



Automotive Fuel Economy in Ukraine: Baseline Analysis & Report



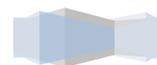
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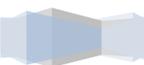
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Acronyms and Abbreviations

GFEI	Global Fuel Economy Initiative
BAR	Baseline Analysis & Report
LDV	Light-duty vehicle
EU	European Union
UN Environment	United Nations Environment Programme
ISA	International Standardization Academy
IEA	International Energy Agency
ITF	International Transport Forum
ICCT	International Council on Clean Transportation
ITS UC Davis	Institute of Transportation Studies at University of California at Davis
FIA	FIA Foundation
GEF	Global Environment Facility
lge	Liter per Gasoline Equivalent
OECD	Organisation for Economic Co-operation and Development (Australia, Canada, Chile, Japan, Korea, Mexico, Turkey and United States)



ACKNOWLEDGEMENTS

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- **Oleg Tsilvik** – International Standardization Academy
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This report is aimed at facilitating the development of sustainable recommendations for a national auto fuel economy policy that will further contribute to developing Ukraine’s agenda for a cleaner, more efficient LDV fleet, as well as providing cleaner air and lower greenhouse gas emissions.

The National Working Group (NWG) members, representing various stakeholders of Ukraine, supervised the implementation of the project, enabling ISA to consider the views and opinions of all interested parties and construct its GFEI in Ukraine activity on this accumulative expertise platform. See Annex 1 for the list of NWG stakeholders’ composition.

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1. SUMMARY

The Global Fuel Economy Initiative was launched in 2009 by UN Environment in partnership with the IEA, ITF, ICCT, UC Davis and FIA Foundation. The GFEI exists to promote the potential of a substantial and attainable improvement in vehicle fuel economy, as a contribution to the global debates on problems of climate change, energy security and sustainable mobility. By introducing policies to improve fuel economy, such as emissions standards, fiscal incentives and labelling, national governments can significantly reduce the amount of fuel used by vehicles in their country, saving money and cutting carbon dioxide emissions.

Global Fuel Economy Initiative

Core partners



Supported



GLOBAL ENVIRONMENT FACILITY

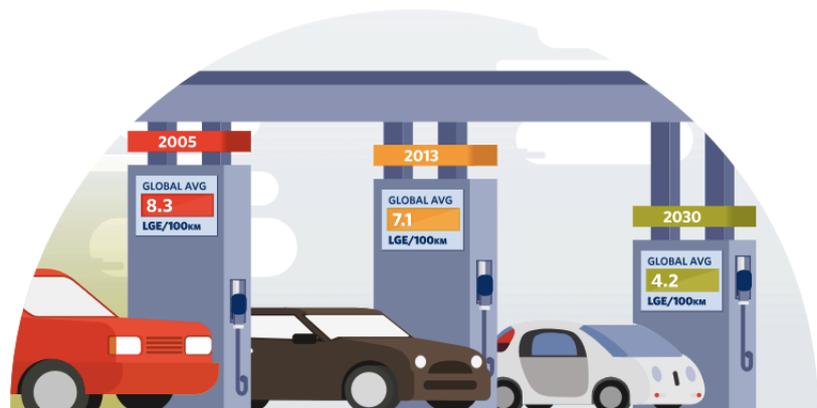
The GFEI targets a 50% reduction in the average fuel consumption (lge/100 km) of all on-road/stock light duty vehicles in use by 2050, compared to a 2005 baseline. To achieve this, all new cars and vans sold must reach this target by 2030.

THE GLOBAL GOALS: FUEL ECONOMY



DOUBLE AVERAGE FUEL ECONOMY

OF NEW CARS BY 2030
AND ALL CARS BY 2050



Source: globalfueleconomy.org

Doubling the fuel economy of the global vehicle fleet would provide significant climate benefits, as it would reduce emissions of CO₂ by about 1.5 Gt/year by 2050. The GFEI target implementation would also result in savings in annual oil import bills of USD \$400 million/year in 2050, and a net saving of USD \$8 trillion between 2010 and 2050. Such savings could help fund sustainable transport including a transition to electric vehicles.

More fuel-efficient vehicles would consume less oil (saves 54 billion barrels by 2050) and reduce CO₂ emissions (33 Gt in total by 2050) globally. The 33Gt of CO₂ that could be saved between

2015 and 2050 are roughly the equivalent of closing 300 coal power stations over the same time period.

EQUIVALENT OF CLOSING 300 POWER STATIONS

The **33gt** of CO₂ that could be saved between 2015 and 2050 is roughly the equivalent of closing **300** coal power stations over the same time period.



Source: globalfueleconomy.org

Achieving the GFEI target is estimated to account for almost one third of the CO₂ reductions necessary to switch individual motorized passenger transport from a 6 degree Celsius (6DS) to a 2DS emission trajectory, according to the International Energy Agency.

The GFEI exists to promote the potential of a substantial and attainable improvement in vehicle fuel economy, as a contribution to the global debates on problems of climate change, energy security and sustainable mobility. By introducing policies to improve fuel economy, such as emissions standards, fiscal incentives and labelling, national governments can significantly reduce the amount of fuel used by vehicles in their country, saving money and cutting carbon dioxide emissions.

The aim of GFEI support in Ukraine, through ISA, was to build the foundation for and promote an improved automotive fuel economy policy package and incentive mechanisms in Ukraine for improvements in energy efficiency as well as lower emissions from the transport sector.

This work comes at a very relevant time for Ukraine, when the car market is recovering after a deep and lingering economic crisis. Moreover, within the framework of the Association Agreement with the European Union, Ukraine committed to improve and develop a national policy on the regulation of CO₂ emissions and energy consumption for road transport. In particular, the EU's provisions on energy efficiency regarding road transport should be reflected in Ukraine's legislation within 5 years, and implemented within 8 years, from the date of entry into force of the Agreement (2014). This is a good opportunity to apply the best world practices and policy options that have proven themselves in other countries.

The level of motorization in Ukraine in 2016 amounted to 202 vehicles per 1,000 inhabitants, which is very low in comparison to other neighbor countries, for example: Russian Federation – 283 (2014), Latvia – 290 (2014), Hungary – 325 (2015), Lithuania – 431 (2015), Poland – 546 (2015), Germany – 548 (2015), Italy – 610 (2014).

At present, the on-road automobile transport system of Ukraine accounts for more than 9.2 million vehicles, with 6.9 million LDVs (statistics of the Ministry of Infrastructure of Ukraine). However, it is reasonable to assume that the real level of vehicles on the road in Ukraine would be hard to calculate due to various factors, including flaws in the official registration system to

account for obsolete/scrapped vehicles and the absence of a mandatory technical inspection system. The lack of a formal scrappage system also means that many obsolete cars are still present in the vehicle stock.

The current vehicle fleet in Ukraine is aged and needs upgrading – the average vehicle age in 2015 was 18.8 years. As Ukraine recovers economically, this creates the potential for an increasing demand for cars. This is, in turn, an opportunity to ensure that the technology brought in through new vehicle purchases is the best available, the most fuel efficient and the cleanest in terms of criteria emissions.

Ukraine currently enforces strict emission standards on the import of used vehicles. As of January 2016, only Euro 5 LDVs are permitted for import; Euro 6 was planned for January 1, 2018, but the Ukrainian Parliament has postponed the implementation for two years until 2020.

The imposed Euro 5 standard, in combination with high customs duties for older vehicles, triggered an unpleasant trend for permanent circulation of “temporary” foreign registrations of vehicles, which tend to be above 15 years old and in disrepair, unfortunately, most notably also with a diesel engine. According to the State Fiscal Service of Ukraine, as of January 2018, almost 425400 LDVs with foreign registration are driving within the territory of Ukraine. This, notwithstanding, represents over 6% of the total LDV fleet and is currently a major headache for the regulators.

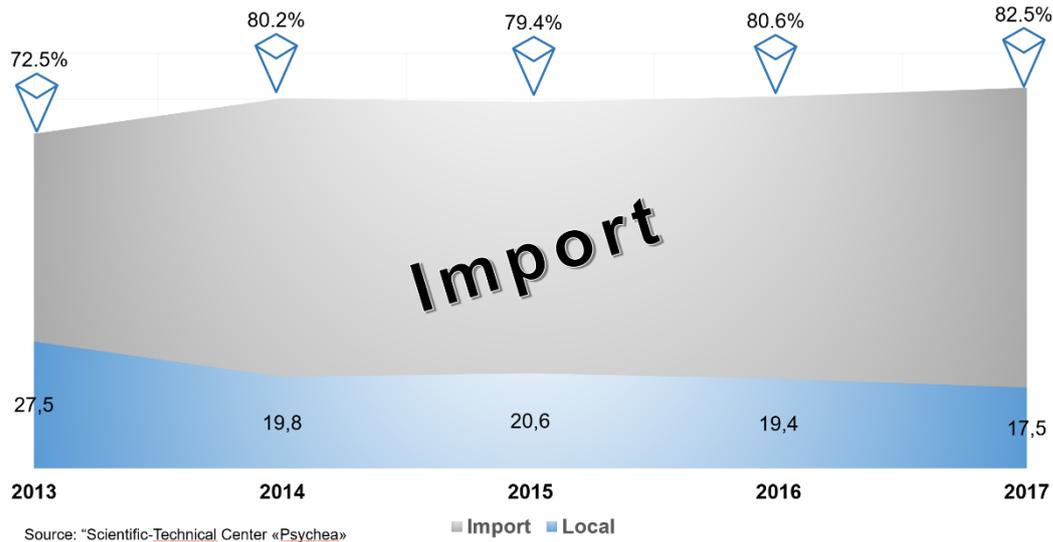
At the same time, Ukraine has shown an impressive progress in terms of “cleaning” its fuel market and raising the allowable fuel quality. Back in 2013, the Cabinet of Ministers of Ukraine has ratified a Technical Regulation "On the requirements for automotive gasoline, diesel, marine and boiler fuels" (<http://zakon3.rada.gov.ua/laws/show/927-2013-%D0%BF>), thus setting Ukraine on a sustainable course of gradual adaptation of environmentally concerned Euro standards for its fuel market.

As per the outlined roadmap, on January 1st 2018, Ukraine has implemented an environmental “EURO-5” standard or a 10 ppm sulfur in diesel and petrol fuel quality to operate on the market.

Today, the fuel market in Ukraine is characterized by a strong dependence on fuel imports – both refined and crude. Nearly 80% of fuels for the needs of the economy are imported to Ukraine. In 2017, oil products ranked first place in Ukraine's imports and the State spent more than \$ 4.1 billion on the purchase of imported fuels. In addition, more than 440 million dollars was spent on the purchase of crude oil for domestic refineries. Given that the consolidated national budget of Ukraine in 2017 was \$30 billion - the expenditure on fuel imports comes to about 15%, which makes this is a heavy burden on the national economy.



Strong dependence on imported fuel products



Ukraine's current fiscal measures are not directed at stimulating cleaner, more efficient vehicle purchases. However, the continuous move towards the EU integration process, complying with the requirements and obligations within the Association Agreement and the Paris Climate Agreement along the way – is moving Ukraine to a new level, when it comes to on-road transport emissions.

As a supporting credible mechanism for Ukraine's sustainable development, the Cabinet of Ministers in May of 2018 has adopted a National Transportation Strategy outlining the strategic development of the relevant industries till 2030, with its core mission of further global economic integration and technological infrastructural advancements. The principle developments are to take place in digital infrastructure, transport safety, automated vehicles, transport corridors and a single transport/infrastructure network with the European Union.

This Strategy also sets the foundation for the use of energy efficient and environmental vehicles, the use of alternative fuels, "green" transport, priority for the needs of environmental protection and conservation of valuable protected areas during the development of transport infrastructure.

This Baseline Analysis & Report (BAR) has been developed by ISA using international experience and cooperation, the GFEI toolkit and methodology (available from https://www.globalfueleconomy.org/transport/gfei/autotool/understanding_the_problem/benefitsofation.asp) for the national auto fuel economy baseline development.

Collecting and analyzing data on LDV registration provides the foundation for all ensuing policy measures, including fiscal incentives. This baseline report provides a transparent methodological assessment of the light-duty vehicle (LDV) fleet in Ukraine (based on data from the years 2005, 2008, 2010, 2012, 2014 and 2016) and is intended to inform policymakers and stakeholders in Ukraine, as well as international expert community, about the state of fuel economy in Ukraine, its potential emissions reductions and fuel savings that could be achieved with the adoption of recommendations provided here.

It is important that Ukraine builds on the outcomes of this baseline analysis and data experience and improves its fuel economy policy, as well as overall transport-related emissions performance of its LDV fleet.

The major findings from the 6 years of data and the 1.6 million vehicle registrations that ISA have analyzed are:

- Auto fuel economy improved from 9.8 lge/100km in 2005 to 6.2 lge/100km in 2016, a 36% improvement;
- Rapid growth in sales of EVs, as of 2016 - 1.5% of the new vehicles sold in Ukraine are EVs;
- There is a growing preference for diesel vehicles, 10% in 2005 to around 49% in 2016;
- Used vehicles still take a big part of new registrations, which keeps the average vehicles stock age as of 2015 at 18.8 years.

For updates and more information on auto fuel economy developments in Ukraine, please visit: <HTTPS://WWW.FACEBOOK.COM/GFEIUKRAINE> and <HTTP://WWW.STANDARDACADEMY.ORG>

2. Baseline development. GFEI Methodology

▪ Data Collection

The ultimate aim of the GFEI Ukraine national baseline development study is to obtain information on the weighted average fuel economy of newly registered cars in a country. The GFEI baseline methodology requires a number of basic data points for each vehicle, which is used to calculate the average weighted fuel economy for newly registered LDVs for each year in the study:

- Vehicle make & model (e.g. Volvo V50)
- Model production year (e.g. 2014)
- Engine displacement (e.g. 1,800 cc or 1.8 l)
- Fuel type (e.g. gasoline, diesel, LPG, CNG, electricity)
- Respective test cycle basis (NEDC, in case of Ukraine)
- Rated fuel economy (lge/100km) or specific carbon emissions per km (gCO₂/km)

The fuel economy baseline includes only LDVs, which are registered for the first time in a given year (new, as well as used imported cars).

In Ukraine, the Ministry of Interior (subordinated state enterprise “Main Service Center”) solely operates the national vehicle registration database (entitled AIS “National database “Automobile”). To form a picture of the LDV fleet and the corresponding trends in auto fuel economy, ISA collaborated with the Main Service Center to gather and analyze new vehicle registration data (above) for the years 2005, 2008, 2010, 2012, 2014 and 2016.



National baseline development

Stage 1. Data gathering

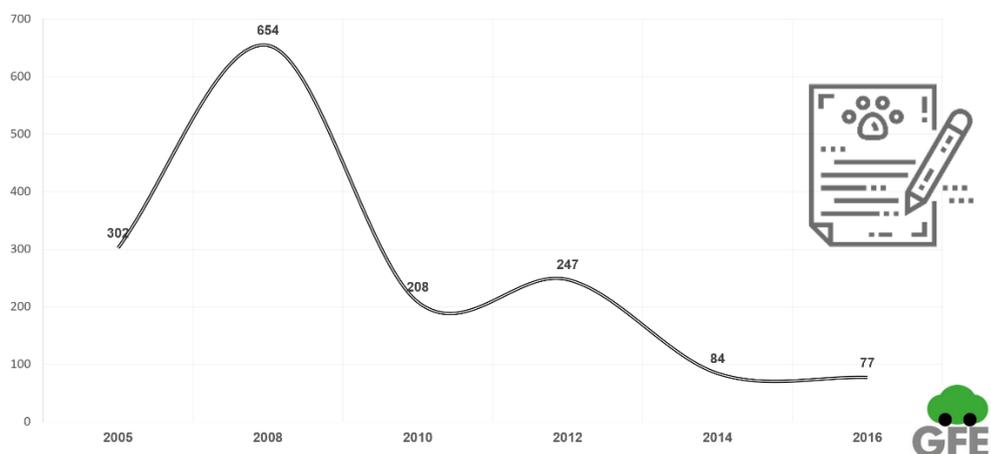
Source of information
Ministry of Interior of Ukraine



This dataset was used for baseline development and covered 1.6 million vehicle registrations over the 6 years.

National baseline development – first results

First registrations of LDVs in Ukraine (thousands)



The data acquired was restructured and “cleaned” of HDV and other vehicles outside of the needed LDV category. After this stage, the database accounted for 1,572,000 newly registered LDVs for GFEI’s further use in global comparisons.

National baseline development

Stage 2. Cleaning data, structuring and verification of national data based on GFEI methodology

№	Дата реєстрації	Операція	Марка та модель ТЗ	Тип ТЗ за конструкцією	Номер кузова	Номер шасі	V двигуна	Вид палива	Рівень викидів CO2	Маса без навант.	Повна маса (кг)
16	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	HONDA/DAI SANITA GE	ЛЕГКОВИЙ			2359	Бензин	2013	1895	2350
17	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	SEVEL/ ENKALAND	ЛЕГКОВИЙ			1498	Бензин	2013	1000	1500
18	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	ENKALAND	ЛЕГКОВИЙ			1792	Бензин	2013	1355	1600
19	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	DAI SEN	ЛЕГКОВИЙ			1299	Бензин	2013	1070	1400
20	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	SEVEL/ SK	ЛЕГКОВИЙ			1408	Бензин	2013	1050	1460
21	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	SEVEL/ TIGGO	ЛЕГКОВИЙ			1845	Бензин	2013	1465	1765
22	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	TA BUNO	ЛЕГКОВИЙ			1599	Бензин	2013	1194	1595
23	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	ПРОТРАБЕ	ЛЕГКОВИЙ			1685	ДІЗЕЛЬНЕ ПАЛИВО	2013	1455	1940
24	03.01.2014	SO - ПЕРВИННА РЕЄСТРАЦІЯ ТЗ ДЛЯ ІНДИВІДУАЛІВ	ACCENT	ЛЕГКОВИЙ			1396	Бензин	2013	1195	1565

Verification and cleaning of data

Many data mistakes on the vehicle’s parameters. Most common are:

- Wrong/absent name of the vehicle’s model
- Wrong/absent data on engine displacement
- Wrong fuel type indicated
- Wrong/absent of vehicle’s weight



challenges that have been encountered during the course of the baseline development:

- Significant delays in acquiring registration data due to institutional changes;
- The quality of original registration data with inaccurate and missing information (wrong model name, fuel type, engine power, transmission type, weight (partially), production place, vehicle purchase price).

3. Main Findings

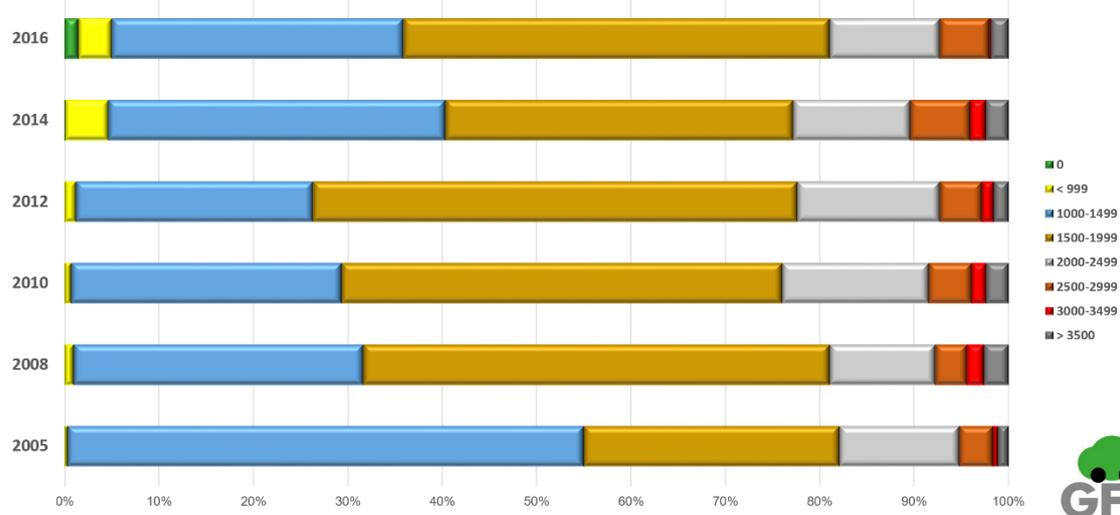
The auto fuel economy baseline analysis for 2005-2016 indicates evident improvement in fuel economy of the LDV fleet in Ukraine. These improvements are primarily due to the downsizing of the economic situation in the country, a decrease in the real income of the population/purchasing power, a collapse of the national currency (threefold!) and significant increase in prices for imported products, incl. vehicles and fuels. Therefore, we cannot rely on past trends to ensure auto fuel economy will increase in the future, making proactive policy and fiscal measures necessary.

▪ Vehicle characteristics by engine size

The vast majority of new car registrations (70-80%) during the national baseline interval (2005-2016) are equipped with an engine size from 1000 to 2000 cc. In 2005, their share on the market was 82% (55% - 1000-1500 cc and 27% - 1500-2000 cc), in 2008 – it was 80% (31% and 49%, respectively), in 2010 – it was 76% (29% and 47%), in 2012 – 76% (25% and 51%, respectively), in 2014 – it was 73% (36% and 37%, respectively), in 2016 - 76% (31% and 45%, respectively).

National baseline development – first results

Engine size distribution in %, (cc)

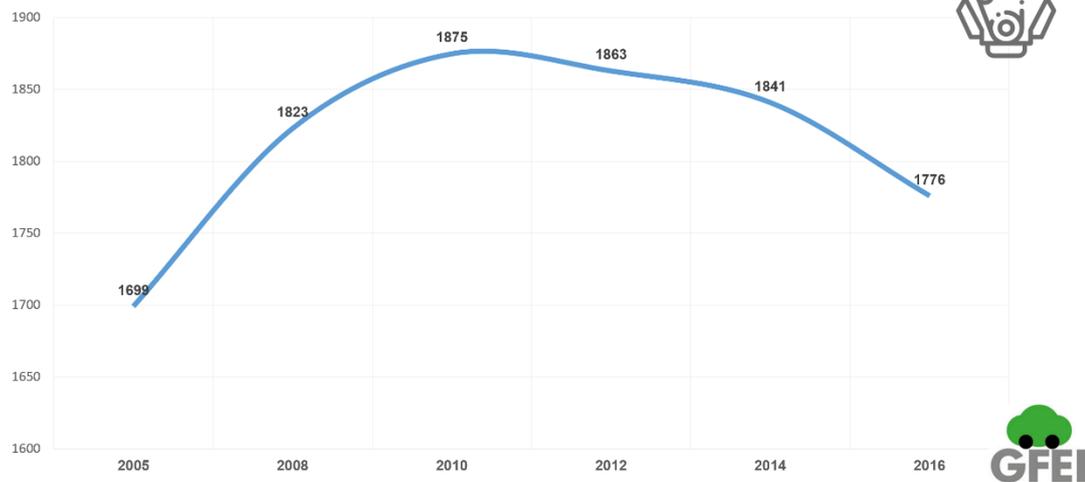


Moreover, starting from 2012 there's an emerging steady tendency for the growing share of cars with engine capacity up to 1000 cc. In 2005-2010 the total number of cars with an engine size of up to 1000 cc on the new vehicle registration market was up to 1% (2005 - 0.36%, 2008 - 0.98%, 2010 - 0.72%), starting from 2012 demand for such fuel efficient cars have increased significantly: 2012 - 1.2%, 2014 - 5% and in 2016 - 4%.

According to the baseline findings, the most popular engine size vehicles among consumers are between 1500 and 2000 cc, except for the base year 2005. From 2005 until 2010 the average engine size increased (from 1699 cc in 2005 to 1875 cc in 2010), however from 2012 - the slope changed downwards and the average engine size upon new registrations began to slightly decrease (from 1863 cc in 2012 to 1776 cc in 2016), but still have not reached the level of 2005 when the value was at 1699 cc.

National baseline development – first results

Average engine size for the first registrations (cc)



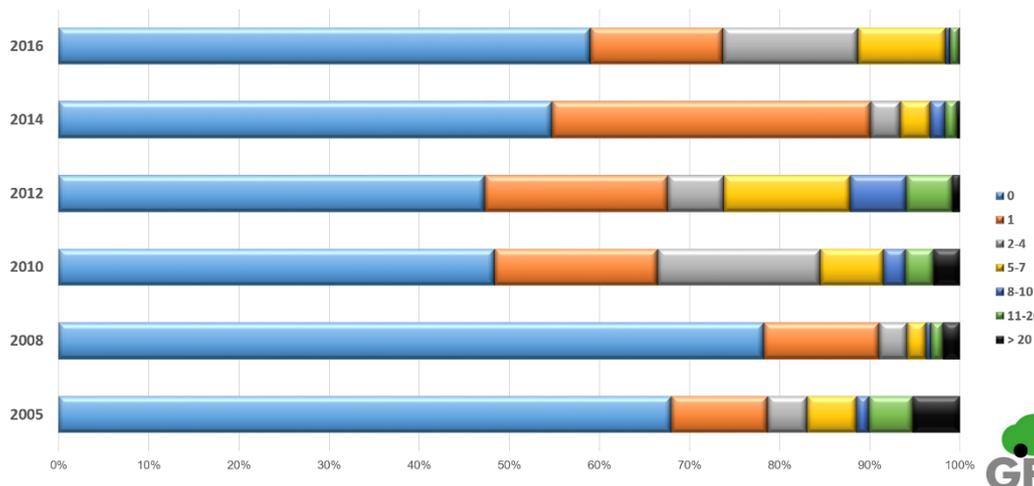
▪ Vehicles' age upon first registration

Given the specifics of the vehicle registration database in Ukraine, which does not mention information about whether it's a new car or used, it is only possible to analyze the age of a vehicle at the time of initial registration.

The largest share of vehicles under the age of 1 year was at the pre-crisis years of 2005 and 2008 (68% and 77% of new registrations, respectively). Subsequently, the economic situation in Ukraine did not contribute to the growth of sales of new cars and their share fell to around 48% in 2010-2012. Afterwards, in 2014 and 2016, the growth of sales of cars up to 1 year resumed and reached 53% and 58% of the total LDV market, respectively.

National baseline development – first results

Vehicle age on the date of registration, (years)



The more popular cars among buyers are aged between 1 and 2 years. Their share has been consistently increasing from 11% in 2005 to 36% in 2014.

The most indicative of the economic situation in a country is the market segment with LDVs aged from 2 to 5 years. It is noticeable that the demand for such LDVs is increasing at the peak of the economic crisis. If we look at their share in 2010 – it amounted to 18%, although at a prosperous market in 2008 did not exceed 3%. The same tendency is observed in 2016 when the share of new vehicle registrations aged from 2 to 5 years have increased to 15%, even though in 2014 it also did not exceed 3%.

As for older vehicles aged 5 years and more, their market share at the initial registration in 2005, 2010 and 2016 has been traditionally insignificant and fluctuated within 10-15%. However, the exceptions came about in 2008 and 2014, when the share of initial registrations of such vehicles was at about 6% and in 2012 it was more than 25%.

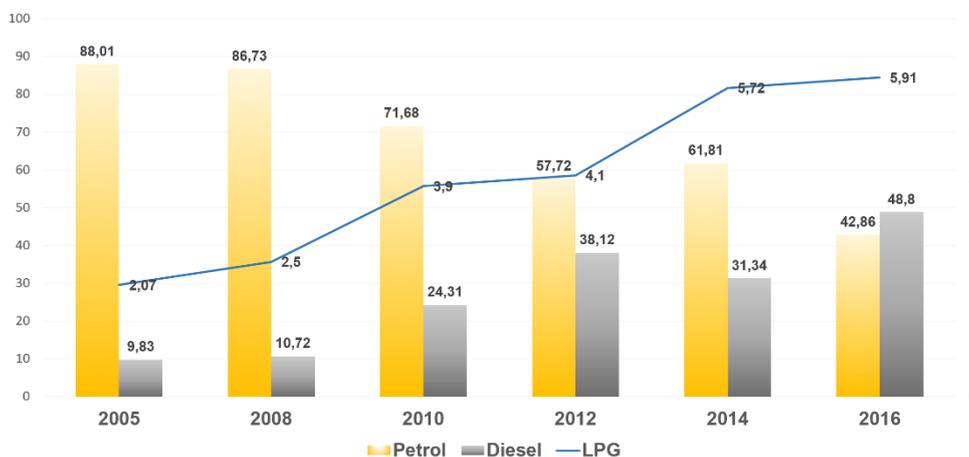
In general, the economic situation in Ukraine after 2008 caused a decline in demand for new vehicles and an increase in the share of used ones. However, starting 2012 the ratio of new-to-used vehicles on the market has been increasing towards the new vehicles and in 2016 it reached a 60/40 % ratio.

▪ Market composition by fuel type: dieselization and electrification

There is a **clear trend of dieselization** within the data, showing an increase in the number of diesel LDVs from 10% in 2005 to around 49% in 2016. This trend is not likely to change in the near future, as the countries of origin of the used LDVs have a higher share of diesel LDVs in their fleets and considering a breakout of “Dieselgate”, many of the “banned” vehicles (both by government impositions and consumer choices) have a very high probability to find their way to developing countries. One such bad practice already surfaced on the Ukrainian auto market, when some local importers brought recalled diesel LDVs (coming out of recent Volkswagen’s case in the United States) to Ukraine.

National baseline development – first results

Diversification of LDV fleet by fuel type (in % of market share)



Sales of advanced fuel-efficient vehicles, such as hybrids, had a very small market share in 2016, with 0.94% or 723 cars.

At the same time, there is a **new emerging trend and a rapid growth in sales of electric cars**. In 2014 their share in the market was 0.07% (62 cars). In 2016 the number reached 1.5% (1148 cars). In 2017, the market operators report another 91% hike in electric mobility.

Currently, about 4% of the Ukrainian market of new LDVs belongs to electric vehicles. This rapid development of the electric mobility ranks Ukraine fifth in the international ranking for the pace of development of the electromotive market.

National baseline development – first results

First registrations of Hybrids and EVs in Ukraine



This all came about in recent years with the adoption of stimulating fiscal measures by the government. First, in 2016, the government levied the customs duty on electric vehicles.

In 2017, the Ministry of Infrastructure presented a Conception for the development of electric mobility in Ukraine. This Conception had an extensive national and international consultative discussion, with ISA participating on behalf of GFEI in Ukraine activities.

And most recently, from January 1, 2018 – the excise tax and VAT have been lifted for the importation of electric vehicles (for one testing year at the moment).

▪ Auto fuel economy trends

Since 2011, GFEI has produced biannual reports tracking global progress towards the GFEI target of doubling the fuel economy of new light duty vehicles by 2030. The latest report shows that while the global average fuel economy is improving, more needs to be done to meet the GFEI target.

Overall, fuel economy improvement rates were significantly lower than those required to meet the 2030 GFEI target of halving fuel consumption to 4.4 lge/100 km lge/100 km in 2005. The global annual average improvement in fuel economy was 1.5% between 2005 and 2015. This is around half the 2.8% rate required to achieve GFEI's target of doubling average fuel economy by 2030 for new vehicles. The annual improvement in average fuel economy at the global level slowed during the course of the past decade, from 1.8% in 2005-08 to 1.2% in 2012-15 and 1.1% in 2014-15. OECD countries saw their improvement rate drop to only 1.0% between 2012 and 2015. However, the rate of improvement in fuel economy accelerated in non-OECD countries over the same period, reaching 1.4% per year, on average, between 2012 and 2015.

Global Fuel Economy Initiative in Ukraine – 2016-2018©

The relative changes in the size of different markets have a significant impact on the evolution of the global average fuel economy. The non-OECD passenger car market is now bigger than the OECD market and has been since 2011. This has resulted in a major change in comparison with the first half of the last decade: since 2014, non-OECD countries have achieved faster fuel economy improvements than OECD economies.

Ukraine was not on the sidelines in the global trends and the baseline results show that fuel economy for cars sold in Ukraine has improved from 2005 to 2016.

Ukraine vs Global fuel economy developments

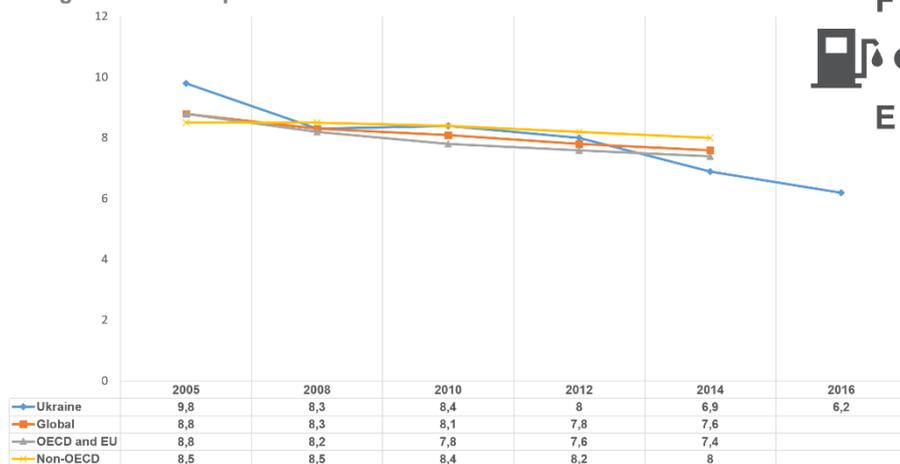


		2005	2008	2010	2012	2014	2015	2016	2030	
OECD & EU average	average FE (Lge/100 km)	8.8	8.2	7.8	7.6	7.4	7.3			
	annual improvement rate (% per year)	-1.8%								
Non-OECD average	average FE (Lge/100 km)	8.5	8.5	8.4	8.2	8	7.9			
	annual improvement rate (% per year)	-0.8%								
Global average	average FE (Lge/100 km)	8.8	8.3	8.1	7.8	7.6	7.6		4.4	
	annual improvement rate (% per year)	-0.8%								
Ukraine	average FE (Lge/100 km)	9.8	8.3	8.4	8	6.9	6.2			
	annual improvement rate (% per year)	-3.3%								
GFEI target	required annual improvement rate (% per year)	-2.80%								
	average FE (Lge/100 km)									-3.7

Back in 2005, Ukraine lagged behind developed markets in this indicator (9.8 lge/100 km in Ukraine against 8.8 lge/100 km in the EU). In 2014, Ukraine was able to outstrip the global trend, reaching 6.9 lge/100 km as its weighted average fuel economy of the LDV fleet (vs. 7.8 lge/100 km global and 7.4 lge/100 km for OECD & EU countries in the same year).

Main findings of baseline analysis

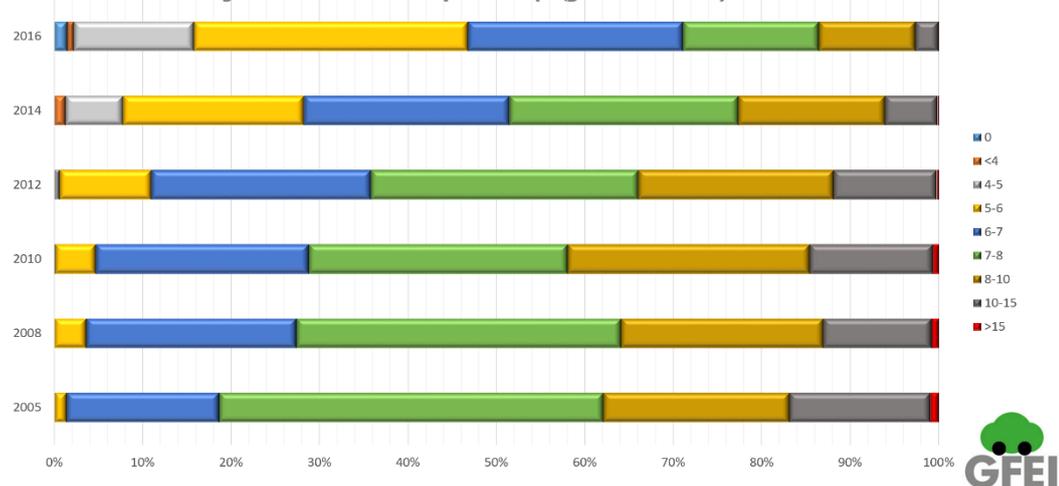
Average fuel consumption in Ukraine



Indicative is the change in consumer preferences towards energy-efficient cars, in particular, in 2005 - the share of initial registrations of cars consuming 4-5 lge / 100 km was only 1.4%, however in 2016 - their spread reached 31% (the most widespread) In contrast, the share of the most popular cars among consumers in 2005 with the average fuel consumption of 7-8 lge / 100 km has decreased threefold (from 45% in 2005 to 15% in 2016). As of 2016, 46% of initial registrations were for cars with the average fuel consumption of up to 5 lge / 100 km, while in 2005 their share reached only 1.5%.

Main findings of baseline analysis

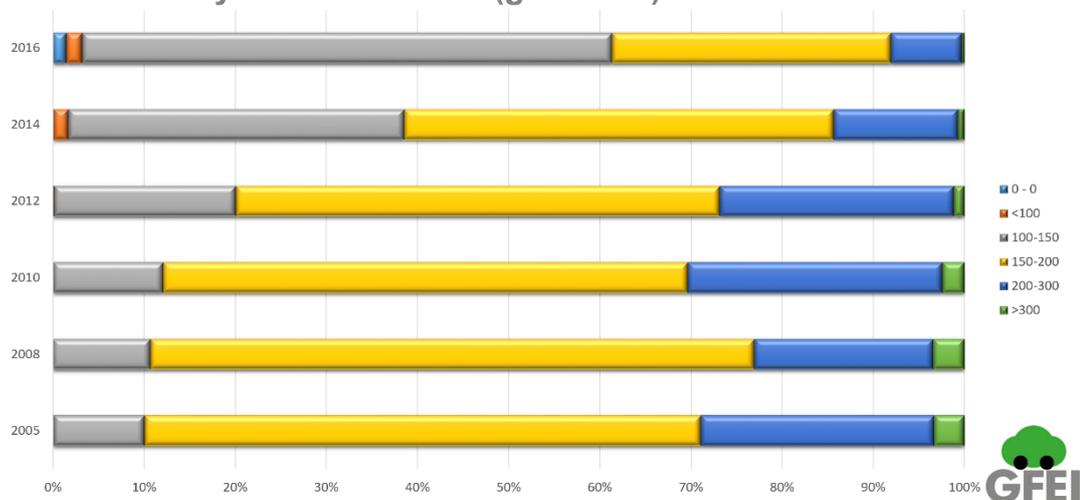
Distribution by fuel consumption (Lge/100 km)



A similar trend is observed in CO₂ emissions. Over 60% of initial vehicles' registrations in Ukraine for this indicator were positioned within the mark of 150 g CO₂ / km, although in 2005 their share in the total number of initial registrations did not exceed 10%.

Main findings of baseline analysis

Distribution by CO₂ emissions (gCO₂/km)

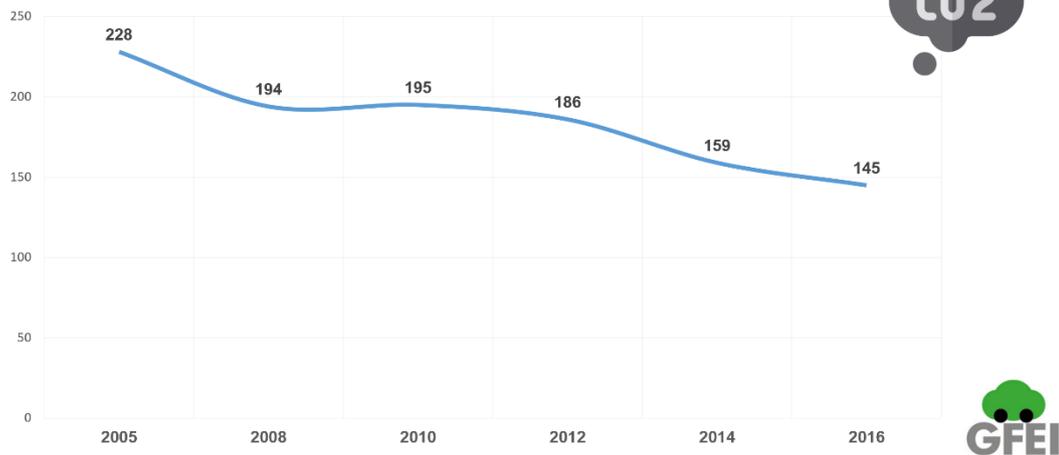


The significant dynamics of CO₂ emissions reduction in Ukraine started in 2005. Over the next three years till 2008 this indicator decreased by 14.9% (from 228 g CO₂/km to 194 g CO₂/km). Then the downward trend "paused" and remained without significant changes until 2010, when the CO₂ emissions decreased by another 4.5% (from 195 g CO₂/km to 186 g CO₂/km) till 2012. In 2014, comparing to the previously recorded 2012, we observed a record reduction rate of CO₂ emissions of 14.5% reaching a low of 159 g CO₂/km. And again, over the next two years, the rate

of CO₂ emissions reduction continued its decreasing tendency at 10.1% and as of 2016 - the national average CO₂ emissions by LDVs reached 145 g CO₂/km.

Main findings of baseline analysis

Average emissions of gCO₂/km in Ukraine



In overview, during the baseline study period 2005-2016, the weighted average annual reduction in CO₂ emissions was at about 3.2% and a general drop of 35% over this period.

4. FEPIT modeling and policy recommendations

This analysis used the GFEI Fuel Economy Policies Implementation Tool (FEPIT) to estimate an auto fuel economy in Ukraine till the year 2025 with a baseline and supportive policy scenario. These projections served as a basis for the recommended fuel economy measures in this report.

The GFEI FEPIT methodology is as follows:

1. National LDV fleet data and tax systems are acquired from official sources.
2. The data is 'cleaned' to make it compatible with tool data input requirements.
3. The data is inserted into the tool and projection algorithms are run.
4. Projections and recommended fuel economy policies are highlighted by the algorithms and further developed by expert analysis.

Analysis of the current situation indicates that immediate actions are available to decrease the negative impact of the transport sector on human health and the environment, both in terms of CO₂ and non-CO₂ emissions.

The weighted average fuel economy of Ukraine's LDV fleet in 2016 comes to 145 g CO₂/km, a significant improvement from 228 g CO₂/km in 2005.

Application of the FEPIT projection tool has helped to identify recommendations that can support the Ukrainian government to further improve the fuel economy of its LDV fleet to an estimated 100 g CO₂/km by 2025, which would bring Ukraine in line with international targets of significantly improving vehicle fuel economy globally (see Summary section for GFEI targets).

It would also lead to high co-benefits (i.e. reduced fossil fuel dependence, reduced emissions of short-lived climate pollutants including black carbon, and improved air quality). Furthermore,

improved fuel economy is also beneficial for the economy and society too, because it saves humans lives. The World Health Organization estimates that indoor and outdoor air pollution prematurely kills 7 million people per year with vehicle emissions as the major contributor.

Thus, based on an extensive collaboratory work of the mentioned here stakeholders and experts within the GFEI in Ukraine activities during the course of the past three years have formulated the **following set of measures** that should be considered in any future efforts to develop national fuel economy policy:

1) Informational measures:

- a) Establishing a unified central vehicle registration database which should contain overall fleet information regarding vehicles' engine power, transmission type, axle configuration, fuel efficiency and CO₂ emission data, including any other informational provision required for vehicle labelling and taxation systems. Preferable, if this database will have the possibility for interconnection with other countries and international resources of information, including the ability to gather and utilize information from them;
- b) Vehicle fuel economy labeling system. Ukraine currently does not have a mandatory system to provide auto fuel economy information to consumers, however, some official auto dealers display information on the vehicle's fuel consumption at their own consideration;
- c) The national informational campaign in support for the fuel and energy efficiency in the transport sector;
- d) Voluntary eco-driving programmes for different categories of existing drivers and obligatory for driving school programs and new drivers.

2) Fiscal measures to encourage the purchase of more fuel-efficient vehicles:

- a) Progressive CO₂-based LDV registration tax;
- b) CO₂-based LDV ownership tax (on annual basis);
- c) Fiscal incentives for owners of "zero" emission vehicles.

3) Technical regulation measures:

- a) Implementation of the EU Fuel Economy Directive and accompanying measures;
- b) Launching of the fuel quality monitoring system;
- c) Launching of mandatory technical inspection system for LDVs.

Implementation of these recommendations will require close collaboration and joint efforts between the Ministry of Infrastructure of Ukraine, the Ministry of Environment and Natural Resources, the Ministry of Finance of Ukraine, the Ministry of Economic Development and Trade of Ukraine, the Ministry of Internal Affairs and the State Fiscal Service of Ukraine. In addition, it will require the support of consumers as well as the private sector.

In addition, as a result of GFEI in Ukraine efforts, the Main Service Center now officially supports the inclusion of additional fuel economy vehicle parameters into the national vehicle registration database, namely:

- Engine power
- Fuel economy in terms of the number of CO₂ emissions
- Environmental auto class (e.g. EURO 5/V)

ANNEX 1 - National Working Group members

1.	International Standardization Academy
2.	Ministry of Interior of Ukraine, Main Service Center
3.	Ministry of Infrastructure of Ukraine
4.	Ministry of Ecology and Natural Resources
5.	Ministry of Energy and Coal Industry of Ukraine
6.	Ministry of Health of Ukraine, Laboratory for air quality of the "Institute of Public Health named after A. M. Marseev NAMSU"
7.	State Energy Efficiency Agency of Ukraine
8.	Kyiv City State Administration, Department of Transport Infrastructure
9.	Main Department of the State Service of Ukraine for food safety and consumer right protection in Kyiv
10.	State institution "Kyiv City Laboratory Center"
11.	Association "Ukraudoprom"
12.	Association of International Auto Carriers of Ukraine
13.	All-Ukrainian Association of Automobile Importers and Dealers
14.	NGO "Energy efficiency institute of Ukraine"
15.	NGO "Consumers Union of Ukraine"
16.	Scientific and Technical Center "Psyheya"
17.	Odesa State Academy for Technical Regulation and Quality
18.	National Aviation University
19.	National Transportation University

