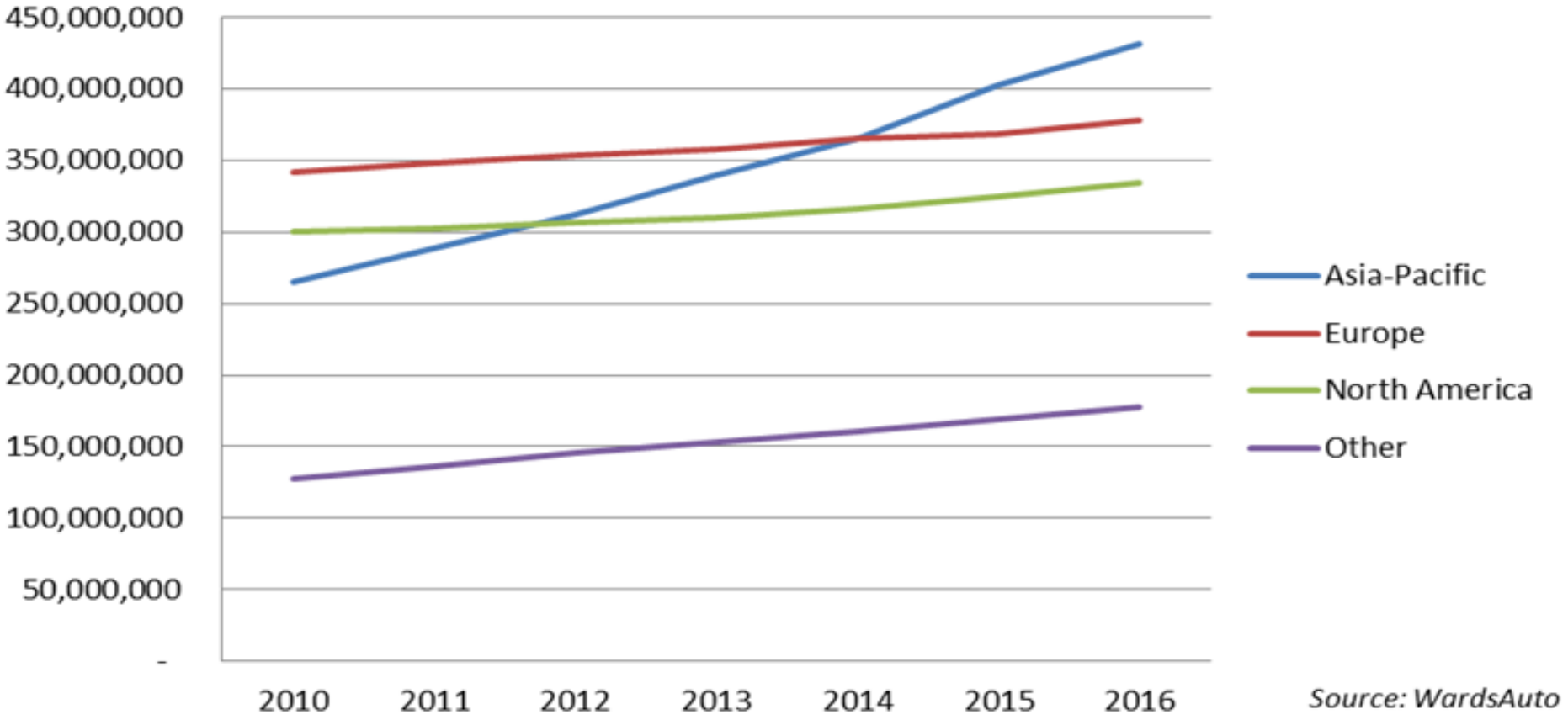

*Source: APERC analysis and IEA (2019)*

***Diesel shows stronger growth than gasoline and dominates transportation fuel over the projection period.***

# Vehicle population and pollution in APEC economies

# APEC vehicles increase sharply with high transportation fuel demand

## World automobile population, by region, 2010-2016




*Vehicle population in APEC shows 11% growth.*

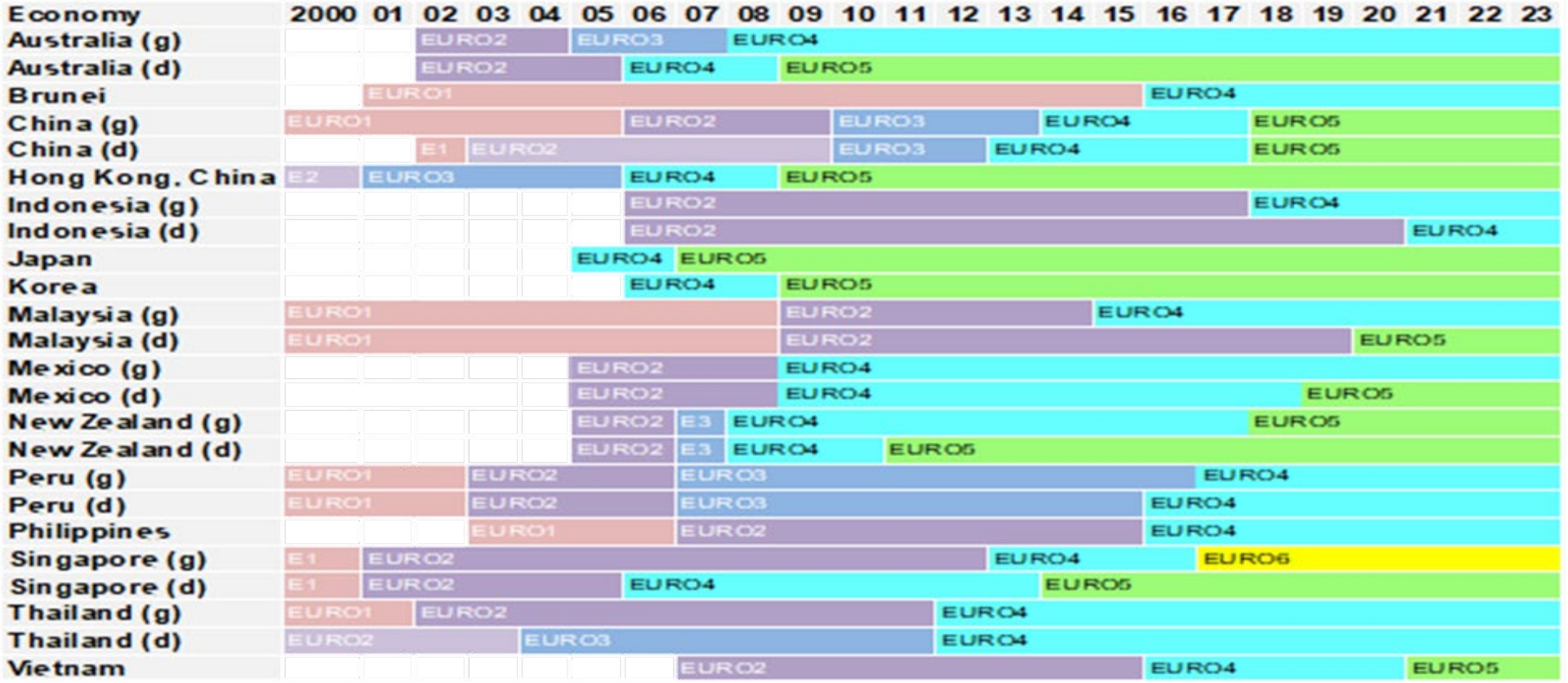
# Vehicle pollution is an increasingly important challenge in APEC

Exhaust gases emitted from vehicles (CO, $NO_X$ and PM) harm human health and environment.

# Harmonization of fuel standards in APEC economies

# APEC economies have adopted fuel standards to set emission limits for cars for the past years

## Fuel quality standards in APEC economies, 2000-2023

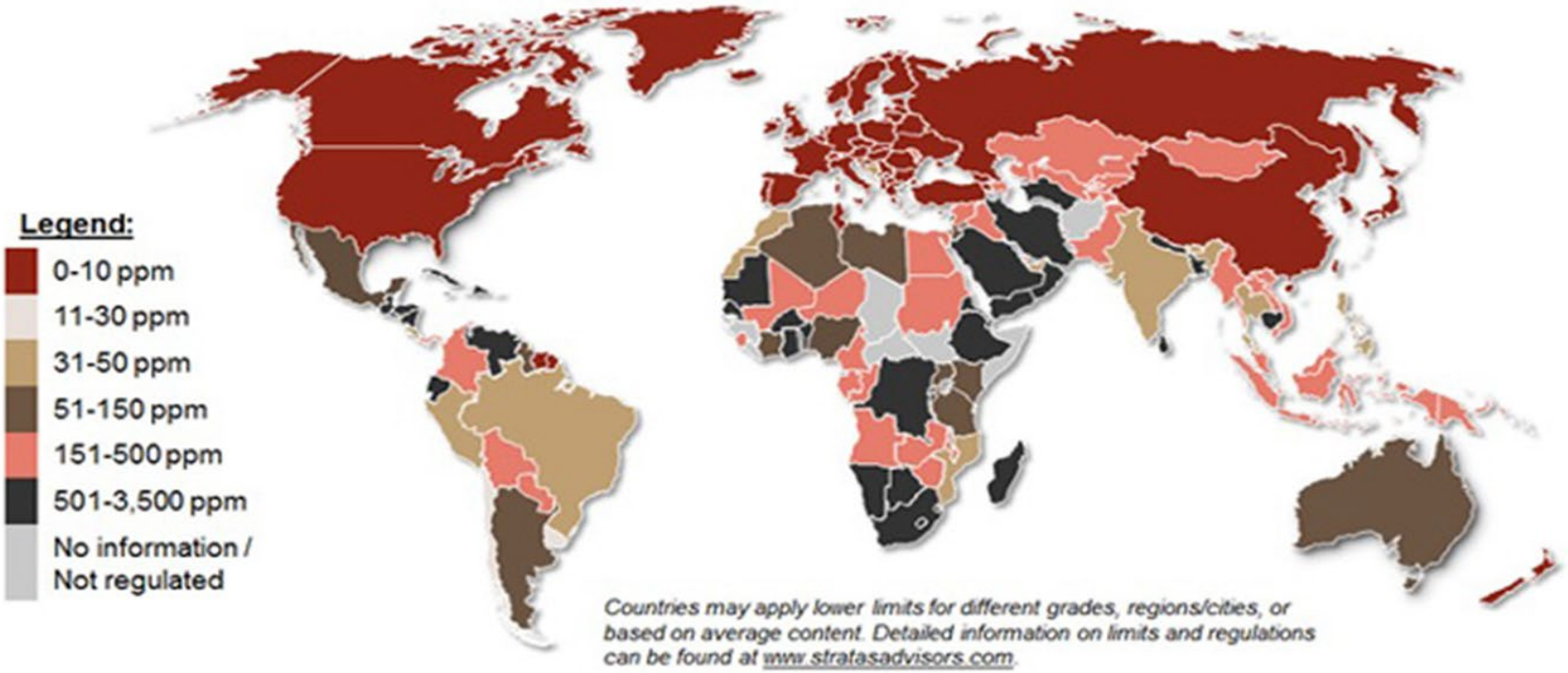



*Source: APERC analysis and PTIT (2019)*

*A variety of specifications of gasoline and diesel have been utilized in APEC economies.*

# …but there are some adverse impacts of APEC economies adopting different fuel quality standards

## Maximum gasoline sulfur limits, 2018

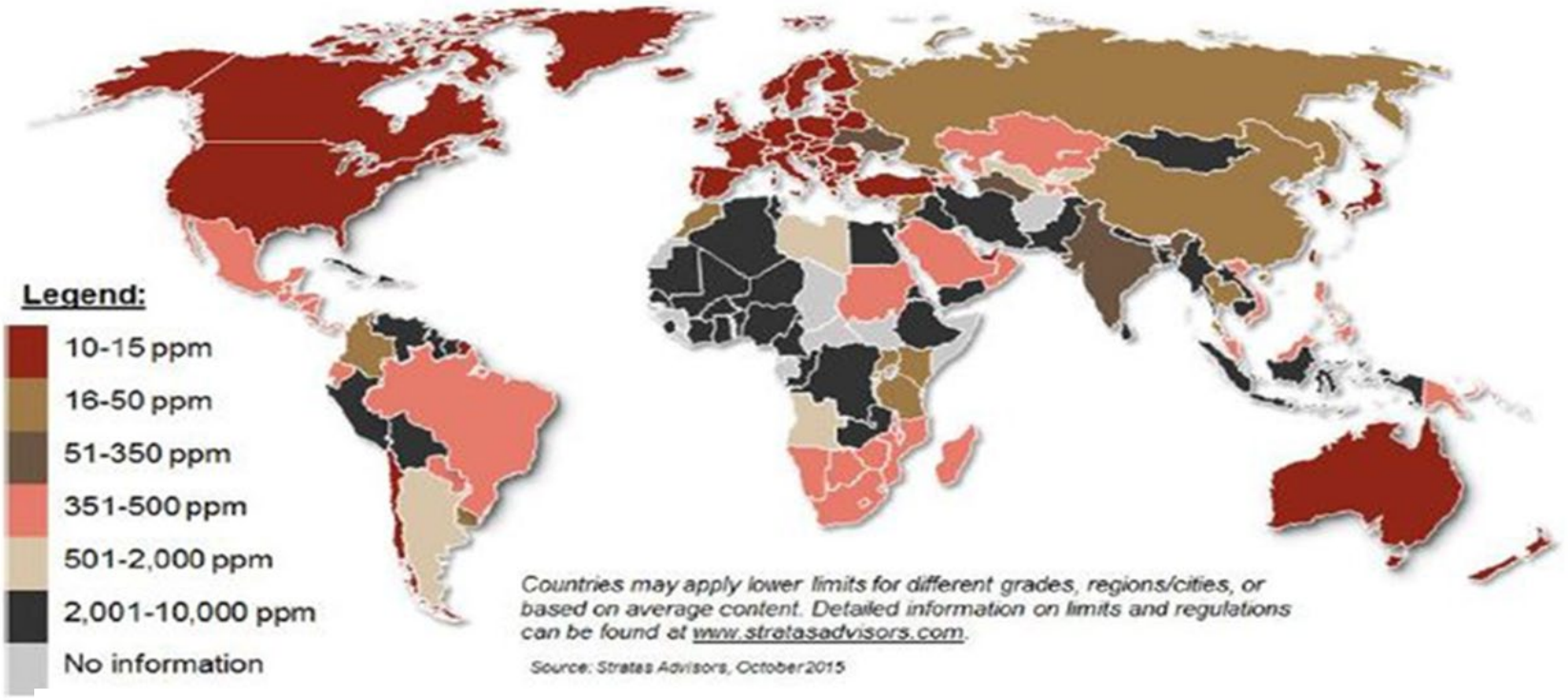



*Source: Stratas Advisors (2018)*

***Vast differences of qualities considerably limit trade among APEC economies…….***

# APEC oil market is uncertain because it is hampered by different quality specifications

## Maximum diesel sulfur limits, 2015




*Source: Stratas Advisors (2015)*

***.....resulting in a need to harmonize the fuel quality standards to facilitate oil trade in APEC.***

# Sustaining APEC trade flows is enabled by harmonizing fuel quality specifications

*The harmonization of fuel quality standards in APEC economies not only supports oil trade market, but also minimizes environmental emissions and reduces excessive logistics cost.*

# SWOT analysis of the harmonization of fuel standards in APEC economies

# SWOT analysis of the harmonization of fuel standards in APEC economies


| Strengths | Weaknesses |
|---|---|
| Expansion of APEC's oil market | Investments are needed for some refineries to upgrade facilities |
| Better air quality, lower GHG emissions, and less health risk | |
| **Opportunities** | **Threats** |
| Fuel swap trading in APEC economies | Differential policy and quality standards of APEC economies |
| Optimization of regional production capacity and consumption | A big gap in GDP and income per capita in the region |
| Strengthened cooperation in improving fuel standards in APEC economies | Increasing trade competition because all economies focus on the same quality products |
| Increased security of supply in terms of Strategic Reserve | Lack of public awareness of fuel quality standards |

# Case Study:
# Evaluation of cost and benefits to upgrade transportation fuel (diesel and gasoline) from Euro III to Euro IV in Thailand

# Case Study: Benefits of sulfur reduction in Euro IV diesel vs Euro III diesel in Thailand


**Health benefit due to sulfur reduction in Euro IV diesel vs Euro III diesel**

| Health impact | S 350 -> 50ppm | S 50 -> 15ppm | S 350 -> 15ppm |
|---|---|---|---|
| Decreased premature deaths | 284-810 | 102-292 | 386-1,102 |
| Decreased new cases of chronic respiratory disease | 1,215-3,767 | 438-1,358 | 1,653-5,124 |
| Decreased respiratory/ cardiovascular hospital admissions | 227-636 | 82-229 | 309-865 |
| Economic potential benefits (billion baht) | 23-57 | 8-20 | 31-77 |

*Source: Pollution Control Department, Ministry of Natural Resources and Environment (2012)*

Economic benefit from upgrading diesel from Euro III to Euro IV was estimated to be USD 756 million

- Less CO, NOx, PM emissions
- Health care cost reduction
- Less lung disease and fewer respiratory health patients

# Case Study: Cost of sulfur reduction in Euro IV diesel vs. Euro III diesel in Thailand

Economic cost of t*he refinery investment (de-sulfurization units) to* upgrade diesel from Euro III to Euro IV was calculated to be USD 74 million

# Summary: Cost and benefits to upgrade diesel and gasoline from Euro III to Euro IV

| | Cost (USD million) | Benefits (USD million) |
|---|---|---|
| Better air quality, lower GHG emission, and health risk reduction (diesel) | | 756 |
| Investments needed to desulfurize diesel from 350 ppm to 50 ppm | 74 | |
| Better air quality, lower GHG emission, and health risk reduction (gasoline) | | 84 |
| Investments needed to desulfurize gasoline from 150 ppm to 50 ppm | 8 | |
| Total | 82 | 840 |

*Source: APERC analysis (2020)*

Comparison of economic benefits and costs to upgrade fuel from Euro III to Euro IV was *justifiable for Thailand to advance to Euro IV.*

# Conclusions

- *It was justifiable for Thailand to upgrade its fuel quality standard from Euro III to Euro IV, based on the economic evaluation that showed the economic benefit (USD 840 million) higher than economic cost (USD 82 million).*
- *Potential application of using the systematic economic cost and benefits evaluation approach:*
  - *any economy that prepares to upgrade or standardize its transportation fuel to a better quality standard.*
  - *any economy that plans to compete in the bunker oil market under the new tanker regulations enforced in early 2020 by the International Maritime Organization (IMO).*

# Thank you for your kind attention.

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