



# Al-Attiyah Foundation Research Series

Expert energy opinion and insight

## Gear change: Vehicle fuel efficiency in the GCC

GCC countries burn almost half of their domestic oil use in road transport. Despite this, the sector has received relatively little public attention to efficiency. This is changing, mostly due to the essential first step of reducing of fuel subsidies. A patchwork of other initiatives, in vehicle mileage standards, public transport, electric vehicles and others, is showing promise but lacks coherence. GCC governments can save money while reducing congestion and pollution, with a coordinated set of policies on more efficient transport.

### GCC vehicle fuel consumption is high

Energy efficiency in the Gulf Cooperation Council (GCC) countries has received substantial attention in recent years from governments and analysts. But most of this has focussed on efficiency in the power generation and residential/buildings sectors. Relatively little has looked at efficiency in industry and – the subject of this paper – transportation.

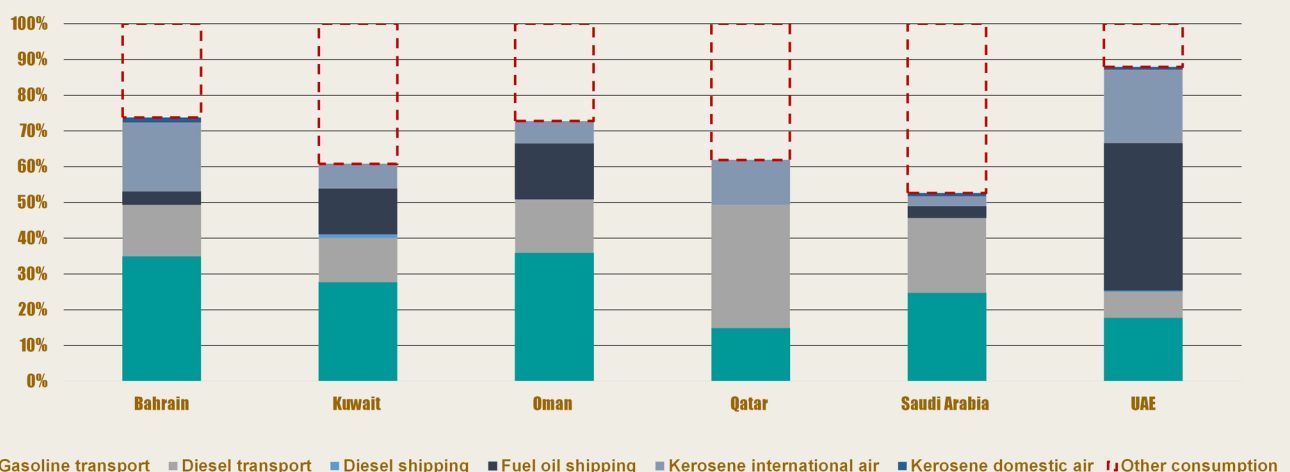
But transport, powered almost exclusively by oil, is a large consuming sector in the GCC. Road transport makes up 41-49% of domestic oil consumption in all GCC countries except the UAE (due to its large aviation and ship bunkering operations).

Growth rates have been rapid too, though varying widely across

In Oman, Qatar and the UAE, gasoline consumption since 2007 has risen at double-digit rates. On a per-capita basis, gasoline demand in the UAE and Oman has grown at around 5% over that period, suggesting a trend towards less fuel-efficient vehicles and to longer road journeys.

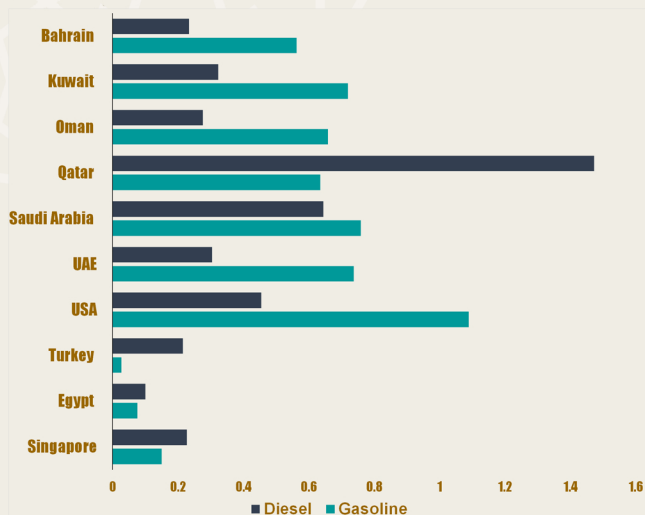
Per capita fuel consumption is high compared to other countries. Gasoline consumption is somewhat lower than in the US but much higher than in some comparable regional countries such as Singapore, which has a tropical climate, high income and an extensive public transport system. Diesel consumption in Qatar, Saudi Arabia and the UAE is, however, even higher than in the USA.

FIGURE 01: SHARE OF TRANSPORT FUEL CONSUMPTION IN GCC COUNTRIES, 2015<sup>1</sup>



<sup>1</sup>International Energy Agency Statistics

FIGURE 02: DIESEL AND GASOLINE CONSUMPTION IN GCC AND SELECTED COUNTRIES, TONNES PER PERSON, 2015<sup>2</sup>



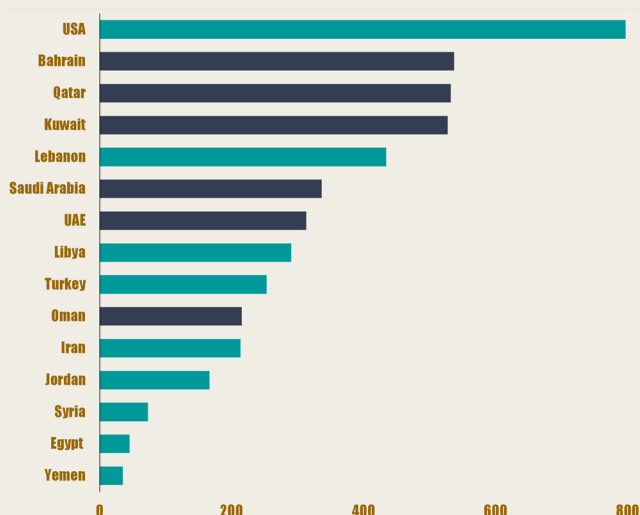
### Climate, urban design and fuel prices drive consumption levels

In the GCC, high summer temperatures, a cultural preference for driving, urban sprawl and historic availability of capital have encouraged the development of extensive road networks. Public transport, other than buses, is limited throughout the GCC area with most lower-income expatriates being transported to and from work by buses or minivans.

Low fuel prices have encouraged both a reliance on personal cars, and a preference for large models with high fuel consumption. As such vehicles are generally owned by those with higher incomes, fuel subsidies are regressive – they disproportionately benefit the wealthy, who are more likely to own big cars.

Despite high wealth levels, vehicle ownership per capita throughout the GCC is not particularly high when compared to

FIGURE 03: ROAD VEHICLES PER 1000 PEOPLE, GCC & SELECTED OTHER COUNTRIES<sup>3</sup>



<sup>2</sup>International Energy Agency Statistics

<sup>3</sup>International Road Federation. Year of estimate varies from 2007-14

global standards. Bahrain, with 537 vehicles per 1000 people, heads the tables in the Middle East, but ranks only 28th globally. This can most likely be attributed to the large population of low-wage expatriate labour who, through necessity, use public buses or have transport provided by their employer. However, with few exceptions, the GCC countries do have the highest number of road vehicles per person in the Middle East (Figure 3).

### Tackling poor vehicle fuel consumption offers financial and environmental gains

At a time of financial stringency due to prevailing low oil prices, GCC countries are seeking to cut energy subsidies across the economy. This includes fiscal and policy related moves to increase domestic fuel prices.

In order to shield vehicle owners from sharp rises in overall fuel bills, subsidy reform is being introduced in conjunction with policies to encourage improvements in vehicle fuel efficiency, and by offering alternatives.

For states which are resource-constrained or those which have only limited ability to increase oil output and/or refined product output (many GCC States), reducing fuel consumption frees up oil for export or reduces import requirements. Even for the major petroleum resource holders, lower domestic fuel demand reduces the need to build or expand refineries, freeing up increasingly scarce capital for other pressing investments.

Reduced petroleum fuel consumption cuts the release of carbon dioxide, the main greenhouse gas. It helps to improve urban air quality by lowering emissions, particularly carbon monoxide, nitrous oxides and particulates.

Lower emissions often lead in turn to improved health, with the intangible benefit of lower health spending and work-place absences and a more attractive environment for tourists. Policies to reduce fuel consumption also have other complementary benefits such as improved public transport and the provision of walking and cycle paths, which all help cut congestion, further improving the quality of life and public health.

### GCC countries are already reforming fuel subsidies

GCC countries have been motivated to reform fuel subsidies primarily for financial reasons. The fall in oil prices from mid-2014 has stretched government budgets, but it has also brought international fuel prices much closer to previous regulated levels, helping to reduce the impact of subsidy reforms.

As Figure 4 shows, all the GCC countries reformed fuel prices during 2015-17. The price rises were greatest proportionately, but from the lowest base, in Saudi Arabia. In Kuwait, 2015 planned price rises were reversed following parliamentary opposition, but the Ministry eventually increased gasoline prices in September 2016 and adjustments to fuel prices are made every quarter. Prices actually fell initially in the UAE, since it linked fuel prices to international levels from August 2015. Now diesel and gasoline-95 can be considered to be essentially unsubsidised in the UAE and

Oman, while gasoline is only moderately subsidised in Kuwait, Qatar and Bahrain.

FIGURE 04: GCC TRANSPORTATION FUEL PRICES 2015-17 (\$/litre)<sup>4</sup>

	GASOLINE RON 91			
	Price Dec 2017	Price Oct 2016	Price Oct 2015	% Change
Saudi Arabia	0.20	0.20	0.12	+67
Kuwait	0.28	0.20	0.20	0
Qatar	0.45	0.31	0.23	+78
Bahrain	0.33	0.33	0.24	+38
Oman	0.48	0.36	0.30	+50
UAE	0.54	0.41	0.43	+7
	GASOLINE RON 95			
Saudi Arabia	0.24	0.12	0.07	+242
Kuwait	0.35	0.36	0.36	0
Qatar	0.48	0.27	0.27	+67
Bahrain	0.42	0.42	0.37	+14
Oman	0.54	0.42	0.38	+26
UAE	0.56	0.43	0.63	-24
	DIESEL			
Saudi Arabia	0.12	0.12	0.07	+71
Kuwait	0.36	0.36	0.36	0
Qatar	0.47	0.27	0.27	+56
Bahrain	0.37	0.42	0.37	0
Oman	0.57	0.42	0.38	+32
UAE	0.60	0.43	0.63	-21

### The Five Pillars of Policy

Reducing fuel consumption from ground transport rests on five pillars.

- Increased fuel prices and/or the introduction of road charging.
- The introduction of fuel-efficiency standards.
- Incentives to use alternative fuels (e.g. CNG, electricity).
- Improved public transport or alternative transport modes.
- Improved urban design (e.g. to reduce sprawl, increase walkability).

Of these, increasing fuel prices is currently being achieved by removing subsidies to move towards international prices. In future, as in Europe and many other countries, fuel taxation could be introduced, with the added aim of helping to reduce vehicle congestion and introduce measures to impose charges on road users to contribute to the cost of road construction and maintenance. Raising fuel prices also affects fuel demand in less obvious but nonetheless significant ways.

First, higher fuel prices are encouraging people to consider alternative transport modes (including ride-sharing). Secondly, improvements in the attractiveness and falling costs of more fuel-efficient or alternative-fuel (e.g. electric) cars are increasingly high on the consumer agenda, influencing vehicle selection. Finally, higher fuel prices are discouraging unnecessary journeys; and encouraging better (less fuel-intensive) driving styles.

<sup>4</sup>MEEES; media reports; ministry releases

### Raising the Standard

Saudi Arabia announced new fuel efficiency standards in 2014, which are scheduled to be phased in between 2016 and 2020. These standards are modelled after the US's CAFE scheme, which places the responsibility on each manufacturer or importer to meet the target across their sales portfolio. The standards are set according to the footprint of the car (the area between the wheels), rather than its weight. This is preferred as it encourages manufacturers to pursue light-weight materials such as aluminium and carbon fibre.

The target will lead to a target efficiency for passenger cars of 14.2 km per litre in 2016, improving to 17 km per litre by 2020. For light trucks the target is 11.4 to 13.2 km per litre, an annual improvement of 4% per year. Beyond 2020, a further five-year cycle of improvements will be set.

However, these standards are still well below those adopted by the US and Canada, and even further below those used in China, India, Japan, South Korea and the EU. Fuel standards also have to be scrutinised closely as experience has shown that real-world performance has increasingly diverged from test-based assessments as manufacturers have got better at gaming (or in some cases, it is alleged) cheating the tests.

Since Saudi gasoline consumption rose 3.1% per year from 2007-14, these standards would eliminate or possibly even reverse growth in fuel consumption assuming there is no change in driving behaviour. However, it will take time for the legacy vehicle fleet to turn over.

The UAE announced fuel standards similar to the Saudi system in 2016. In 2013, the average fuel efficiency of UAE vehicles was estimated at 14.8 km per litre for cars (US 15.0 km per litre) and 10 km per litre for light trucks (US 10.5 km per litre). The UAE figures are, therefore, somewhat better for cars, but worse for light trucks when compared to the data from Saudi Arabia.

From 2017, new vehicles sold in Qatar will have to be labelled with their fuel efficiency. However no mandatory standards were identified in the UAE, Oman, Bahrain or Kuwait.

The Saudi standards have the advantage of being closely based on the US system, making them familiar to car manufacturers and building on several decades of American experience. They incorporate adjustments for Gulf conditions, particularly credits for air-conditioning efficiency.

Implementation of harmonised standards across the GCC, and even allowing compliance across countries, would help carmakers to meet the requirements without excessive customisation.

These standards apply to gasoline-powered vehicles. Light-duty diesel vehicles are rare in the GCC as there has been no policy drive to encourage their uptake, and low fuel prices have not encouraged car-owners to choose higher-mileage diesel

models. Concerns over diesel-engine pollution, and the Volkswagen testing scandal, suggest this will continue. Standards for GCC heavy-duty vehicles, such as buses and goods trucks, have not been identified.

Diesel consumption amounts to 43% of the total road fuel consumption in the GCC (gasoline being the rest, apart from tiny amounts of CNG), and it therefore also presents a major area for improving consumption.

### Time for an Oil Change?

Low fuel prices have discouraged the adoption of alternative-fuelled vehicles in the GCC. Unlike in Europe or North America, Gulf governments do not offer financial incentives to offset the higher cost of eco-friendly vehicles.

With its abundant natural gas reserves, Qatar opened its first compressed natural gas (CNG) fuelling station in 2012. CNG not only saves petrol or diesel but is also cleaner. In addition to the move to CNG, state utility Kahramaa has targets of 4% of vehicles being hybrid or electric by 2022, and 10% operating on electricity by 2030.

Electric vehicle manufacturer, Tesla, unveiled its first Middle East showroom in Dubai in July this year. The Emirate is targeting 2% of all vehicles and 10% of the government fleet being electric or hybrid by 2020 and 10% by 2030.

Electric charging stations, though still rare, are becoming more common. As more electric vehicles are introduced, their battery technology could be used to help store variable renewable energy and smooth grid demand peaks.

Abu Dhabi has also introduced CNG vehicles, but a lack of filling stations results in long waiting times. Small-scale liquefied natural gas (LNG) could also be used for heavy-duty vehicles, especially around ports where LNG is already available (Ras Laffan, Jebel Ali, Hamriyah, Mina Al Ahmadi and Sur).

In the GCC region, concerns over battery performance in high temperatures, and the load on the battery from air-conditioning, have held back adoption of electric cars.

Hybrid options available have been considered too small and slow by Gulf drivers. We were not able for this paper to identify specific CNG or electric vehicle initiatives in Saudi Arabia, Kuwait, Bahrain or Oman, though the hybrid Toyota Prius is now sold in Saudi Arabia and Bahrain.

Nevertheless, at the currently foreseen penetration levels, the impact of alternative fuel vehicles would be relatively modest.

At the historic rate of Saudi demand growth, gasoline consumption would rise nearly 50% by 2030. A 10% share of electric vehicles would still leave about 35% consumption growth.

### Reshaping Transport in Gulf Metropolises

Apart from Dubai's new and quite extensive metro, which opened in 2009, and tram system, and systems under construction in Riyadh and Doha (both scheduled to open in 2019), public transport systems rely on buses.

However, Abu Dhabi, Bahrain, Jeddah, Kuwait City, Makka and Madinah all have metros at various stages of planning.

Dubai reported that about 187 million journeys were made on its metro in 2016. At a rough estimate, if all the metro journeys were replacing single-occupancy car journeys (admittedly a high case), this could save as much as 5% of the UAE's gasoline consumption.

Extending the metro to the contiguous city of Sharjah, and constructing another system in Abu Dhabi, would add to savings in fuel and congestion.

Long-distance rail has previously not been developed in the GCC, except for limited stretches in Saudi Arabia from Dammam to Riyadh, and a relatively new freight railway in the UAE. New lines, for cargo and passenger use, are under development in Saudi Arabia connecting Makka, Madina, Jeddah, Riyadh, eastern ports and northern industries.

The planned GCC rail network has made slow progress and constrained capital budgets are likely to hold it up still further. Cars will remain essential in more scattered rural or suburban areas such as Saudi Arabia's south-west or Abu Dhabi's Western Region.

However, cargo rail and coastal shipping could reduce the demand for diesel in heavy-duty vehicles.

More futuristically, Dubai is working on constructing the Hyperloop, a vacuum tube in which passenger pods are magnetically accelerated to high speeds. A Dubai-Abu Dhabi route, 150 km long, is being considered, which would be covered in 12 minutes.

Ride-hailing services such as Uber and Careem are growing in popularity, with Saudi Arabia's Public Investment Fund signalling its support by investing \$3.5 billion in Uber in 2016.

Dubai has a target for 25% of all journeys to be in self-driving vehicles by 2030, which could improve fuel consumption and save on parking, congestion and accidents.

Changing urban design is a long-term endeavour, with much of the built environment already determined.

Dubai has created some areas that are relatively walkable in the cooler months, as well as constructing an extensive cycleway although mostly for leisure purposes.

### Implications

The most visible part of fuel efficiency policy so far has been removing subsidies. Regional governments have long shied away from increasing fuel prices from concerns over the impact on residents and creating political opposition. However the reforms to date, and those in neighbouring countries such as Egypt and Iran, although attracting some complaint, have largely passed off without incident.

In the UAE, Bahrain, Oman and Qatar, fuel prices are already at or close to international levels. The UAE and Oman engaged in a fairly extensive public communications effort. In Kuwait, reform remains hamstrung by popular and parliamentary opposition. In Saudi Arabia, where prices are still low, further subsidy reductions are required, but should be accompanied by a better communications campaign.

The Saudi government is introducing a system of payments of 600-1200 Riyals monthly for those in lower income brackets, which will help cushion the impact of higher energy prices. Moving from blanket fuel subsidies to targeted payments will help reduce their otherwise regressive nature by preferentially helping those on lower incomes.

Diesel price hikes will increase transport costs, and hence the price of goods, or reduce the margins of retailers or haulage companies.

Fuel price increases generally will lead to a one-off increase in inflation, though this is not necessarily a concern as inflationary pressures generally remain subdued.

### Impact on Fuel Demand

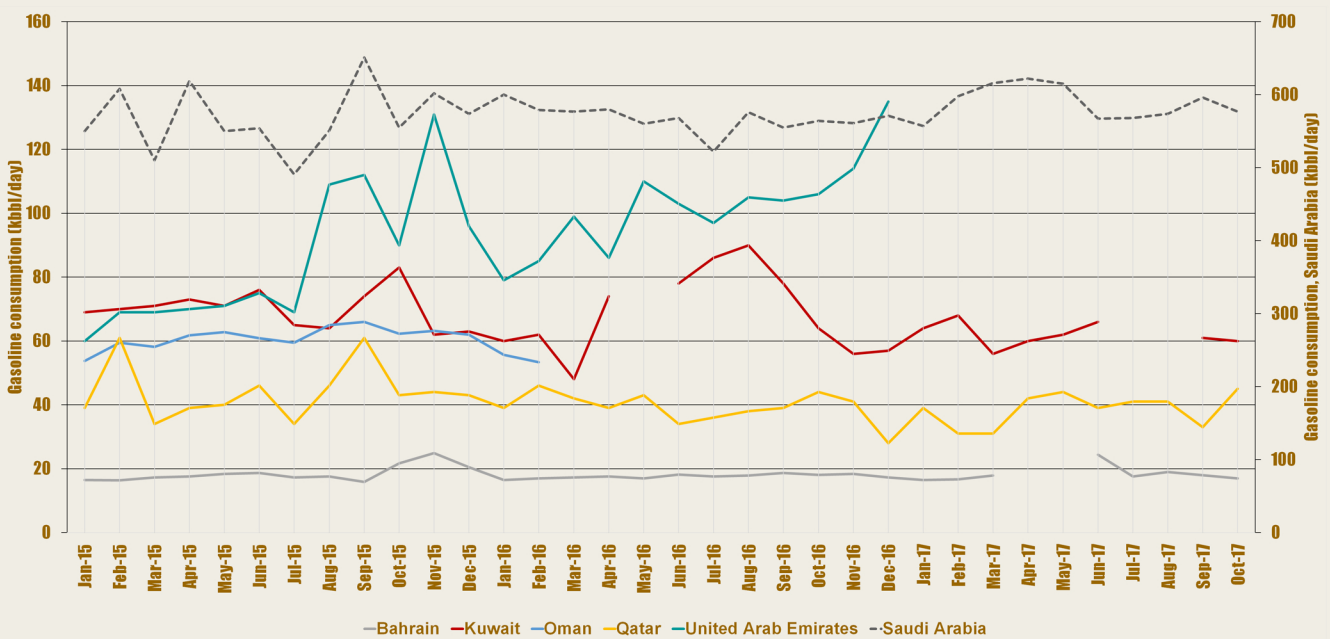
Successful fuel efficiency policies will have an impact on demand growth. With the Gulf countries having been one of the largest centres of oil demand growth over the past decade or so, this also has implications for the global market and for product flows.

Interpreting the effect of the recent subsidy cuts is difficult. It is still early to see patterns in the data, which is anyway patchy. Diesel demand also includes fuel used in power generation and industry, not just transport, and therefore has significant seasonal variation. The economic slowdown with low oil prices would anyway be expected to reduce transport demand growth. And it is certainly too early to see the impact of the Saudi vehicle efficiency standards, or the various new GCC public transport schemes.

With these caveats, Figure 5 does suggest that the fuel price rises have had an effect in reducing consumption in Oman (though the data series breaks off early) and Qatar, and holding it steady in Bahrain. The UAE (/Abu Dhabi?) figures show a sharp increase but the data do not appear to include Dubai and may be unreliable. Saudi Arabia (plotted on the right-hand axis for ease of visibility) shows stable consumption until a sharp and unexplained rise from February 2017 onwards (this is in advance of both Ramadan, and the April 2017 reinstatement of bonuses). Fuel consumption fell in Kuwait, even though price increases were reversed.

In any case, with the ambiguous exception of Abu Dhabi, GCC gasoline consumption has been flat since early 2015, breaking the trend of rapid previous increases.

FIGURE 05: GASOLINE CONSUMPTION IN THE GCC, 2015-17<sup>5</sup>



<sup>5</sup>Joint Organisations Data Initiative statistics



## Conclusion

Transport fuel efficiency is an important and under-studied aspect of the GCC's energy and oil demand. The region's climate, lifestyle and legacy infrastructure all encourage high fuel demand. Reducing this has economic and environmental benefits, though the magnitude of these vary between the six countries.

Regional governments have been paying closer attention to the issue, mostly in reforming fuel subsidies, which is an important prerequisite for improving the attractiveness of more efficient and alternative fuel vehicles, and public transport.

Vehicle efficiency standards, currently only in place in Saudi Arabia and being introduced by the UAE, help support fuel price increases by offsetting the financial impact on motorists of fuel price rises.

Travellers can also more easily accept fuel price increases if they are given viable alternatives – notably public transport. Other than buses, this is very limited across the region.

Although some of the leading metropolises have, or will soon have, metro and tram systems, intercity rail is virtually absent. Walkability, better road crossings, cycle tracks and shaded areas help reduce short-distance car travel as well as improving health and liveability.

Alternative fuels – such as electricity and CNG - may moderate demand increases, but will not have much impact unless deployed much more aggressively.

More futuristic solutions, including autonomous vehicles and the Hyperloop, are interesting but should not be prioritised over currently proven options. Currently GCC governments are pursuing rather a patchwork of transport initiatives, many of which relate to fuel consumption as a primary or secondary goal.

**GCC-wide cooperation is highly desirable on vehicle fuel standards and international rail networks. Otherwise, national coordination and coherency can go a long way to deliver the benefits of improved fuel efficiency.**