Opinions

November 2012

Fuel economy policies could spare Commonwealth governments from an impending transport fuels disaster

Dr Lewis M Fulton, PhD

COMMONWEALTH ADVISORY BUREAU

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The world is on an unsustainable path regarding oil use and its related environmental impacts such as CO2 emissions.

Transportation is a key contributor to this problem. About half the world's oil is used in transport. We face a near tripling of the number of cars on the planet by 2050, the vast bulk in emerging economies; but at the same time, vibrant transport systems are critical to economic development and healthy functioning of society.

The question is how to deliver needed transport services while cutting the negative impacts of pollution, congestion, energy and resource depletion, and environmental damage which will follow?

Improved fuel economy is essential if we are to address some of these negative implications. The **Global Fuel Economy Initiative** (**www.globalfueleconomy.org**) is a partnership of the International Energy Agency (IEA), United Nations Environment Programme (UNEP), International Transport Forum (ITF), International Council for Clean Transportation (ICCT), ITS Davis, and the FIA Foundation, which works to secure real improvements in fuel economy, and the maximum deployment of existing fuel economy technologies in vehicles across the world. The Initiative promotes these objectives through in-country policy support, analysis and advocacy.

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Fuel economy policies could spare Commonwealth governments from an impending transport fuels disaster

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Summary

The number of road vehicles, and road fuel use, in Commonwealth countries could double by 2030 and increase by a factor of four by 2050. Given that about half the Commonwealth's (and world's) oil is used in transport and oil accounts for about 95% of transport fuel use, this could spell economic disaster for the oil importing countries which make up the vast majority of the Commonwealth. Yet, one simple solution – improving vehicle fuel economy – could cut the cumulative oil bill of Commonwealth countries by GBP 200 billion by 2030, rising to GBP 2 trillion by 2050. In this *Opinion*, energy expert Lew Fulton sets out some alarming statistics on oil use and cost, and analyses the case of Kenya – a country that has already recognised the scale of the challenge it faces and the steps it needs to take to improve fuel economy. He argues that through inaction, Commonwealth countries are missing out on the opportunity to save billions of unnecessary expenditure on oil – a cost which could slow economic development in some countries. By setting out the core elements of a national policy on fuel economy, he encourages all countries to work with the Global Fuel Economy Initiative (GFEI) and other experts. By adopting this high-impact low-cost policy solution, Commonwealth countries will, he argues, save their citizens billions of pounds and reduce their CO_2 emissions.

Introduction

In 2011, Commonwealth countries consumed about 3 billion barrels of oil (about 8 million barrels per day, one tenth of the world total), with more than half of this for road transport. This cost over GBP 100 billion pounds last year. Worse, these costs have been increasing rapidly, both because of rising demand and rising world oil prices and could double over the coming decade if no action is taken. Commonwealth countries – and the world as a whole – are on an unsustainable path regarding oil use and its related environmental impacts such as CO_2 emissions. Oil use for transport is a key contributor to this unsustainability. About half the Commonwealth's (and world's) oil is used in transport and oil accounts for about 95% of transport fuel use. At the same time, vibrant transport systems are critical to economic development and healthy functioning of society. The question is how to deliver needed transport services while cutting their negative impacts.

When it comes to transport fuel use and CO_2 emissions, many steps can help, but one solution stands out above the rest – vehicle fuel economy improvement. Work that I have been involved in at the International Energy Agency (IEA) shows that it is possible to cut the world's road transport energy use and CO_2 emissions by nearly half over the next 40 years, compared to where it would otherwise be, and at very low cost (or potentially even net savings) to society (figure 1).

If left unaddressed, this problem will only get worse: the number of cars and trucks is rising rapidly in many countries, particularly in Asia, where most Commonwealth citizens reside. However it is also rising rapidly in Africa, as my case study of Kenya shows (see text box, page 8). Combine the increased vehicle traffic with expected continuing increases in oil prices, and the total demand for and cost of fuel could increase several fold over the coming two to three decades. This could spell economic disaster for the oil-importing countries which make up the vast majority of the Commonwealth. Commonwealth countries use about a tenth of the world's oil, and this share will likely rise as many Commonwealth countries are growing faster than

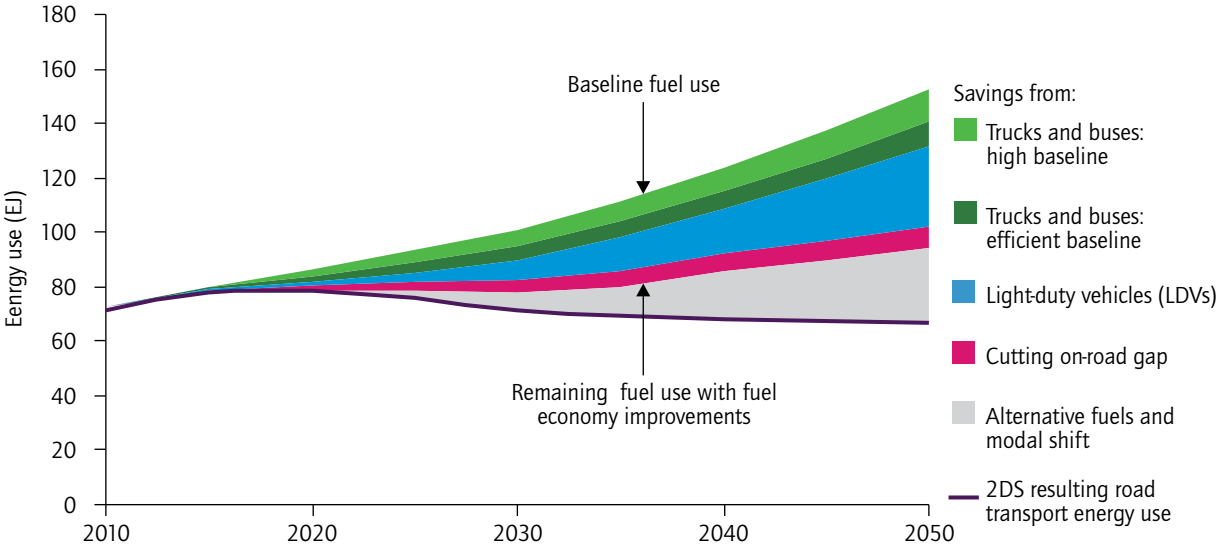
the world average (with India the notable giant in the group). Based on IEA projections the number of road vehicles, and road fuel use, in Commonwealth countries could double by 2030 and increase by a factor of four by 2050.[1] With ongoing increases in world oil price, the expenditure on fuel will rise even faster and could approach GBP 1 trillion per year by 2050. Since nearly all Commonwealth countries import most of their fuel, this translates into hundreds of billions of pounds per year in lost foreign exchange.

Conversely, if the vehicles sold in these countries over the next 20 to 30 years exhibit strong gains in efficiency (by cutting new car fuel use per kilometre in half by 2030 for example), these import costs can also be cut dramatically. As a rough estimate, by 2035 the savings could approach GBP 200 billion per year. The total savings between 2010 and 2050, for both cars and trucks in the Commonwealth, could exceed GBP 2 trillion. This will include other key global benefits such as large cuts in vehicle-related CO_2 emissions.

But why are cars and trucks not already as efficient as possible? Most passenger cars, SUVs, minivans etc. are bought by consumers taking into account a range of vehicle attributes, such as size and performance (e.g. acceleration). Naturally, vehicle purchase price is also a key consideration. Fuel economy, and the cost of fuel, is often of secondary concern. This is partly due to a lack of good information. Indeed, in many countries there is so little information available about fuel economy that consumers are not able to make informed choices even if they want to. And since consumers don't demand better fuel economy when choosing a car, manufacturers often don't make it a priority to provide it. Even trucking companies and individual operators, though usually having a strong incentive to save on fuel costs, are not able to make informed choices, or have access to the most fuel efficient trucks on the global market.

In contrast, in countries and regions with strong fuel economy policies (discussed below) such as the European Union and Japan, the fuel economy of new cars has improved dramatically over the past few years. This trend will likely continue. These improvements will in fact provide some knock-on benefits for other countries, as some of the same cars will be sold around the world. But not always: lower fuel-economy versions

Figure 1: Global transport energy use in a baseline scenario and with strong efficiency improvements



Source: IEA[2]

of the same model (with fewer new technologies) are often sent to markets without fuel economy incentives and regulations.

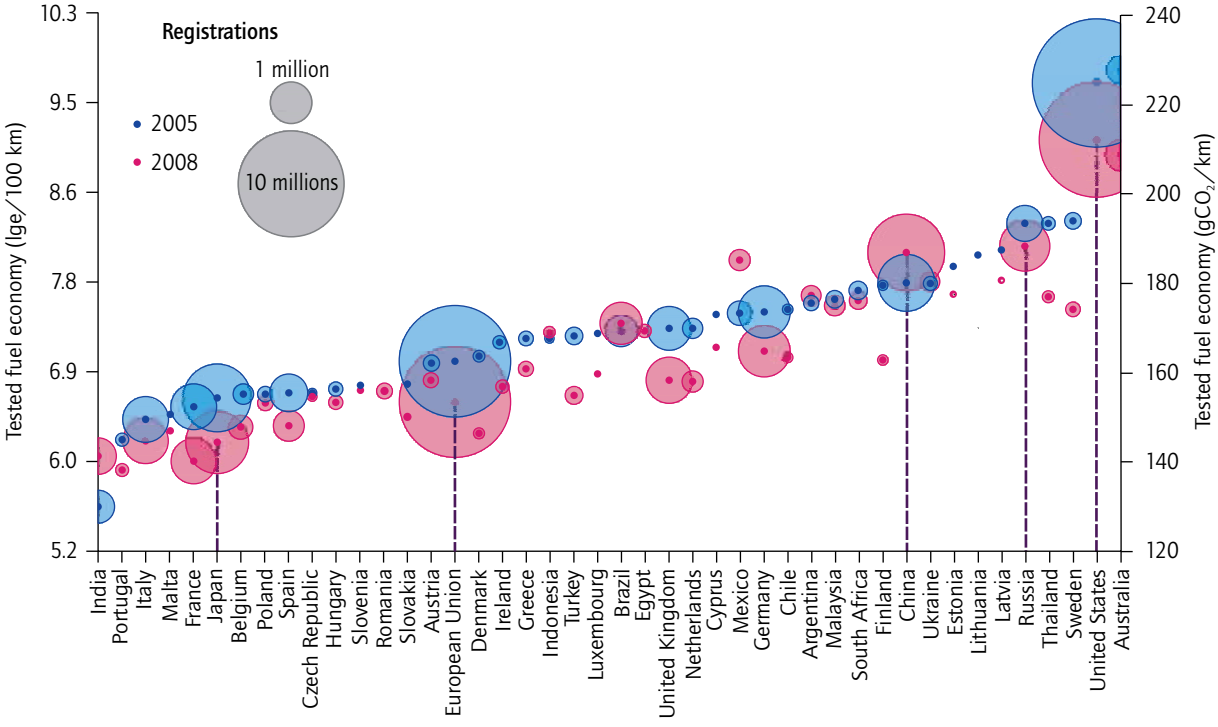
Figure 2 shows the range of new light-duty vehicle fuel economy in Commonwealth and other countries for 2005 and 2008. The range is striking. Countries like France and Japan, with traditionally strong fuel economy policies, have achieved average tested new car economy levels of less than 7 litres per 100 kilometres, while some Commonwealth countries such as Australia are above 9. The United Kingdom has benefited from EU policies and its own vehicle and fuel fiscal policies, and in 2008 came in below 7.

Fuel economy improvement is not only about cars; trucks and motorcycles can also benefit and, particularly for long-haul trucks, save a great deal of fuel since these vehicles travel long distances each year. As shown in figure 1 in the 'high baseline' case, if trucks do not experience much fuel economy improvement in the future (a real possibility), then the fuel savings achievable through strong policies is nearly as great as for cars.

What is the potential for improving fuel economy?

There is a wide range of vehicles on the world's roads: small cars, large SUVs, small and large trucks; there are vehicles with lots of fuel savings technologies on them already, and many with very few. In fact, there is now a large body of research indicating that the technologies that are already available to save fuel, and that have not yet been fully utilised **hold the potential to cut the average new car fuel use per kilometre roughly in half between 2005 and 2030**.[4] This has become so well documented, in fact, that it was chosen as the official target of the Global Fuel Economy Initiative and

Figure 2: Comparison of fuel economy levels across countries, 2005 and 2008.



Source: IEA[3]

is endorsed by the IEA, ITF, UNEP, FIA Foundation, and ICCT, among others.[5]

Why is there so much potential? First of all, there are many technologies that are well known and commercially available, but that have not been fully exploited. An obvious example is hybridisation. By combining a small electric motor and batteries into the already present engine drive-train system of today's cars such as the Prius, great efficiencies can be gained – and this also enables other improvements such as regenerative braking, that recaptures electricity. Hybridisation already saves around 30% of fuel per kilometre in today's cars that have it, and as new designs and optimisations are introduced, the savings will only increase. But hybrid vehicles only represent about 2% of world car sales today. This untapped potential is hugely wasteful.

In fact there are many other technologies already available out there besides hybridisation, and some of them are much cheaper. For example, the IEA estimates that more efficient air conditioning units could save 3% of fuel per year globally (with a higher percentage savings in hot countries).[6] Such units cost more – but at an estimated cost of around USD 150, the value of fuel savings at current oil prices would be at least USD 50 per year for moderate-distance drivers in moderate climates, giving about a three-year payback. Over 10 years, the savings of USD 500 (or more with rising oil prices, or in hotter climates) would be over three times the cost of the technology. This is just one example; there are many technologies with similar economics.

If there are so many good technologies out there, why aren't they being used? The answer is economic market failure, or (to be kinder), a range of market 'imperfections'. First of all, consumers aren't usually aware of the value of the fuel savings from various technologies, just as they aren't aware of how these all add up on vehicles to make such a big difference in lifetime cost between different models. Consumers are also risk averse: you never know how long you will own your car, or what fuel costs will do – why spend an extra USD 150 for the possibility of making back USD 500 over three years, when you might sell in two? And there are sometimes trade-offs between fuel efficiency and vehicle performance. That same more efficient air conditioner can help lower fuel use, or allow for a more powerful engine with the same fuel use. Many manufacturers (and consumers) follow the latter path.

The problem is that all these small market imperfections, and lack of action by consumers, can add up to a very large societal problem. Foregoing USD 500 in fuel savings (e.g. perhaps 500 litres of fuel) over 10 years represents only a modest loss for most people. But 10 million people doing the same adds up to USD 5 billion in excess fuel cost, and 5 billion excess litres of fuel used over the same period – a major waste of resources, and loss to society. And that's just for the example of the air conditioners.

How does it all add up? In its recent roadmap, the IEA reviewed studies of fuel economy potential and developed targets for cars, trucks and even two-wheelers (motorcycles), through to 2030 (consistent with GFEI in that year). As shown in table 1, for passenger LDVs (cars, minivans and SUVs), a fuel use reduction of roughly 50% per km for new cars appears achievable by 2030. And perhaps two thirds of this could be achieved by 2020. For trucks and two-wheelers, the reductions are smaller, but still quite large. There will be an additional five to 10-year time lag before these improvements are felt, on average, across the entire stock of cars (due to fleet turnover effects).

So far I have focused on low-cost, incremental technologies for saving fuel. But what about revolutionary technologies like electric vehicles – what contribution might they make? Indeed, there is a lot happening around the world these days regarding electric vehicles (EVs), natural gas vehicles, even fuel cell vehicles. All seem promising and may eventually go mainstream (nearly 50,000 EVs were sold in 2011, the most ever). By 2050 such advanced vehicles need to be fully mainstreamed and well on the way to supplanting internal combustion engine vehicles. But in the nearer term, even if sales of these new technology vehicles grow very fast, they won't be able to make much impact on oil use. It is very unlikely they will amount to more than about 2% of the world's vehicles by 2020, and no more than 10% by 2030 (the 'other' category in figure 3). In other words, sales of internal combustion engine vehicles (conventional and hybrids) will likely account for

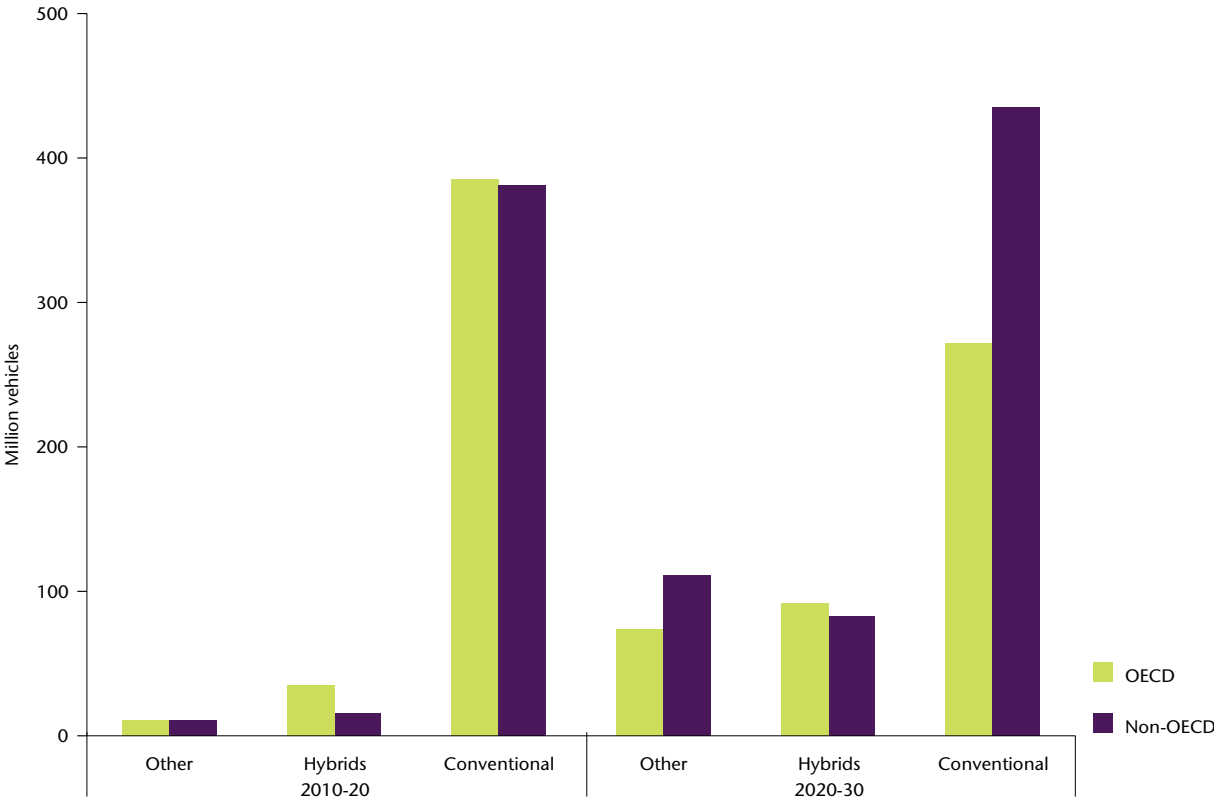
90% or more of all cars sold over the next two decades, regardless of what happens with new fuel technologies and drive-train systems. Thus it remains imperative to improve the efficiency of these conventional vehicles and cut their fuel use, starting now.

Table 1: Fuel economy estimates in 2005 and potential improvements to 2030

	2005	2010	2020	2030	Percent change, 2005–2030
Passenger LDVs	8.1	.6	5.4	4.1	-49%
Light/medium trucks	13.7	13.4	10.7	9.5	-31%
Heavy trucks and buses	39.1	35.9	31.8	27.1	-31%
Motorcycles and scooters	2.8	2.9	2.6	2.3	-18%

Source: IEA[7]

Figure 3: Expected sales of new cars by type, 2010–2030



Source: IEA[8]

Kenya's oil future

In 2010, Kenya had a population of 41 million people, national GDP of about USD 30 billion, and a vehicle stock (cars and trucks) of around 1.2 million.[9] That's only 30 vehicles per 1000 people, far below countries like the UK that have over 500 per 1000. But Kenyans already import about USD 2 billion of oil per year to fuel these cars and trucks).[10] As the population increases (projected by the UN to rise to nearly 100 million by 2050), and incomes increase, the stock of vehicles, their use, and associated oil demand will naturally rise. Using modest growth assumptions, it appears likely that the stock of vehicles will at least triple by 2030 and increase by as much as eight-fold by 2050 to around 10 million (which is still only 100 per 1000 population). With faster economic growth, the vehicle numbers could be much higher.

New cars and light trucks in Kenya currently use about 8 litres/100km of fuel, but the actual fuel economy on road for all cars is certainly worse, probably above 10 litres/100kms. In this growth scenario, if the fuel economy of Kenyan vehicles does not improve, the USD 1.5 billion currently spent on fuel rises to USD 6 billion in 2030 and to USD 20 billion in 2050 (in constant dollars). The total cost to Kenyans between 2010 and 2030 could be close to USD 75 billion.

The effects of such oil costs on the Kenyan economy could be devastating – in fact they could serve to reduce growth and – ironically – preclude a faster economic growth scenario that would show an even greater rise in oil demand and costs. That is why the Kenyan government must take bold policy action now along the lines described below. Each year that goes by without strict government policies to control fuel use increases the risk of an extremely expensive oil-dependent future.

With the support of the GFEI, Kenya has begun to explore steps towards cutting this cost increase by at least a quarter by 2030 and by half by 2050. As mentioned, these savings could be even greater if they were combined with other transport policies, such as shifting vehicles to new fuels, and curbing car travel growth through sensible transport policies.

How do we get there? Policy perspectives

So what must be done to capture all the fuel economy potential? Some countries like Japan, and the EU as a whole, are leading the way. In fact, most OECD countries now have a package of policies in place that appear likely to improve new car fuel economy substantially over the next five to 10 years. Approaches vary, but the basic elements as set out in the IEA's Policy Pathway Report[11] are as follows:

1. Measure vehicles and give consumers the information they need: implement a fuel economy labelling system, based on the tested score of each model available in the market. Provide a way for consumers to see these labels, starting with the requirement that a sticker be displayed on the window of each car in the dealer's show rooms. In addition, put this information on the internet, and advertise its availability. Make brochures available at car dealerships and other locations. Even conducting a national advertising campaign could be cost-effective. If consumers begin to understand the significant differences in fuel economy between vehicles (even vehicles of a similar size and market class), they begin to care and make choices that reflect this understanding. The EU and Japan have proven this fact and now it is time for all Commonwealth nations to learn from their model.

2. Send price signals: the most important price signal that will spur consumers to save fuel is a tax on that fuel. Many countries, including Turkey, Japan

and most European countries, already have fairly high fuel taxes. However many other countries, including some Commonwealth countries, have low taxes or even a negative tax – which amounts to a fuel subsidy (where the retail cost of fuel is kept below the production cost). Low fuel prices send the wrong market signal, suggesting that oil is cheap and abundant, and that there are no side effects to its use. To get consumers to conserve fuel you must facilitate their understanding of its real societal cost. Fuel taxes play a central role in affecting consumers' driving habits and their choice of vehicle. Beyond fuel taxes, other price signals are possible. One that is emerging as very effective is the 'feebate' or 'bonus-malus' system of vehicle purchase tax: scale the vehicle tax to fuel economy, with much higher taxes on 'guzzlers' and low or even negative taxes (rebates) on the most efficient vehicles. Consumers have shown strong responsiveness to such a system in making their vehicle purchase choices.

3. Set fuel economy standards: the most reliable method to improve the fuel economy of new cars is to require that it happens. Most OECD countries now have mandatory fuel economy or CO_2 emission standards, though the form and stringency of these standards varies considerably. (Standards can be based on the rated fuel economy or CO_2 emissions of each vehicle, since these are perfectly correlated for a given fuel type.) As of 2011, the only non-OECD country to adopt standards for LDVs has been China, though India has recently announced its intention to implement standards that will take effect in 2015.[12] Thus apart from India and countries in the EU, no Commonwealth countries have as yet adopted fuel economy (or CO_2 emission) standards.

4. Regulate vehicle imports: many countries, including most Commonwealth countries, import most of their vehicles. These countries are not in a position to regulate vehicle production, but can effectively encourage higher fuel economy by importing more efficient vehicles. Import regulations could involve minimum efficiency standards for all imported cars and trucks, either overall or separately for each vehicle class. Another alternative is a system of import duties that are a function of a vehicle's fuel economy or CO_2 emissions. There is no reason why small countries can't encourage more efficient cars, and fewer guzzlers, to enter their borders.

This list of policies only scratches the surface of policy options open to Commonwealth countries. There are many details that must be considered in setting sound policy that will have to be worked through at the national level. But guides and tools are available to help: the UNEP/GFEI tool kit[13] and the recent IEA Policy Pathway report are both good places to start when thinking through the complex task of developing national fuel economy policies. In fact a key role of GFEI and its partners is to provide support and guidance to governments that are interested in pursuing fuel economy policy development.

Conclusions

Commonwealth countries will purchase millions of cars and trucks in the coming two decades, and will drive these vehicles billions of kilometres. It will take a lot of fuel to power all this mobility, and the cost of that fuel is startling. The right policy choices could cut road transport fuel consumption in half by 2050. Countries have it in their power to cut their fuel bills – and CO_2 emissions – dramatically, by nearly a factor of 2 over the coming decades, through sound fuel economy policies. Good policies can also save their citizens billions of pounds in import costs and slow climate change. But action is needed now. The Global Fuel Economy Initiative and other experts can offer expert advice and guidance, including in-country policy support to help countries make the right choices about their fuel use.

Biography

Lewis Fulton has worked internationally in the field of transport/energy/environment analysis and policy development for over 20 years. He is Co-Director of the NextSTEPS Program within the Institute of Transportation Studies at the University of California, Davis. There he helps lead a range of research activities around new vehicle technologies and new fuels, and how these can gain rapid acceptance in the market.

From 2007 to 2012 he was a Senior Transport Specialist with the International Energy Agency, Paris, as well as acting as Division Head for Energy Technology Policy during 2011–2012. He returned to the IEA in 2007 after working there originally from 1999–2005. During 2006–2007 he worked in Kenya with the UN Environment Program, developing and implementing GEF-funded sustainable transport projects around the world. During the 1990s he also worked at the US Department of Energy for four years, and taught at the Independent University of Bangladesh and the University of Maryland.

His IEA reports include, among many others, *Transport, Energy and CO_2: Moving Toward Sustainability* (2009), *Saving Oil in a Hurry* (2005), *Biofuels for Transport: An International Perspective* (2004), and *Bus Systems for the Future* (2002). He received his PhD in Energy Management and Environmental Policy from the University of Pennsylvania in the United States in 1994.

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4 Eads, G., 2011, *50by50: Prospects and Progress, published by the Global Fuel Economy Initiative*, http://www.globalfueleconomy.org/updates/2011/Pages/50by50isachievablesaysnewreportforGFEI.aspx

5 As described, for example, in http://www.globalfueleconomy.org/Documents/Publications/workplan.pdf

6 International Energy Agency, 2012: *Technology Roadmap: Fuel Economy of Road Vehicles* ©OECD/IEA 2012, Table 7, page 22.

7 International Energy Agency, 2012: *Technology Roadmap: Fuel Economy of Road Vehicles* ©OECD/IEA 2012, Table 3, page 14.

8 International Energy Agency, 2012: *Technology Roadmap: Fuel Economy of Road Vehicles* ©OECD/IEA 2012, Figure 5, page 13.

9 Sources for this section are various: population estimates and projections come from the UN; GDP projections from the World Bank and OECD; vehicle sales and stock estimates from the UN Environment Programme. Projections of fuel consumption, cost and savings are the author's own but are intended to be consistent with other projections, such as IEA projections of new light-duty-vehicle sales in developing countries, adjusting for Kenya's specific growth rates.

10 Kenyan Government, 2011, Statistical Annex to the Budget Speech 2011/2012 http://www.treasury.go.ke/oldwebsite/index.php?option=com_docman&task=cat_view&Itemid=54&gid=88 (with analysis from VBD Automotive technologies estimating the share for road vehicle fuel, which comes to USD 2 billion out of a total USD 2.4 billion of oil imports for all purposes; personal communication from Henry Kamau, VBD.)

11 These policy elements are further described in IEA, 2012, *Policy Pathways: Improving the Fuel Economy of Road Vehicles*, http://www.iea.org/publications/freepublications/publication/name,31268,en.html, as well as various reports available on the websites of GFEI and ICCT, among others.

12 India announced its final rule in May 2012: http://www.dnaindia.com/mumbai/report_cars-must-have-fuel-efficiency-label-from-2013_1702021

13 UN Environment Programme, UN/GFEI Tool Kit: http://www.unep.org/transport/gfei/autotool/index.asp

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Improved fuel economy is essential if we are to address some of the negative implications of this growth, such as pollution, congestion, energy and resource depletion, and environmental damage. The **Global Fuel Economy Initiative** (**www.globalfueleconomy.org**) is a partnership of the International Energy Agency, United Nations Environment Programme, International Transport Forum and FIA Foundation, which works to secure real improvements in fuel economy, and the maximum deployment of existing fuel economy technologies in vehicles across the world. The Initiative promotes these objectives through shared analysis, advocacy, and through the *Cleaner, More Efficient Vehicles Tool* for in-country policy support.

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