Gasoline and diesel will continue to dominate in the future of road transport

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The transport sector — road transport, in particular — accounts for more than half of world oil consumption. In the future, the transport sector’s share of oil consumption will grow even more, primarily due to the increasing use of motor vehicles in developing and emerging countries. Road freight transport will also take on greater significance. And overall, gasoline — and, increasingly, diesel — will continue to dominate the fuel mix. A trend reversal in which road transport moves toward a more intensive use of alternative fuels such as liquefied petroleum gas (LPG) and natural gas, and alternative drive systems such as hybrid cars (HEVs) and battery electric vehicles (BEVs), still cannot be observed — despite government support. Given that gasoline and diesel will also be dominant in the future, additional efforts should be made to reduce CO$_2$ emissions and improve the environmental friendliness of motor vehicle traffic. Given the deleterious environmental effects of diesel fuel, its preferential tax treatment should be abolished.

With a share of roughly 55 percent, the transport sector is the world’s biggest contributor to oil demand. Road transport alone accounts for 40 percent of oil consumption. Demand growth in the transport sector only experienced disruption during the global recession of 2009 — and with roughly 1.8 billion metric tons, the annual demand stood nearly 30 percent higher in 2012 than it did at the beginning of the millennium (Table 1 and Figure 1).

**Worldwide demand for fuel continues to rise**

If the growth of fuel demand is broken down according to global region and individual country, it becomes clear that there is much variation: While demand in the U.S. and a few other OECD countries decreased after 2007 — and, for this reason, stands at roughly the same level today as it did in 2000 — it has risen sharply in the non-OECD countries, especially in the BRIC countries (Brazil, Russia, India, China). The increase in the non-OECD countries amounted to 80 percent, and their share of the total fuel consumption for road transport has now reached 45 percent. By contrast, Europe’s current share in the consumption of global fuel stands at just over 15 percent — and it is decreasing.

If one considers the individual types of fuel, a mixed picture also emerges (Figure 2 to 5): Fuel consumption is dropping in OECD countries, most notably those in Europe. In the rest of the world, it is increasing strongly. Since 2007, diesel consumption has risen only in the non-OECD countries. As a result, the share of diesel in fuel consumption has increased significantly in recent years: It now stands at over 45 percent of total fuel consumption worldwide, and at 70 percent of total fuel consumption in Europe. There has also been a worldwide increase of roughly four percent in the share of

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1 All data on fuel consumption according to region sourced from IEA Oil Information Statistics, which are currently available, broken down by consumption sector, up until 2012. Annual demand including biogenic shares and LPG.
tries, compressed natural gas (CNG) is increasingly being used; its share, however, accounts for less than half a percent of all fuel consumption. Outside the OECD, Iran, Pakistan, Argentina, and India are among the countries with larger fleets of natural gas-powered vehicles.

Various factors are responsible for the increasing regional growth in fuel demand: All regions have seen biofuels. In Europe, this is due to the increased usage of both biodiesel and ethanol. In the U.S. and Brazil, government aid policies have led to ethanol becoming more prevalent.

Although an increasing amount of liquefied petroleum gas (LPG) is being used as fuel in road transport, its world market share remains at just over one percent due to a growing demand for fuel overall. Countries outside the European Union (EU) with above-average LPG consumption in road transport include Japan, Turkey, Russia, and Korea. In the OECD countries, compressed natural gas (CNG) is increasingly being used; its share, however, accounts for less than half a percent of all fuel consumption. Outside the OECD, Iran, Pakistan, Argentina, and India are among the countries with larger fleets of natural gas-powered vehicles.²

Table 1

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel consumption total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>1,369,483</td>
<td>1,548,426</td>
<td>1,725,379</td>
<td>1,788,194</td>
</tr>
<tr>
<td>None-OECD</td>
<td>424,383</td>
<td>530,320</td>
<td>696,908</td>
<td>773,888</td>
</tr>
<tr>
<td>BRIC</td>
<td>161,245</td>
<td>211,361</td>
<td>311,455</td>
<td>352,264</td>
</tr>
<tr>
<td>OECD</td>
<td>945,100</td>
<td>1,018,106</td>
<td>1,028,471</td>
<td>1,014,306</td>
</tr>
<tr>
<td>USA</td>
<td>465,540</td>
<td>505,848</td>
<td>502,730</td>
<td>495,958</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>282,153</td>
<td>299,219</td>
<td>302,035</td>
<td>292,348</td>
</tr>
<tr>
<td><strong>Gasoline incl. Biofuels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>827,015</td>
<td>889,725</td>
<td>955,655</td>
<td>966,255</td>
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<tr>
<td>None-OECD</td>
<td>215,099</td>
<td>263,157</td>
<td>336,528</td>
<td>375,595</td>
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<td>BRIC</td>
<td>81,108</td>
<td>100,984</td>
<td>140,861</td>
<td>161,341</td>
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<td>OECD</td>
<td>611,916</td>
<td>626,568</td>
<td>619,127</td>
<td>590,660</td>
</tr>
<tr>
<td>USA</td>
<td>359,657</td>
<td>382,533</td>
<td>387,559</td>
<td>366,552</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>131,290</td>
<td>113,829</td>
<td>93,748</td>
<td>84,949</td>
</tr>
<tr>
<td><strong>Diesel incl. Biofuel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>529,532</td>
<td>642,557</td>
<td>750,735</td>
<td>801,410</td>
</tr>
<tr>
<td>None-OECD</td>
<td>206,036</td>
<td>264,110</td>
<td>355,809</td>
<td>393,320</td>
</tr>
<tr>
<td>BRIC</td>
<td>79,942</td>
<td>109,281</td>
<td>169,469</td>
<td>189,723</td>
</tr>
<tr>
<td>OECD</td>
<td>321,496</td>
<td>378,447</td>
<td>394,926</td>
<td>408,090</td>
</tr>
<tr>
<td>USA</td>
<td>105,464</td>
<td>122,913</td>
<td>114,808</td>
<td>127,559</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>146,571</td>
<td>180,489</td>
<td>201,755</td>
<td>200,434</td>
</tr>
<tr>
<td><strong>Liquid gas (LPG)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>12,936</td>
<td>16,144</td>
<td>18,989</td>
<td>20,529</td>
</tr>
<tr>
<td>None-OECD</td>
<td>1,248</td>
<td>3,053</td>
<td>4,571</td>
<td>4,973</td>
</tr>
<tr>
<td>BRIC</td>
<td>195</td>
<td>896</td>
<td>1,125</td>
<td>1,200</td>
</tr>
<tr>
<td>OECD</td>
<td>11,688</td>
<td>13,091</td>
<td>14,418</td>
<td>15,556</td>
</tr>
<tr>
<td>USA</td>
<td>419</td>
<td>402</td>
<td>363</td>
<td>1,847</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>4,292</td>
<td>4,901</td>
<td>6,532</td>
<td>6,965</td>
</tr>
</tbody>
</table>

For information only:

| Natural gas (CNG) (TJ)          |      |      |      |      |
| World                           | 140,325 | 467,689 | 1,273,369 | 1,549,486 |
| None-OECD                      | 105,002 | 396,177 | 1,134,038 | 1,394,656 |
| BRIC                            | 25,703  | 169,906 | 480,247  | 646,192  |
| OECD                            | 35,323  | 71,512  | 139,331  | 154,830  |
| USA                             | 11,730  | 24,845  | 30,939   | 32,505   |
| OECD Europe                     | 16,785  | 26,057  | 55,191   | 62,294   |

Quelle: OECD.

<table>
<thead>
<tr>
<th>Worldwide fuel consumption¹ in road traffic</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shares in percent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD without Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BRIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remaining World</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Gasoline, diesel, LPG, incl. Biofuels.

Source: OECD.

The share of the BRIC countries is growing.

Figure 1

Gasoline consumption¹ in road traffic

In million tons

<table>
<thead>
<tr>
<th>World</th>
<th>OECD Total</th>
<th>OECD Europe</th>
<th>BRIC</th>
<th>Remaining World</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,000</td>
<td>800</td>
<td>600</td>
<td>400</td>
</tr>
<tr>
<td>2002</td>
<td>880</td>
<td>680</td>
<td>480</td>
<td>280</td>
</tr>
<tr>
<td>2004</td>
<td>800</td>
<td>600</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>2006</td>
<td>720</td>
<td>520</td>
<td>320</td>
<td>120</td>
</tr>
<tr>
<td>2008</td>
<td>640</td>
<td>440</td>
<td>240</td>
<td>80</td>
</tr>
<tr>
<td>2010</td>
<td>560</td>
<td>360</td>
<td>160</td>
<td>40</td>
</tr>
<tr>
<td>2012</td>
<td>480</td>
<td>280</td>
<td>120</td>
<td>40</td>
</tr>
</tbody>
</table>

¹ Including biofuels.

Source: OECD.

In Europe gasoline consumption is declining.
are being used worldwide. Furthermore, passenger cars—especially in Western Europe—are equipped with diesel engines. For this reason, diesel fuel remains dominant in the expanding road freight transport, in all regions of the world. But due to the growth in the non-OECD countries, the demand for gasoline will also continue to grow.

Oil-based fuels will also continue to play a dominant role in the medium- and long-term due to their availability and the slow expansion of alternative fuels. According to current forecasts, global oil consumption will continue to grow, especially in the transport sector, despite the existence of more efficient internal combustion engines and a higher prevalence of alternative fuels. It is expected that transportation’s share in oil demand will rise from currently just under 55 percent to 64 percent by 2040—in addition to air transport, road freight transport, for which diesel is predominantly used. In the non-OECD countries—including the large BRIC countries—the number of cars and thus the total road traffic is also increasing. However, in many OECD countries the demand for passenger transport is stagnating—and in some OECD countries, it is actually declining. In addition to this, more efficient engines that consume less fuel are being used worldwide.

For world road traffic the use of diesel fuel is increasing.

Oil-based fuels will also continue to play a dominant role in the medium- and long-term due to their availability and the slow expansion of alternative fuels. According to current forecasts, global oil consumption will continue to grow, especially in the transport sector, despite the existence of more efficient internal combustion engines and a higher prevalence of alternative fuels. It is expected that transportation’s share in oil demand will rise from currently just under 55 percent to 64 percent by 2040—in addition to air transport, road

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4 For example, in the U.S.—which accounts for nearly 30 percent of the consumption—the declining fuel sales over the past few years are mainly due to the decreasing transport demand and, to a lesser extent, to more efficient vehicles as well. See: EOP (2015) “Explaining the US Petroleum Consumption Surprise.”

5 This is also a major reason for the predicted production increases. In accordance with the Current Policy Scenario of the IEA and the reference scenario of the EIA, the production of conventional and alternative crude oil will increase in the long term: Under this scenario, it will increase from 87 million barrels per day in 2013 to 113 million barrels per day in 2040. See: International Energy Agency, 2014 World Energy Outlook 2014, Paris, US Energy Information Administration, 2014 International Energy Outlook 2014, Washington D.C. Conventional crude oil (including the LPG derived from oil and natural gas production) and unconventional oil (including tight oil or shale oil, among others), but not biofuels etc.
In Europe, however, oil consumption in the transport sector will definitely decrease. But even here, gasoline and diesel will dominate the fuel mix in the long-term.

**Europe: The promotion of alternative fuels has little effect on the fuel mix**

In 2012, vehicles in European road transport consumed 85 million tons of gasoline and 200 million tons of diesel—that is, road transport accounted for over 97 percent of Europe's total fuel demand. The prevalence of other fossil fuels has increased steadily: LPG’s share in fuel consumption reached 2.5 percent, and natural gas’s share reached 0.5 percent. Hydrogen and electricity usage in road transport are so minor that they play no significant role as energy sources (Figure 6).

The use of biofuels has been increasing from 2006 onward, but since 2010, the increase has been less dynamic. Contributing to this change was a reduction of the tax benefits. As well, there was uncertainty about how, among other things, the reduction of greenhouse gases will be credited in the future within the EU.\(^7\) In 2012, the energy contribution of biofuels stood at three percent for gasoline, and at just under six percent for diesel. If one uses the sustainability criteria of the 2009 Renewable Energy Directive as a basis, the share of biofuels for the EU decreases from 5.9 percent to 5.1 percent.\(^8\) To date, the increases are not sufficient to reach the EU’s 2020 target of ten percent.\(^9\)

In the past, many European countries have introduced measures to promote alternative fuels. Such measures include not only various forms of tax incentives, including tax reductions for certain drive systems or for alternative fuels (Table 2), but also regulatory measures (production standards, emission regulations) as well as other, more unconventional incentives (allowing vehicles with alternative engines the use of bus lanes, or free parking). Nevertheless, alternative fuels such as LPG and CNG and the vehicles that run on them have experienced only moderate success in European markets (Figure 7). However, the share of LPG in transportation fuel has increased significantly.

**Figure 6**

**Europe: fuel consumption in road traffic**

By fuel type, in percent

![Graph showing fuel consumption in Europe by fuel type (2000-2012)](image)

1. EU Countries (EU15 + CZ EE HU PL SK SI) + CH NO IS.

*Source: OEC. © DIW Berlin 2015*

**Table 2**

<table>
<thead>
<tr>
<th>Year</th>
<th>Tax Reductions for Alternative Fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$100 million</td>
</tr>
<tr>
<td>2007</td>
<td>$120 million</td>
</tr>
<tr>
<td>2008</td>
<td>$140 million</td>
</tr>
<tr>
<td>2009</td>
<td>$160 million</td>
</tr>
</tbody>
</table>

**Figure 7**

**Europe: new registrations of cars, share of vehicle technologies**

In percent

![Graph showing new registrations of cars by technology type (2001-2013)](image)

*Sources: ICCT International Council on Clean Transportation; Calculation by DIW Berlin. © DIW Berlin 2015*

Cars with alternative drive systems still have a low share in total new registrations.

transport in particular will increase.\(^6\) This is primarily due to the increased use of motor vehicles—for freight traffic, as well—in emerging and developing countries.

6. In the New Policies Scenario of the IEA, in which the oil production rises considerably less, transport’s share in the oil demand will also reach nearly 62 percent by 2040. Unlike the Current Policy Scenario, which is based on energy policies that are currently being pursued and measures that have already adopted, the New Policies Scenario also takes into account planned projects, especially those in support of renewable energies.

7. Consumption figures, including biofuels.


0.4 percent of new registrations in the EU are assigned to electric-powered vehicles (including PHEVs). Major differences, however, exist from country to country: In 2013, electric cars accounted for more than 5 percent of registrations in the Netherlands, where they were given substantial tax breaks. In Germany around the same time, they accounted for only 0.3 percent. The country with Europe’s largest share of new electric car registrations is Norway, with almost six percent — thanks to massive government aid.

The prevalence of electric cars in most European countries also remains low; for the most part, statistics also include the plug-in hybrids (PHEVs), whose actual electric usage is unknown (Box). At the moment, around

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13 Japan has the highest share worldwide, with a quarter of all new registrations.

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In the EU, the prevalence of alternative fuels and drive systems is still minor.\textsuperscript{14} For the prospects of energy sources in the medium-term, the technical design of the existing vehicle stock and new vehicles is crucial. Against this background, the European Union issued guidelines in fall 2014 for the development of infrastructure for alternative fuels.\textsuperscript{15} The use of such fuels—including, according to the guidelines, electricity, biofuels, LPG, LNG, CNG, and hydrogen—is hindered, as the EU sees it, by the high cost of the vehicles, low consumer acceptance, small number of charging stations, and low density of alternative-fuel filling stations. As a result, the directive defines minimum requirements for the establishment of infrastructure for alternative fuels: By the end of 2020, the member states are required to have built a sufficient number of publicly accessible charging points for electric cars (meaning one charging point for every ten vehicles, at least in densely populated areas) and a sufficient density of filling stations (one every 150 kilometers, on average, for natural gas). Furthermore, the infrastructure for alternative fuels in the EU should be harmonized in the coming years (for example, through minimum technical specifications for charging points and CNG filling stations). EU member states are also required to submit, by the end of 2016, a national policy framework for the expansion of alterna-

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\textsuperscript{14} Objectives to spread the use of less-polluting fuels and vehicles can be found in European Commission (2011) COM (2011) 144, final. For a current summary of the objectives, see EEA (2014).\textsuperscript{14}


FUELS AND VEHICLE TECHNOLOGIES

In the assessment of fuel demand, fuels are differentiated according to type. The fossil fuels, gas and diesel, are labeled “conventional.” Non-conventional fuels include:

- Liquefied petroleum gas (also called LPG, fossil origin)
- Natural gas (compressed natural gas, fossil origin)
- Electric current
- Hydrogen

A distinction must be made for alternative fuels such as biodiesel and bioethanol, as well as future synthetic biofuels of the so-called “second generation,” which are mainly used as an admixture in conventional fuels.

For all fuels, various production pathways that are connected with specific efficiencies and environmental effects are possible. For example, these fuels (excluding LPG) can be produced using electricity.

In the standard approach, the analysis of the entire production chain of fuels for use in vehicles (Well-to-wheels Analysis) is restricted to the required energy consumption and greenhouse gas emissions, although other effects arise. In the case of conventional pathways (for example, the combustion of gasoline in an Otto engine), about 15 percent of the total energy is already required before use in vehicles. In non-conventional pathways, the upstream energy demand is even higher and even off-balance effects are critically assessed.

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\textsuperscript{2} ICCT (2014) a. a. O.
tive fuels and the corresponding necessary infrastruc-
ture. Still not much is known about it, and a coordina-
tion of policies among neighboring countries will not
take place before 2017. Some countries have submitted
somewhat ambitious targets for the number of electric
cars they expect to have registered by 2020. If these fig-
ures are examined in relation to the EU proposals, it ap-
ppears that the infrastructure in most countries would
have to be significantly expanded.

It is questionable whether such measures introduced
at the European level can help increase the use of al-
ternative drive systems, and thus of alternative fuels,
in the EU. It certainly helps that technical standards
for charging and gas stations will be harmonized and
usage information will have to be standardized, for in-
stance when it comes to comparable price information
of different fuels. But infrastructure can only operate
economically if the demand is high enough. It is unlike-
ly to succeed if the policy promotes multiple competing
alternative energy sources at once. But if the focus were
to be on only one alternative fuel in a regionally limited
manner, there would in turn be fears that the market
that arises for such vehicles would not be large enough
to offer potential suppliers sufficient incentives for in-
vestment in new vehicle technologies.

At the moment, the diesel engine is still dominant in
Europe. In 2013, 53 percent of newly registered cars were
diesel-powered, with particularly high proportions in
Spain, France, and Belgium (with roughly two-thirds).26
Diesel fuel combustion’s impacts on air quality have
reached a critical level across Europe: The monitoring
of air quality in urban areas of the EU reveals consider-
able violations of the legal health-protection safety lim-
its of particle concentrations and nitrogen oxides, which
are at the same time precursors of ozone formation and
can essentially be traced back to the emissions of die-
sel-powered vehicles.27

According the European Commission’s forecasts, oil-
based fuels, with a share of over 80 percent, will still
be the predominant energy source for passenger trans-
port in 2050.28 Because conventional fuels will con-
tinue to dominate, it will become even more important to
reduce their environmental impact. At the EU level, the
existing fuel quality directive regulates the legally per-
mitted environmentally hazardous fuel components,
such as benzene and sulfur.29 Suppliers will thereby be
required, among other things, to reduce the lifecycle
GHG intensity of mineral fuels — i.e. emissions that
stem from the vehicle production process — by six per-
cent by 2020 over the base year of 2010. In order to cre-
ate incentives for reducing emissions, those reductions
that are achieved by a decrease in flaring and venting
at the production site, among other things, will be fac-
tored into the emissions calculations. Differentiating
greenhouse gas emissions according to their raw mate-
rial source (such as conventional crude oil, oil shale, or
tar sands) has also been proposed. However, the calcu-
lation procedure adopted by the EU in the spring of 2015
does not adequately take into account the very different
GHG intensities of the various raw material sources.20

**Germany: Diesel will soon surpass gasoline for automobiles as well**

Despite an increase in the number of motor vehicles (by
16 percent) and increasing demand for transport — the
mileage increased by nine percent — the total fuel con-
sumption of German automobiles has decreased slight-
ly since the turn of the millennium (by 4 percent).31 For
commercial freight vehicles, significantly greater mile-
ages in conjunction with decreasing specific diesel con-
sumption led to an almost unchanged demand for fuel (Table 3). Meanwhile, however, diesel is used just as of-
ten in passenger car traffic. Here, the number of vehi-
cles, mileage, and fuel consumption have more than
doubled since 2000 — with hardly any reduction in av-
verage consumption (Table 4). The number of gasoline-
powered cars, in contrast, has fallen. As a consequence,
their total mileage also declined (by a quarter), as did
diesel’s fuel consumption (by a third). In 2013, the demand
for conventional fuels in Germany amounted to approxi-
mately 66 billion liters, 60 percent of which were diesel.

After reaching a maximum of 7.4 percent in 2007, the
biogenic share (biodiesel, vegetable oil, bioethanol, bioma-
thane) of all fuel stood at 5.2 percent in 2013.32 Despite
the significant sales slump, biodiesel remains nearly
three times as prevalent from an energy perspective as
bioethanol (E10), which has great difficulty maintain-
ing its place on the market. Despite significant tax ben-
efits, natural gas and LPG so far cover only 1.5 percent of

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calculation methods and reporting obligations under Directive 98/70/EC of
the European Parliament and of the Council on the quality of gasoline and
diesel fuels (EU).

21 Between 2000 and the end of 2013. Inventory adjusted for methodologi-
cal differences, fuel consumption, and mileage according to national concept.
See Tables 3 and 4.

in Figures 2013.
the energy needs of road transport. At the same time, the government promotes the consumption of diesel through an energy tax rate that is 40 percent lower compared to that of gasoline (Figure 8).

Although the annual registration figures for motor vehicles with alternative drive systems have increased in recent years by more than 50,000, with a total of 745,000 they only make up 1.5 percent of all vehicles registered in Germany.41

For Germany, no measures can be found in either the „Action Programme for Climate Protection 2020“ or in the „Mobility and Fuel Strategy“ — which was conceived as an implementation tool — that could trigger a growing trend away from conventional fuels. Consequently, no additional stimuli are expected beyond the technological trends and regulatory frameworks (particularly EU regulations limiting CO₂ emissions from motor vehicles) that are already in effect. Thus fossil fuels will continue to dominate in various scenarios until 2030 in transport; even in 2050, according to most model calculations, they will cover over half of transportation’s final energy consumption. Among the oil-based fuels, the share of diesel will increase and the share of gasoline will decrease.

It is not only the technological advantages (such as the high energy density of gasoline and diesel) and path dependencies (including existing filling station infrastructure) that play a role in the persisting dominance of conventional energies: As well, the availability of less polluting alternatives is limited in Germany. Analyses of

27 F. Dünnebeil, U. Lambrecht (IFEU), M. Goletz (DLR), W. Zittel, P. Schmidt (LBST), F. Mülller-Langer, K. Naumann (DBFZ) (2013), Analyse aktueller Szenarien zur Entwicklung des Verkehrs in Deutschland und dessen Umweltwirkungen, Kurzstudie im Rahmen der wissenschaftlichen Begleitung, Unterstützung und Beratung des BMVBS in den Bereichen Verkehr und Umweltwirkungen, DIE ZITAT.
the technical and economic conditions of different energy sources anticipate, in the medium-term, a greater potential in the production of various synthetic gases from renewable electricity; these synthetic gases could be made available in the already existing LNG and CNG networks (Power to Gas).\textsuperscript{28}

\section*{Conclusion}

In Europe and in Germany, gasoline and diesel will remain by far the most significant fuels in road transport. Alternative concepts, such as battery-electric or fuel cell drive systems, will continue to play a secondary role—despite government support. The scarcity of refueling infrastructure and low consumer acceptance continue to hamper a faster expansion of alternative fuels and drive systems. Given an expected increase in transport demand, particularly in the case of freight, the focus should be on—in addition to the promotion of alternatives—how to use fossil fuels more efficiently while producing fewer emissions. Contributing to this is the EU regulation that aims to reduce the specific consumption of the vehicles—in the future, with light and heavy commercial vehicles as well. The policy should concomitantly increase the energy taxes on fuels. At present, incentives to buy vehicles with alternative drive systems are low due to the nominally unchanged energy tax rates and the low oil prices.

In particular, the preferential tax treatment given to diesel fuel should be abolished: The specific consumption and low fuel costs create incentives for high mileages. In addition, these cost structures contribute to the continuing rise in the spread of diesel vehicles—even though diesel emissions have far more adverse health effects than the emissions from other fuels.\textsuperscript{29}

\begin{table}[h]
\centering
\small
\begin{tabular}{lcccc}
\hline
\hline
\textbf{Diesel consumption total} & Mill. l & 9,395 & 13,792 & 17,092 & 19,354 \\
\textbf{thereof:} & & & & & \\
\textbf{Cars} & & & & & \\
\textbf{Vehicles} & 1,000 & 5,961 & 9,593 & 11,267 & 13,215 \\
\textbf{Average mileage} & 1,000 km & 19.6 & 19.5 & 21.1 & 20.5 \\
\textbf{Total mileage} & Mill. km & 116,612 & 186,721 & 237,700 & 271,143 \\
\textbf{Average fuel consumption/100 km} & Liter & 6.0 & 6.8 & 6.8 & 6.8 \\
\textbf{Total fuel consumption} & Mill. l & 8,260 & 12,740 & 16,149 & 18,439 \\
\textbf{Buses} & & & & & \\
\textbf{Vehicles} & 1,000 & 85 & 84 & 75 & 75 \\
\textbf{Average mileage} & 1,000 km & 43.8 & 41.6 & 43.5 & 42.1 \\
\textbf{Total mileage} & Mill. km & 3,736 & 3,500 & 3,252 & 3,157 \\
\textbf{Average fuel consumption/100 km} & Liter & 30.4 & 30.1 & 29.0 & 29.0 \\
\textbf{Total fuel consumption} & Mill. l & 1,136 & 1,052 & 943 & 916 \\
\textbf{Vehicles with gasoline engine} & & & & & \\
\textbf{Gasoline consumption total} & Mill. l & 38,818 & 33,217 & 28,359 & 26,406 \\
\textbf{thereof:} & & & & & \\
\textbf{Cars} & & & & & \\
\textbf{Vehicles} & 1,000 & 36,879 & 36,076 & 30,545 & 30,056 \\
\textbf{Average mileage} & 1,000 km & 12.0 & 10.9 & 11.4 & 11.0 \\
\textbf{Total mileage} & Mill. km & 442,855 & 391,443 & 349,416 & 329,927 \\
\textbf{Average fuel consumption/100 km} & Liter & 8.6 & 8.3 & 7.9 & 7.8 \\
\textbf{Total fuel consumption} & Mill. l & 38,129 & 32,520 & 27,724 & 25,738 \\
\hline
\end{tabular}
\caption{Germany: road freight transport – vehicles, mileage, fuel consumption}
\end{table}

Higher environmental standards are necessary, not only in the vehicles’ fuel consumption, but also in the upstream supply chain. At this juncture, however, the EU Commission recently wasted an opportunity by not sufficiently taking into account the greenhouse gas intensities of the different natural resources in its fuel quality directive.


\textsuperscript{29} ICCT (2014) Real-World Exhaust Emissions from Modern Diesel Cars.

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