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INDICATORS of the NEW and SECOND HAND vehicle fleet in BELGIUM and the DIFFERENT REGIONS

Study accomplished under the authority of the Flemish, Walloon and
Brussels Capital Region

11 October 2010

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List of abbreviations

Avg.	Average
BCR	Brussels Capital Region
BEL	Belgium
BEV	Battery Electric Vehicle
BXL	Brussels Capital Region
cc	cubic centimeter (cm ³)
CC	Company Car
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO ₂	Carbon dioxide
DIV	'Dienst Inschrijving Voertuigen', Belgian vehicle registration service
DPF	Diesel Particulate Filter
HC	Hydrocarbons
kg	kilogramme
kW	kilowatt
LPG	Liquid Petroleum Gas
(m)g/km	(milli)gramme per kilometer
Nat. person	Natural person
NOx	Nitrogen oxides
PM	Particulate Matter
VITO	Vlaamse Instelling voor Technologisch Onderzoek
VL	Flanders
VUB-ETEC	Vrije Universiteit Brussel – Department of Electrotechnical Engineering and Energy Technology
WAL	Wallonia

1. Introduction

The first part of this report analyses the new vehicle fleet of Belgium and its different regions, registered in 2006, 2007, 2008 and 2009, while the second part focuses on the second hand vehicle fleet of the same period.

This report allows the follow-up and evolution of the vehicle fleet especially concerning its environmental performance. The Flemish, Walloon and Brussels Capital Region (BCR) can be mutually compared, as well as different years of registration. Different technical and environmental indicators are considered in these analyses: fuel type, displacement, power, vehicle weight, emissions (particulate matter or PM and CO₂) and Ecoscore. This report is an update of the previous report written by VUB-ETEC, in which new vehicles registered in 2006 and 2007 were analysed. Additional analyses have been added compared to the previous report, more specifically on new company cars and second hand vehicles.

It must be noted that these analyses concern specifically vehicle *registrations*, hence they don't reflect what is actually driving on the roads of the different regions. Especially for company cars, very high numbers are registered in the BCR due to the companies' locations. These cars are however used in the other regions as well.

The necessary databases to perform these analyses were provided by VITO, based on data originally obtained from DIV ('Dienst Inschrijving Voertuigen', the Belgian vehicle registration service). This database was matched with the Ecoscore database, so to each car in the database the Ecoscore was added. If an exact matching was not possible, the car was compared with equivalent cars and the mean Ecoscore of those cars was used. Each record in the final databases contains information on the vehicle model, technical specifications (displacement, power, weight, dimensions, top speed), region, euro standard, year of first registration, fuel type, Ecoscore, emissions (CO, HC, NOx, PM and CO₂), fuel consumption, Ecoscore and number of vehicles. It should be noted that not all information is completed in the database. Concerning our investigated indicators, this is especially the case for vehicle weight, and emissions of CO₂ and PM for second hand car registrations.

2. Composition of the new Belgian passenger car fleet

2.1 Total numbers

The total Belgian car fleet currently (d.d. 01/08/2009) counts 5.192.566 passenger cars¹. In Flanders more than 3 million cars are registered, in Wallonia almost 1,6 million and in the BCR more than 500.000. In 2009, 490.094 new passenger cars were registered in Belgium². In Flanders, there were

¹ Data from Federal Governmental Department of Economy,
http://statbel.fgov.be/nl/statistieken/cijfers/verkeer_vervoer/verkeer/voertuigpark/index.jsp

² The following numbers are obtained from the data files provided by VITO and based on DIV data. According to Statbel, 479.920 new passenger cars were registered in 2009. So our data are a good representation of the official data.

256.897 new registrations, 153.093 in Wallonia and 80.104 in the BCR (Figure 1). The share of new vehicles compared to the total fleet is a lot higher in the BCR (16 %) than in Flanders and Wallonia (± 9 %). Over the last four years, the number of new cars has remained very stable in Wallonia. In Flanders and the BCR however, a strong decrease has occurred in 2009.

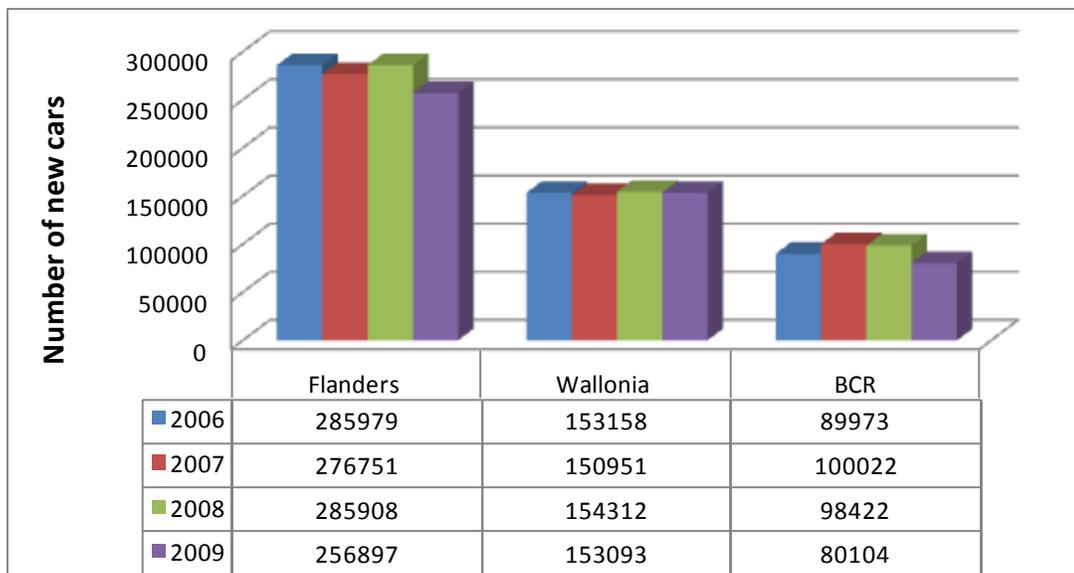


Figure 1: Number of newly registered passenger vehicles in the different Belgian regions from 2006 to 2009.

For Belgium, the number of newly registered vehicles has increased in 2008, the other years however have seen a decrease in the number of registrations (Table 1). In 2009, in all regions less new passenger cars were registered. The BCR was affected the strongest (-19 %), followed by Flanders (-10 %). Wallonia has been less affected. This might be the influence of the economic crisis, but also in Wallonia the eco-bonus premium might have been able to counterbalance this negative effect.

Table 1: Total number of newly registered cars and annual growth of the new car fleet for the different regions and years.

Year	2006	2007	2008	2009
Total number	529.110	527.724	538.642	490.094
Growth Belgium	--	-0,26 %	+2,07 %	-9,01 %
Growth Flanders	--	-3,23 %	+3,31 %	-10,15 %
Growth Wallonia	--	-1,44 %	+2,23 %	-0,79 %
Growth BCR	--	+11,17 %	-1,60 %	-18,61 %

2.2 Fuel type distribution

Diesel is by far the dominant fuel type of the new vehicle fleet in Belgium (Figure 2 and Figure 3). The share of diesel has continually increased from 74 % in 2006 to 79 % in 2008, after which, however, a downfall can be seen in 2009 to 75 %. Petrol cars make out the complement of the share of diesel cars due to the very low (<1 %) shares of LPG and CNG cars. The share of petrol therefore follows the opposite trend of diesel: a decrease to 2008 (from 25 to 21 %), followed by an increase to 24 % in 2009. This change of evolution in 2009 compared to the previous years can be linked to the downfall in new

vehicle registrations (see Table 1). The number of new diesel cars has decreased with 13 % in 2009, while petrol cars have increased with only 6 %, pointing out the higher sensitivity of diesel cars to the economic crisis, possibly due to the high share of diesel within the company cars which are very sensitive to economic effects.

When comparing the different regions in this respect, the BCR has the largest proportion of diesel cars (80 % in 2009), followed by Wallonia (77 %) and then Flanders (73 %).

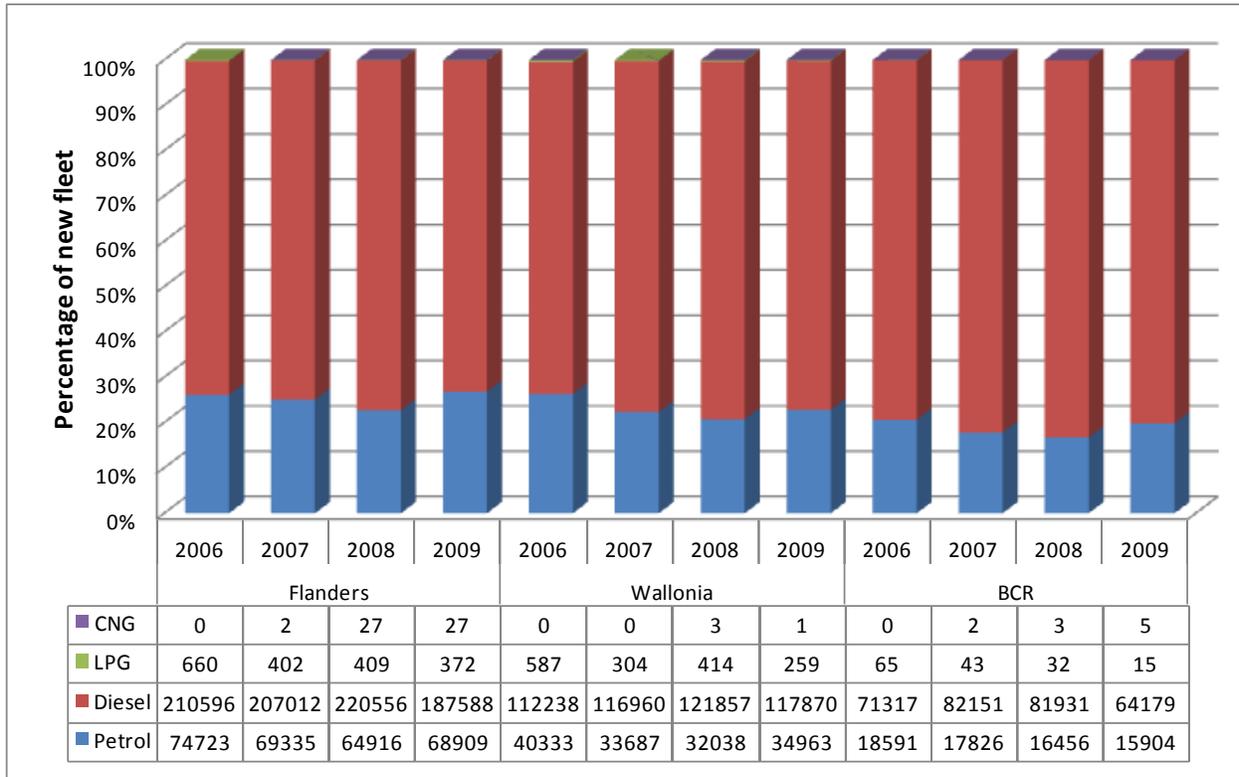


Figure 2: Share of fuel type in the new car fleet for the different regions and assessed registration years.

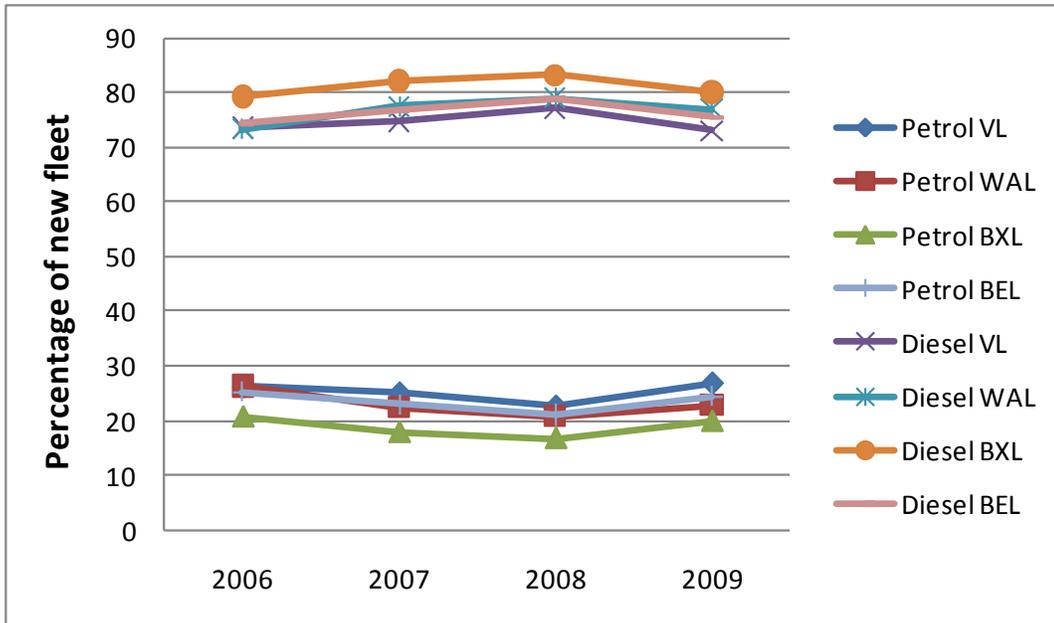


Figure 3: Evolution of the share of new registrations of petrol and diesel cars for the different regions and Belgium.

2.3 Ecoscore distribution

When comparing the new vehicle fleet over the different years, a clear increase can be seen of the average Ecoscore for Belgium and the separate regions (Figure 4). Wallonia has the highest average Ecoscore (65,35 in 2009), but Brussels has seen the strongest increase since 2006, namely +6,29 %, followed by Flanders (+5,81 %) and Wallonia (+5,32 %). The overall Belgian average in 2009 was an Ecoscore of 64,67.

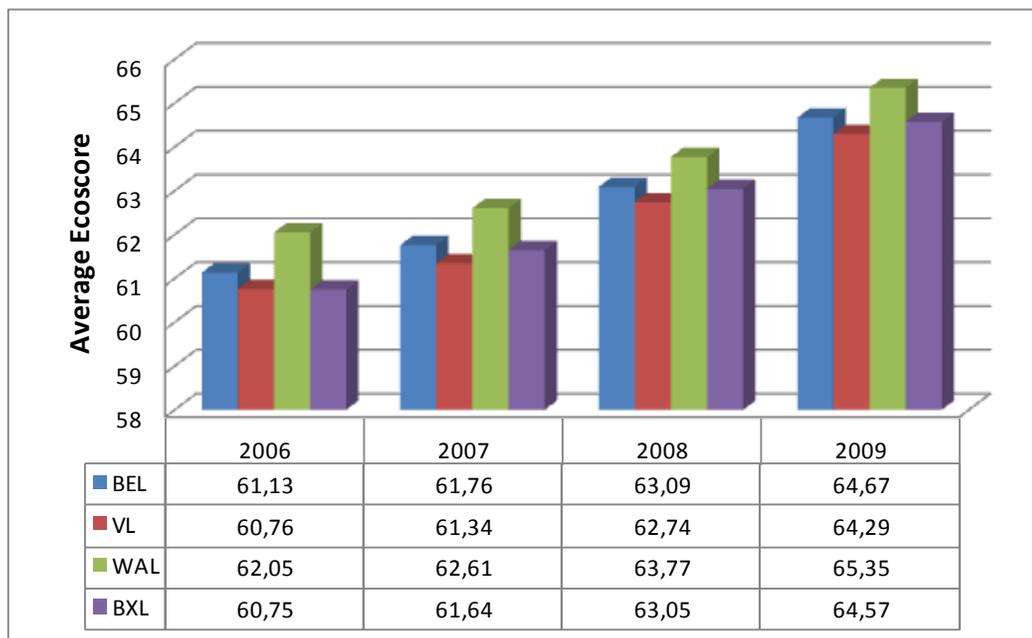


Figure 4: Average Ecoscore for the new vehicle fleet of the different Belgian regions from 2006 to 2009.

When comparing the different fuel types, CNG and LPG cars still have the highest Ecoscores as expected, but they remain quite stable over the last four years. Between the more conventional fuel types, petrol cars still display the highest average Ecoscore (66,90 versus 63,93 for diesel in 2009). Diesel cars however are improving their Ecoscore faster than petrol cars, namely with 7 % since 2006 (versus 4 % for petrol) (Figure 5). In 2009, also two new battery electric vehicles (BEV) were registered, which are not included in this figure, but of which the average Ecoscore is 82,00, so still much higher than the best CNG car. The missing bar in this graph for CNG in 2006 is due to the fact that no new CNG cars were registered that year.

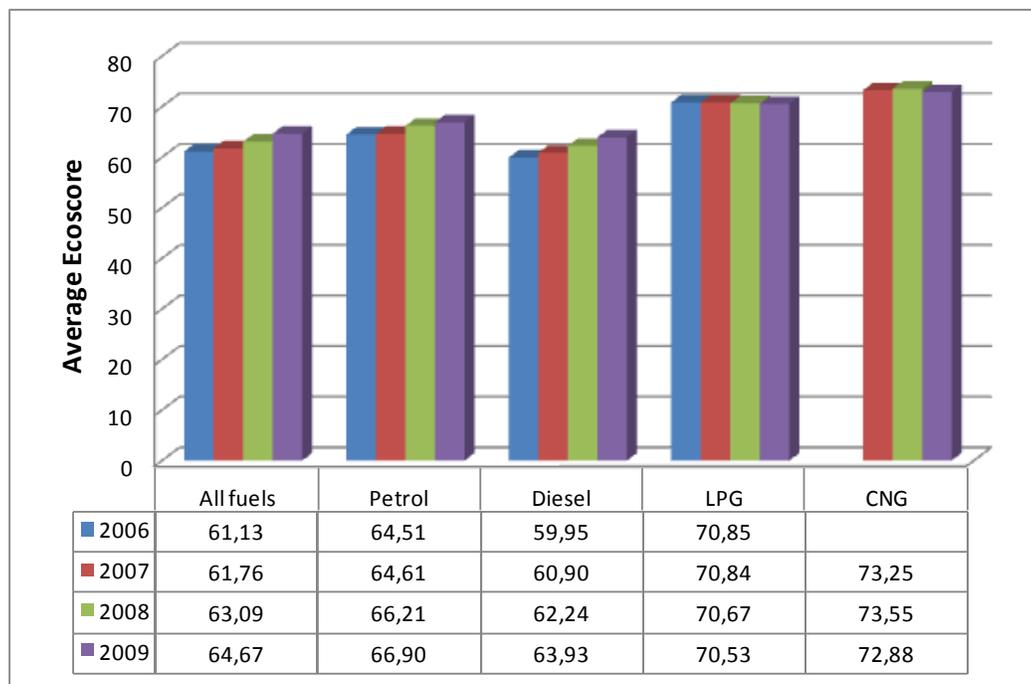


Figure 5: Average Ecoscore for the different fuel types of the new Belgian vehicle fleet from 2006 to 2009.

The distribution over 5-point wide Ecoscore classes for the new Belgian fleet is shown in Figure 6. 41 % of the newly registered vehicles correspond to the Ecoscore class 61-65. The next best represented classes are the 66-70 class with 29 % and the class 56-60 with 15 % (numbers for 2009). In general, the classes with an Ecoscore below 65 have decreased and a strong increase is seen in the classes with an Ecoscore of more than 65, especially in 2009. This evolution towards higher Ecoscores has caused the overall Ecoscore to increase, as was seen in Figure 4.

When comparing the Ecoscore class distribution per region (Figure 7), the same trends can be seen for the different regions as for the Belgian distribution in Figure 6. Wallonia is the best represented region in the highest Ecoscore class (>70), with 16 %, while Brussels is represented more in the class below of 66-70 Ecoscore points (32 %). Wallonia and Brussels perform better in general within the higher Ecoscore classes, while Flanders still contains more vehicles with lower Ecoscores. This explains the lower average Ecoscore for Flanders, but since the trends are globally the same, all regions show an improvement of the average Ecoscore.

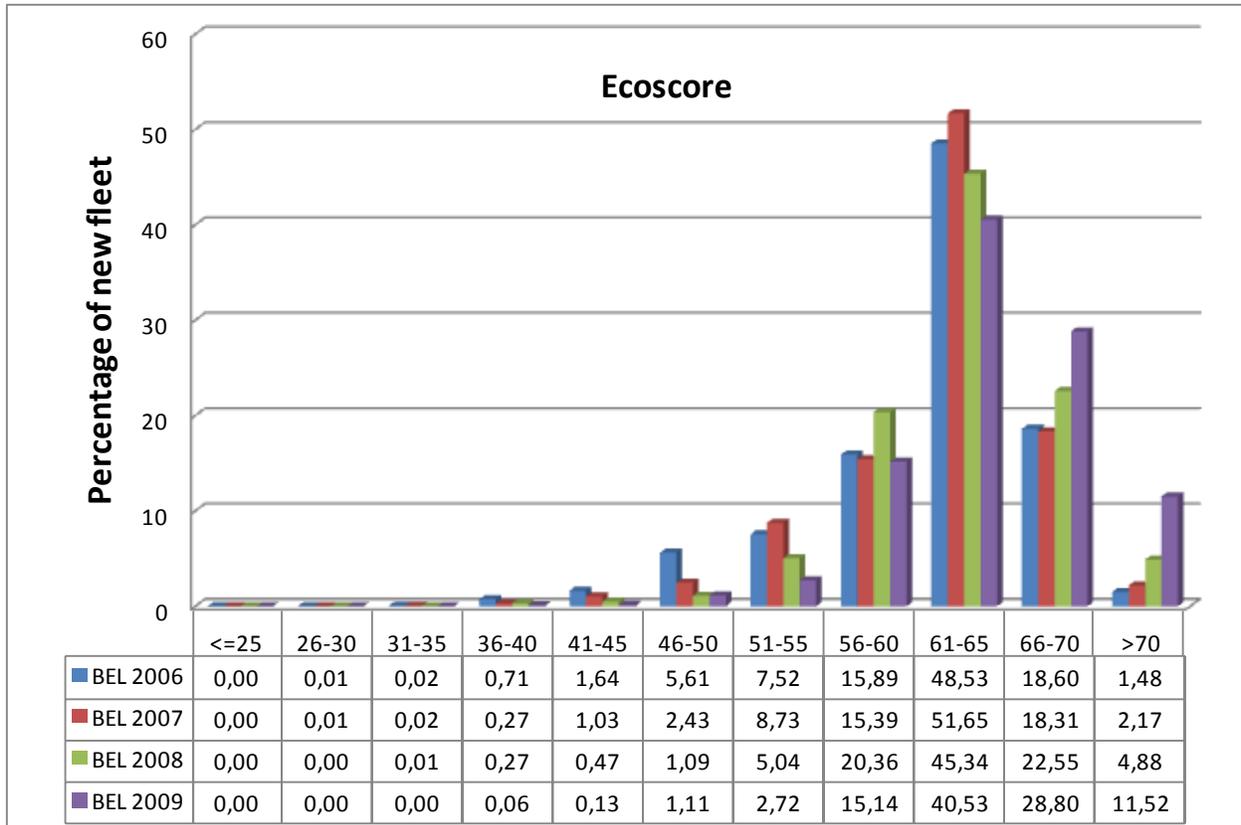


Figure 6: Ecoscore distribution of the new Belgian vehicle fleet from 2006 to 2009.

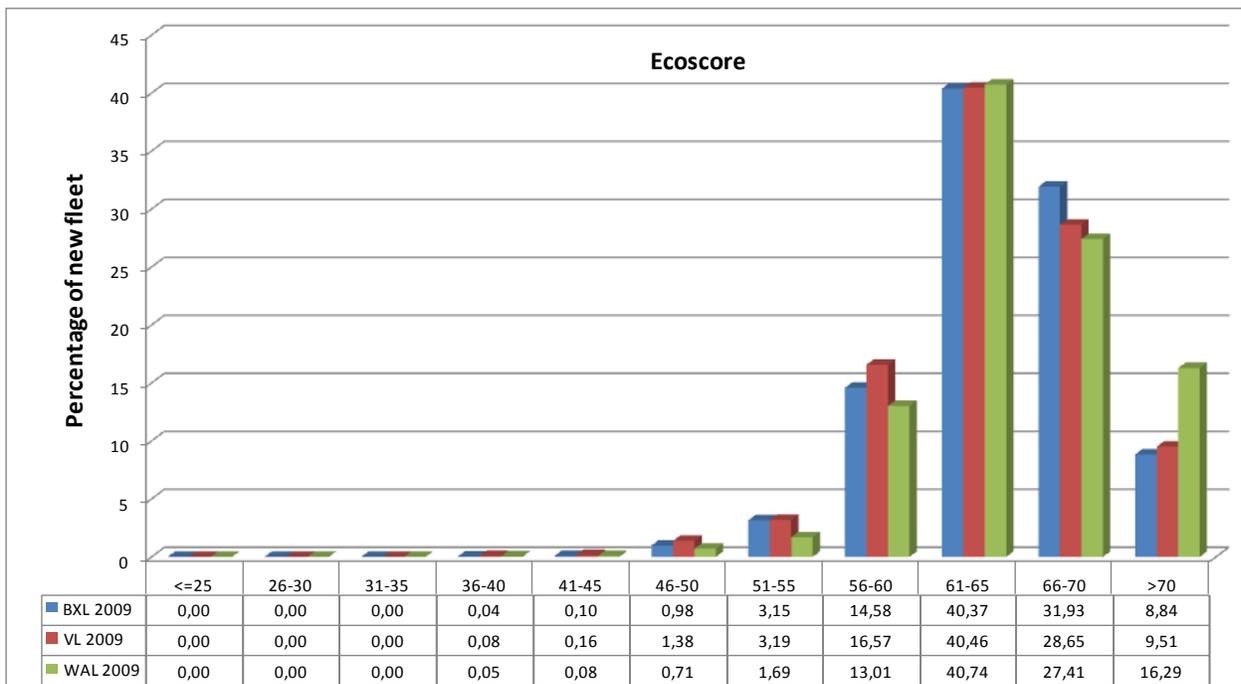


Figure 7: Ecoscore distribution of the new vehicle fleet of the different regions in 2009.

3. Analysis of vehicle and emission parameters of the new fleet

3.1 Vehicle weight

The average vehicle weight of the new Belgian fleet has increased from 2006 to 2008 with 1 % to an average of 1444 kg (Figure 8). In 2009 however, this average has decreased again to 1431 kg. For the Flemish and Walloon region, the 2009 average weight is lower than the 2007 value, for Brussels it is the same. The Brussels' fleet has the highest average (1461 kg), but is more or less *ex aequo* with Flanders. The new Walloon fleet is by far the lightest with 1367 kg in 2009, as well as in the previous years. The previous increase in vehicle weight can be explained by the growing demand for luxury and safety options on new cars. The decrease of vehicle weight in 2009 on the other hand might be explained by the need for less expensive and thus smaller and less consuming cars due to the financial crisis.

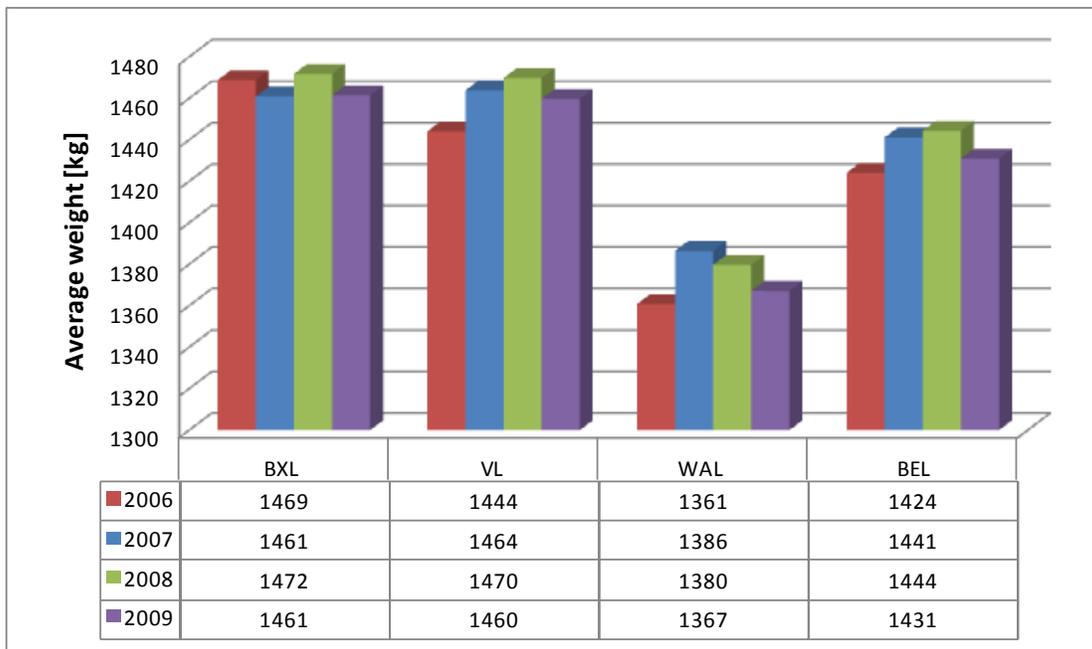


Figure 8: Average vehicle weight for the new fleet of the different Belgian regions from 2006 to 2009.

Figure 9 displays the vehicle weight distribution of the new Belgian fleet for the last four years. Most vehicles (33 % in 2009) fall under the weight class of 1251-1500 kg, followed by the adjacent classes (29 % in class 1501-1750 kg and 23 % in class 1001-1250 kg). In 2009, more small vehicles weighing less than 1250 kg were registered than the year before, but also more of the big cars in the 1751-2000 kg class. The other classes have become less popular, especially the most populated 1251-1500 kg category of vehicles.

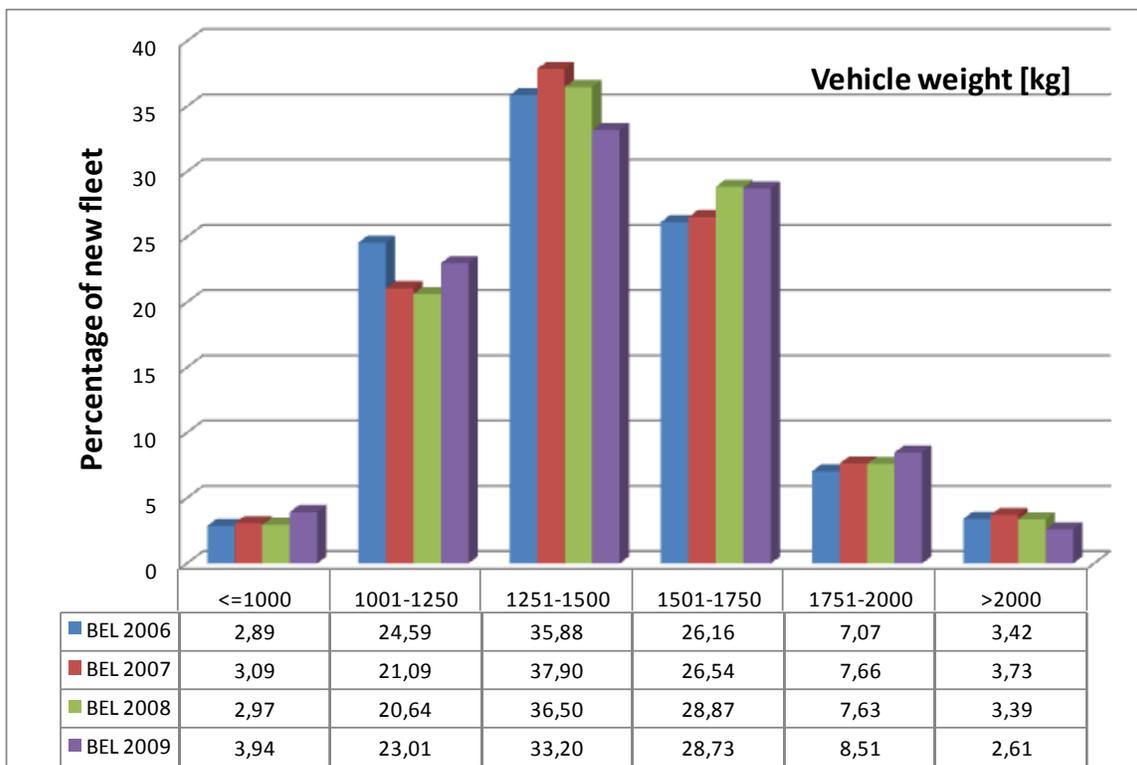


Figure 9: Vehicle weight distribution of new cars in the Belgian fleet from 2006 to 2009.

When we take a look at the new fleet of 2009, a different pattern in the weight distribution for the different fuel types can be observed (Figure 10). Petrol cars are in general lighter than diesel and LPG cars. Almost half of the petrol cars have a weight between 1001 and 1250 kg, while almost half of the LPG cars weigh between 1250 and 1500 kg. The weight of diesel cars is spread mainly between the 1251-1500 and 1501-1750 kg classes (each 35 %). Only 0,40 % of new diesel cars have a weight lower than 1000 kg, compared to 15 % of petrol and 3 % of the new LPG cars.

Figure 11 shows that in general the Ecoscore increases as the vehicle weight goes down. Vehicles weighing less than 1000 kg, have an average Ecoscore of 72,37 (2009). In every weight class, the average Ecoscore has increased over the last four years. The strongest increase has occurred for new vehicles weighing more than 1750 kg. The Ecoscore of the >2000 kg class has even increased with 15 % since 2006. This strong improvement for heavy cars might be linked to the general presence of particulate filters with these cars.

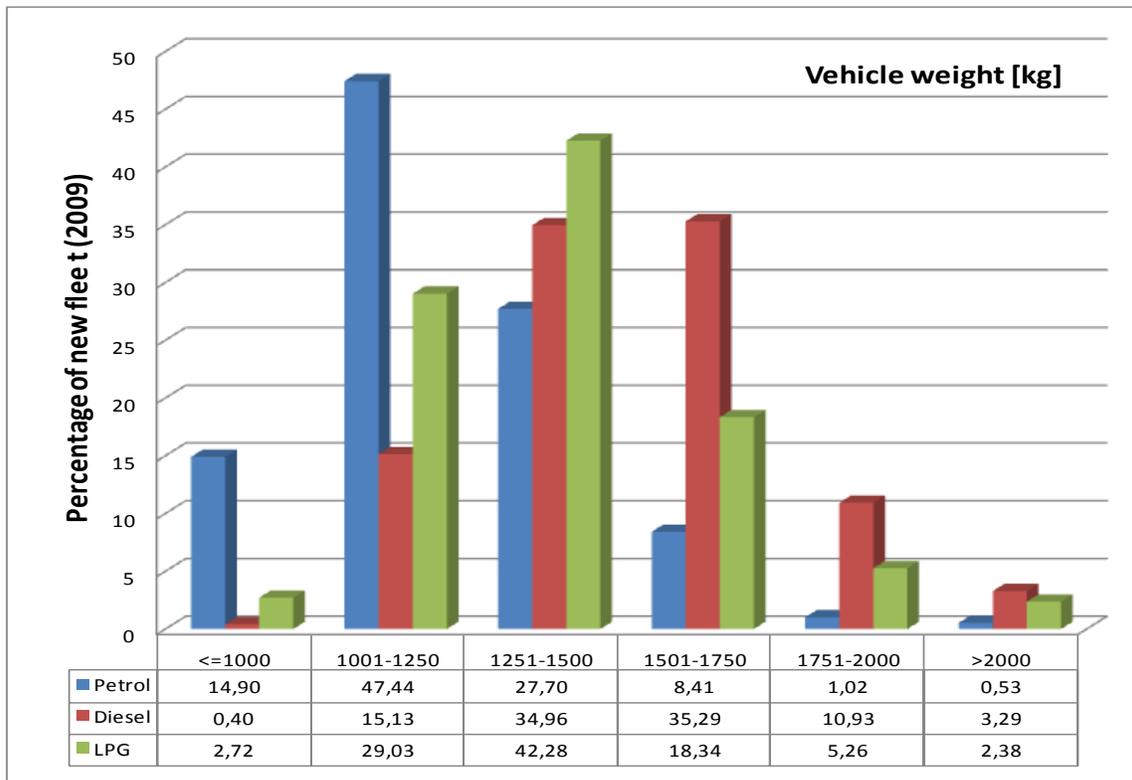


Figure 10: Vehicle weight distribution of different fuel types for new Belgian cars in 2009.

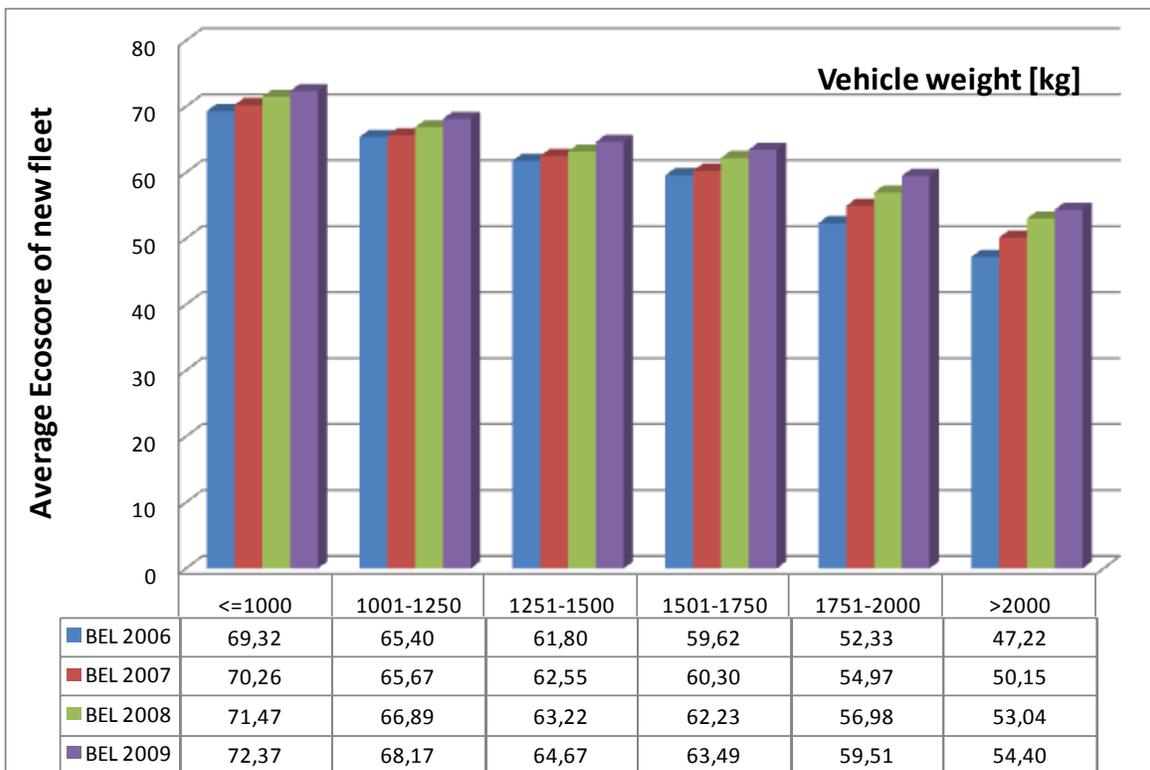


Figure 11: Average Ecoscore in function of the vehicle weight for the new Belgian fleet from 2006 to 2009.

Figure 12 shows that LPG cars always have the highest Ecoscore for the different weight classes. When comparing new petrol and diesel cars, petrol cars perform better up to 1250 kg, for higher weights, the inverse can be observed. Diesel cars weighing more than 1250 kg have a higher average Ecoscore than petrol cars. So diesel cars perform better than petrol towards higher vehicle weights, which is due to the stronger sensitivity of petrol cars for an increase in vehicle weight.

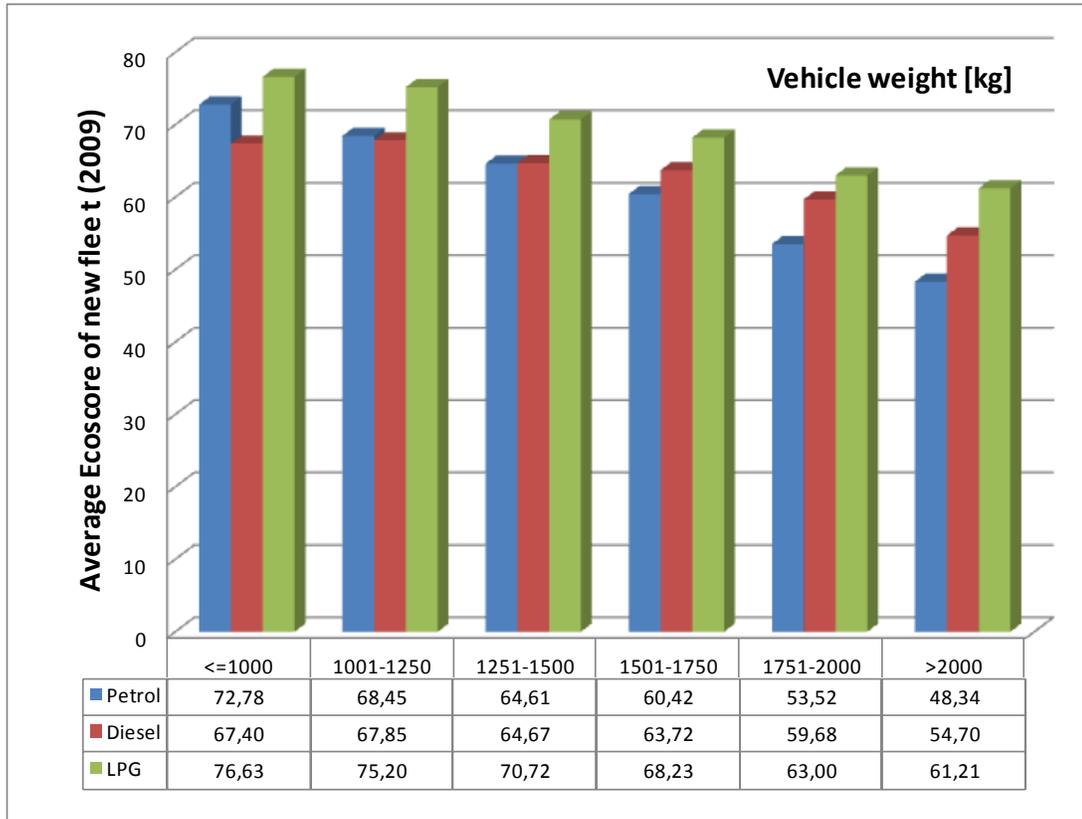


Figure 12: Average Ecoscore in function of the vehicle weight for different fuel types in the new fleet of 2009.

3.2 Engine displacement

In 2009, the average engine displacement of the new fleet in Belgium amounted to 1676 cc, a decrease of 2 % compared to 2006 (Figure 13). In Flanders and Wallonia, the average displacement has increased in 2007, but afterwards it has decreased strongly. In the BCR however, this average has remained quite stable up to 2008, then also a strong decrease is seen in 2009. The new fleet of the BCR currently has the highest displacement values (1721 cc), but is closely followed by the Flemish fleet (1718 cc). New cars in Wallonia tend to have a lot smaller average displacement (1584 cc).

When comparing different fuel types (Figure 14), each year diesel cars have the highest average displacement, closely followed by LPG cars. Diesel cars even differ with petrol with more than 300 cc on the average each year. After a small increase from 2006 to 2007, the average displacement has decreased continually up to 2009 for both diesel and petrol.

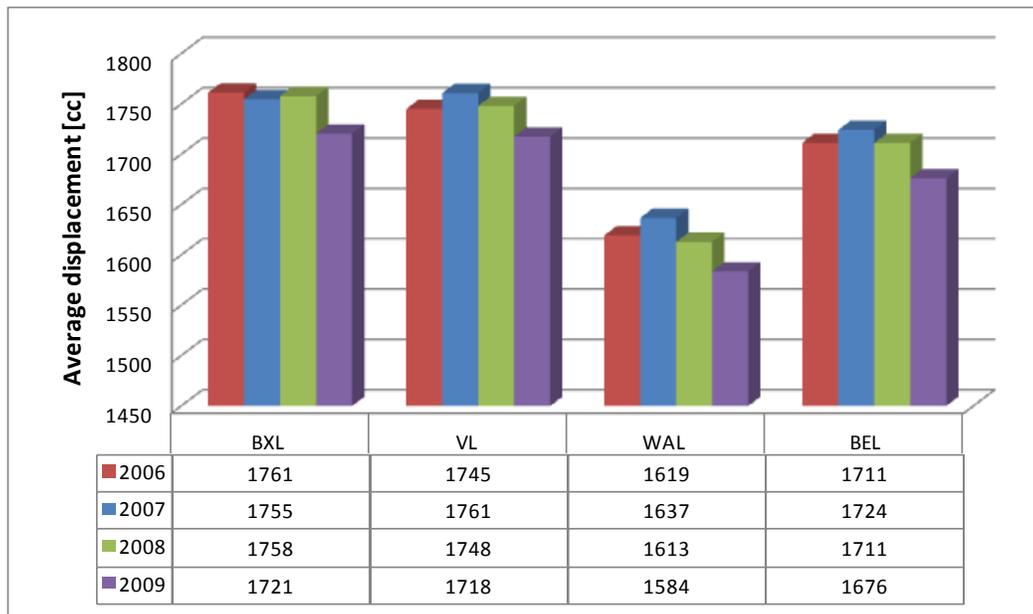


Figure 13: Average displacement of the new fleet for Belgium and the different regions, from 2006 to 2009.

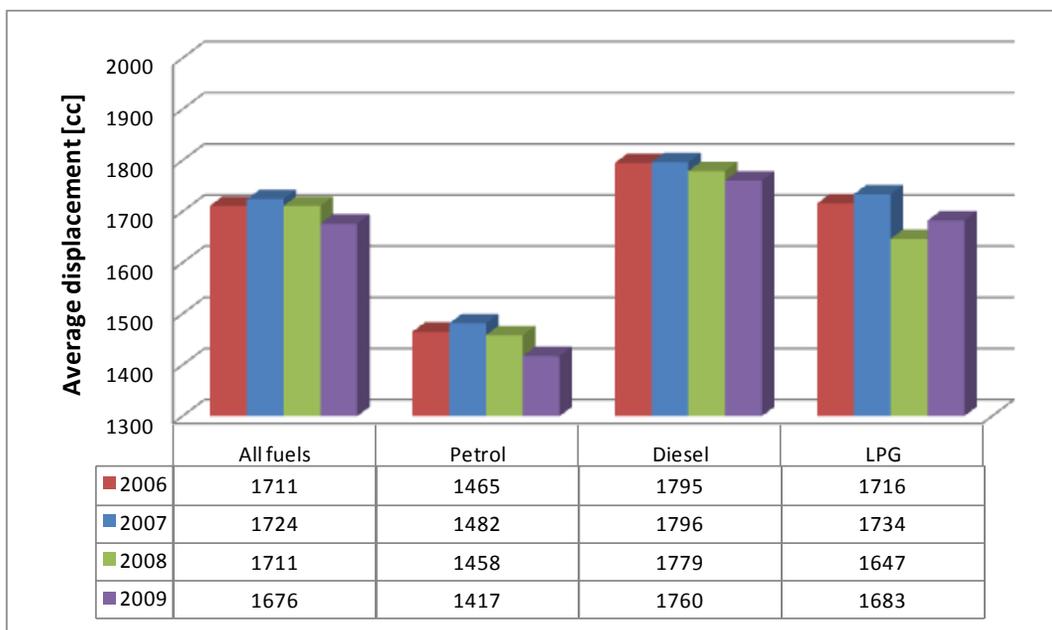


Figure 14: Average displacement of the new Belgian fleet for different fuel types, from 2006 to 2009.

The majority (more than 60 %) of the new fleet has an engine displacement belonging to the 1401-2000 cc class, which share has continually increased since 2006 and has lowered again in 2009 (Figure 15). The next most populated class (28 %) is the one with the smallest engines, which share follows more or less the inverse trend of the biggest class: a decrease up to 2008 and then an increase in 2009. The share of cars with larger engines has shown a minor decrease and tends to remain quite stable.

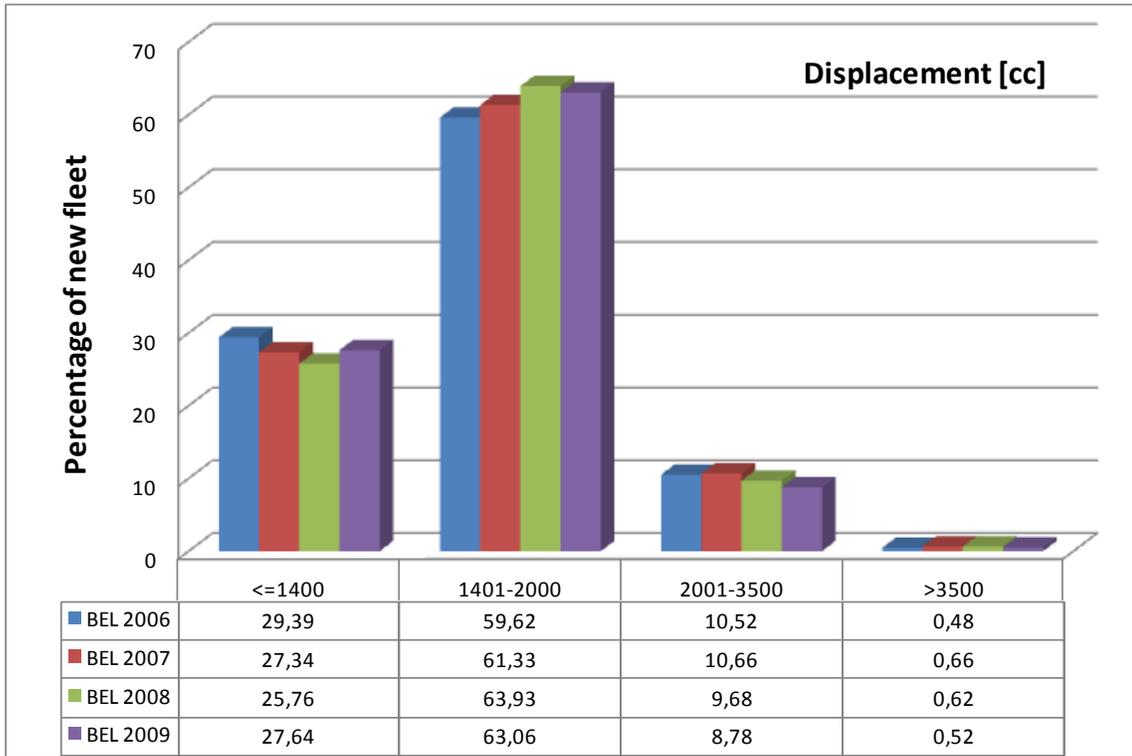


Figure 15: Engine displacement distribution for the new Belgian fleet from 2006 to 2009.

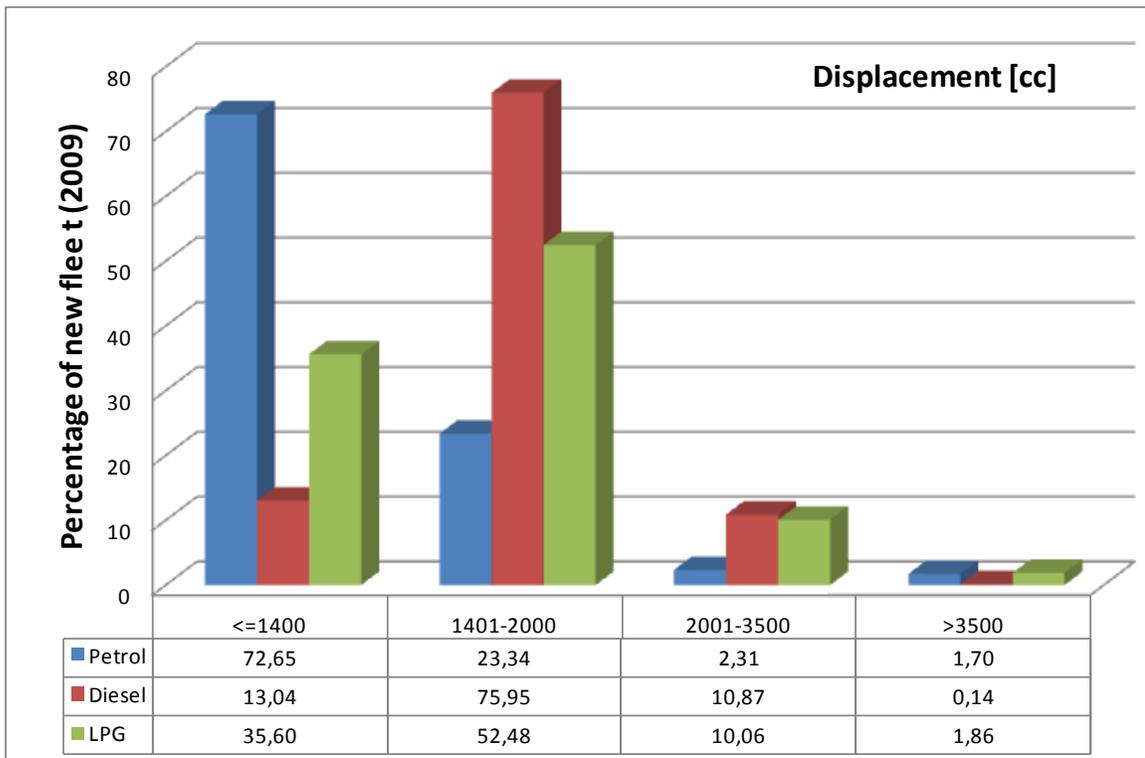


Figure 16: Engine displacement distribution for the different fuel types of the new Belgian fleet in 2009.

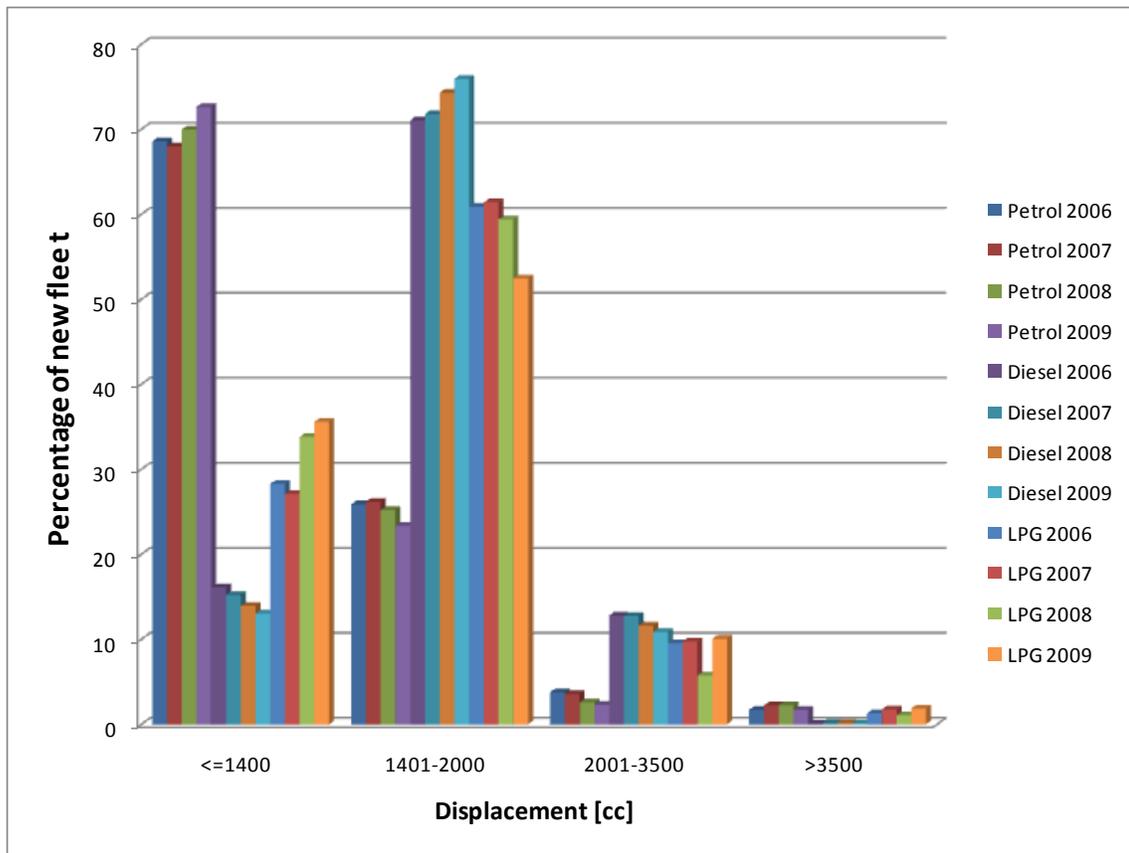


Figure 17: Evolution of the engine displacement for different fuel types in the new Belgian fleet.

Figure 16 and Figure 17 show a clear difference between the engine displacement of petrol, diesel and LPG cars. In the new fleet of 2009, 73 % of the petrol cars has a small engine (≤ 1400 cc), which share is even increasing over time. Diesel and LPG cars on the other hand, generally have larger engines: in 2009, 76 % of new diesel cars and 52 % of new LPG cars has a cylinder capacity between 1401 and 2000 cc. Over time, even more diesel cars belong to this displacement class (Figure 17). For LPG cars, especially the share of vehicles with smaller engines (≤ 1400 cc) increases strongly, while the share of cars with bigger engines has decreased. So for petrol and LPG vehicles, a downsizing trend exists. For new diesel vehicles however, the opposite can be seen, so engines still become larger.

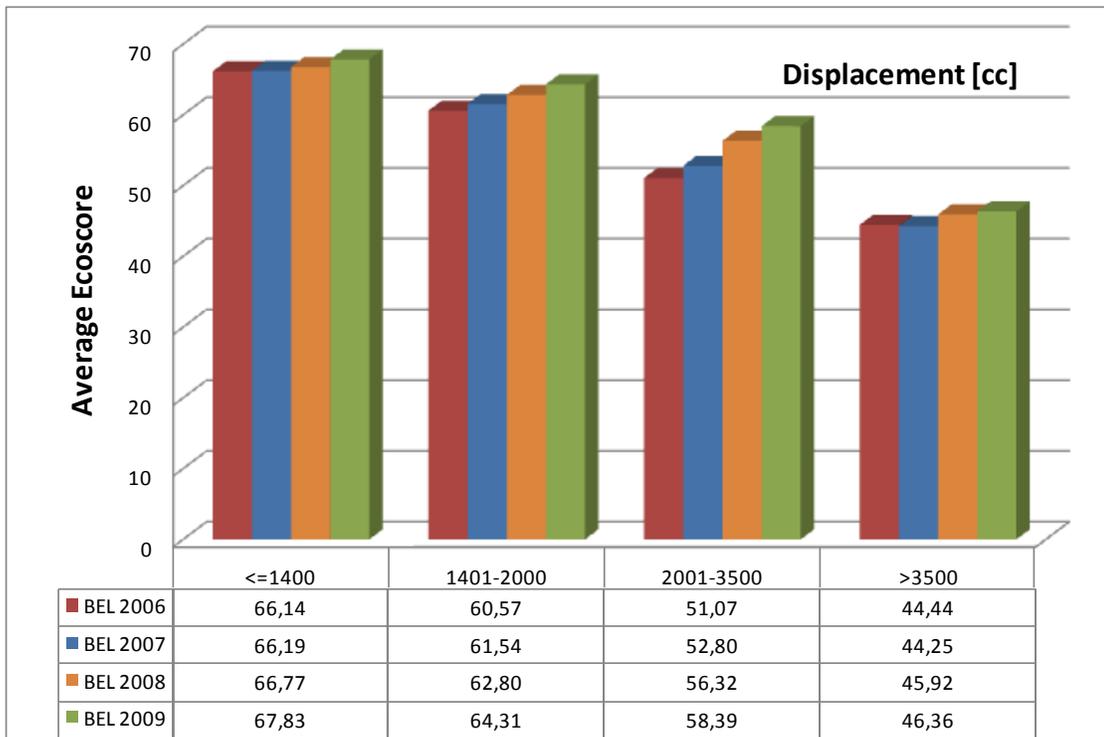


Figure 18: Average Ecoscore in function of the engine displacement of the new Belgian vehicle fleet from 2006 to 2009.

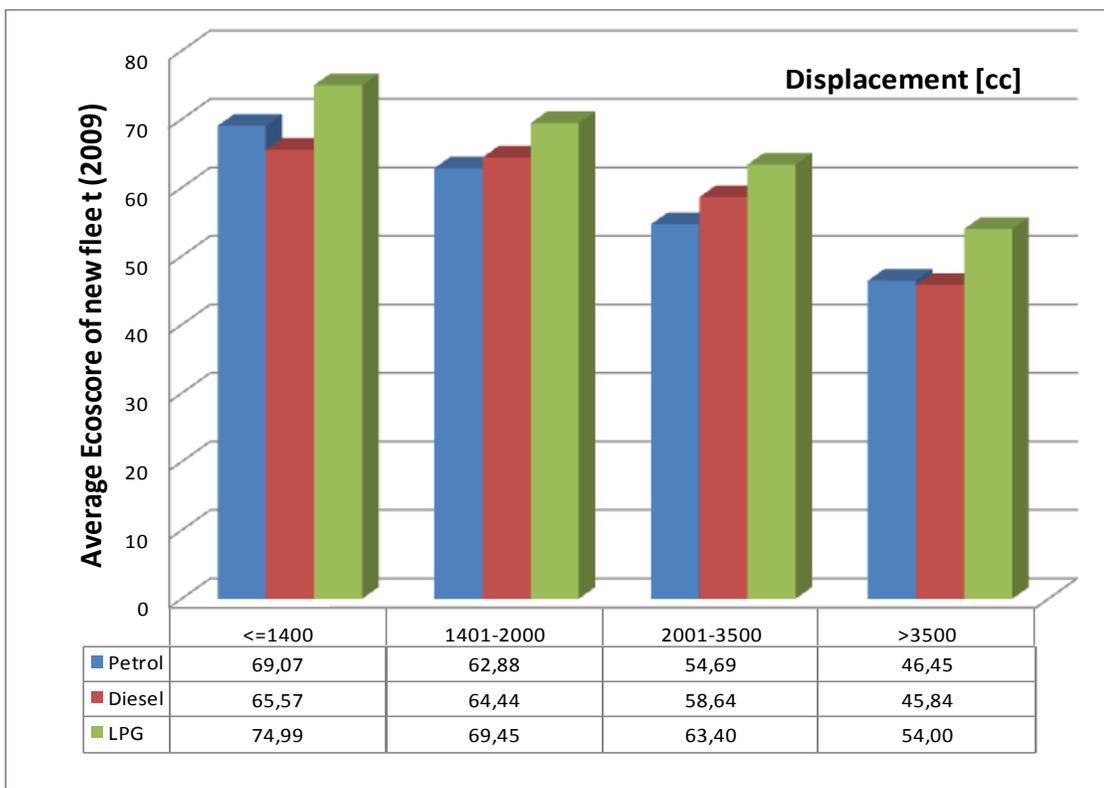


Figure 19: Average Ecoscore in function of the engine displacement for different fuel types of the new Belgian fleet of 2009.

Figure 18 shows that the smaller the vehicle's engine, the higher the Ecoscore. The average Ecoscore of the different displacement classes continually increases over time, with the strongest increase (+14 % since 2006) in the 2001-3500 cc category. New cars with an engine of more than 3500 cc seem to have little space for improvement of their environmental performance.

For all displacement classes, LPG cars have the highest Ecoscores when compared to diesel and petrol vehicles (Figure 19). For the classes with a cylinder capacity below 1400 cc and above 3500 cc, petrol cars show a higher Ecoscore than diesel cars. For the classes in between these values, diesel cars perform better than petrol.

3.3 Engine power

The average engine power of the Belgian fleet in 2009 amounted to 80,51 kW, which is an increase of 2 % since 2006 (Figure 20). The 2009 average value however is slightly lower than for 2008, which has occurred in all three regions. The Flemish region has the highest average engine power (83,59 kW in 2009), closely followed by the BCR (82,93 kW). Vehicles in Wallonia are on the average less powerful, with an average of 74,07 kW.

When comparing the different fuel types (Figure 21), it is clear that petrol cars are in general less powerful than diesel and LPG cars which have similar average numbers. The average engine power has decreased for petrol since 2007, while it has slightly increased for diesel cars over the same period.

Different power classes have been established according to the categories used for the Belgian registration tax (Figure 22). This figure shows a clear difference between mainly petrol and diesel cars: 66 % of new petrol cars have an engine power below 70 kW, while only 35 % of diesel cars belong to this class, followed by the next class of 71-85 kW. Diesel cars are also more represented in the higher power classes than petrol, with an exception for the >155 kW class, since powerful (sports) cars are generally running on petrol. LPG cars tend to follow the same trend as diesel cars: 37 % of new LPG cars can be found in the ≤70 kW class, followed by 30 % in the next category. Their engines are on average more powerful than petrol and diesel engines.

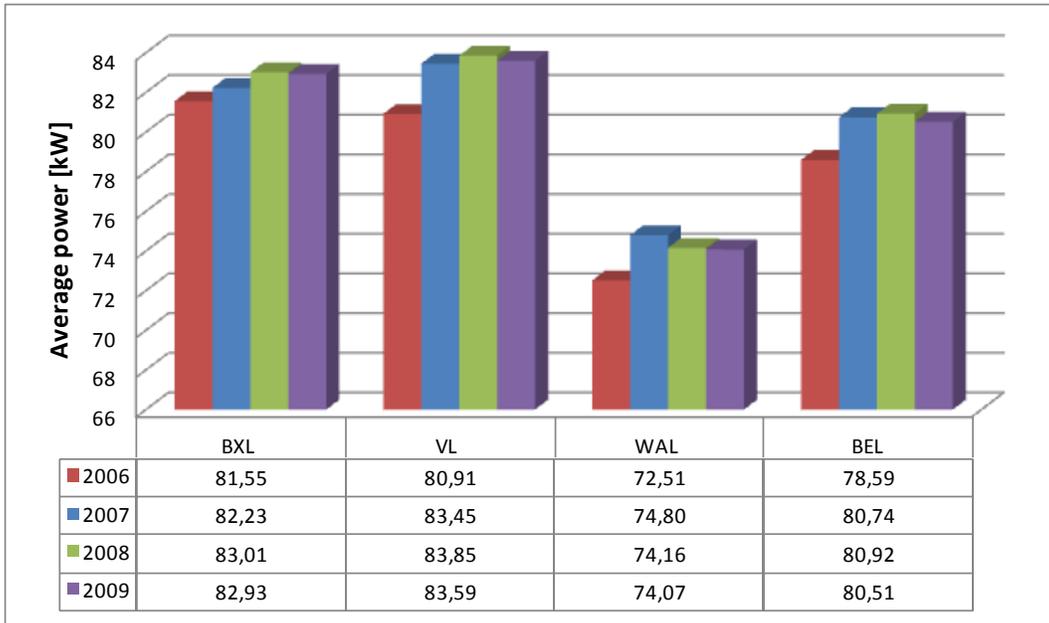


Figure 20: Average engine power of the new fleet for Belgium and the different regions from 2006 to 2009.

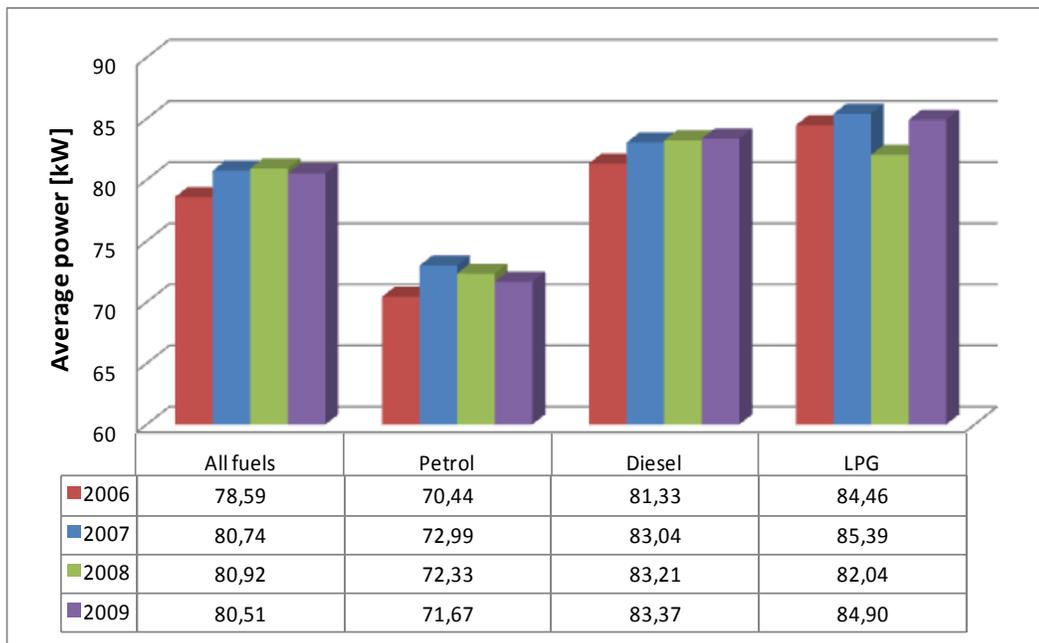


Figure 21: Average engine power of the different fuel types of the new Belgian fleet from 2006 to 2009.

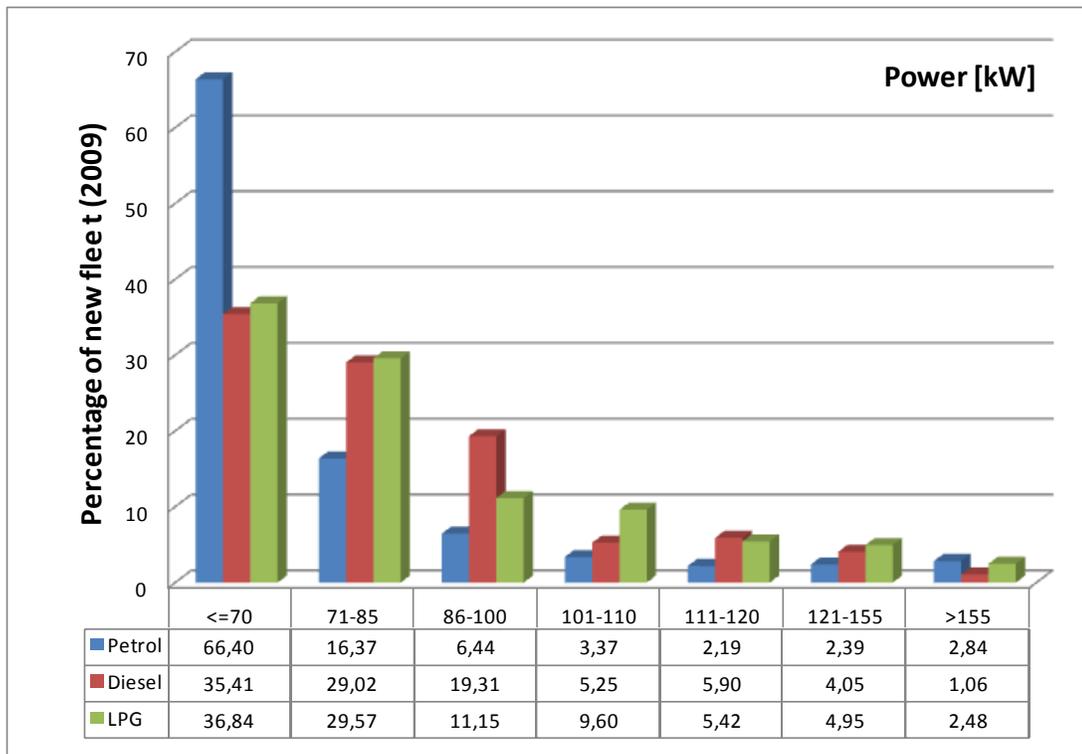


Figure 22: Engine power distribution of the new Belgian vehicle fleet in 2009 for different fuel types.

In Figure 23, it can be seen that the shares of petrol and diesel in the different power classes are fluctuating over the last four years. In 2009, compared to 2008, the share of petrol cars below 70 kW and with 101-110 kW has decreased, while it has increased for the 71-100 kW class.

When looking at the new Belgian fleet in general (Figure 24), the shares of the lower power classes below 85 kW have decreased until 2008, then in 2009 it has increased again. Also more new cars belong to the higher power classes (above 110 kW). In 2009, less new cars were registered with an engine power between 86 and 110 kW. This graph follows the same trend of the diesel cars in Figure 23, since diesel cars make out the majority of new registrations.

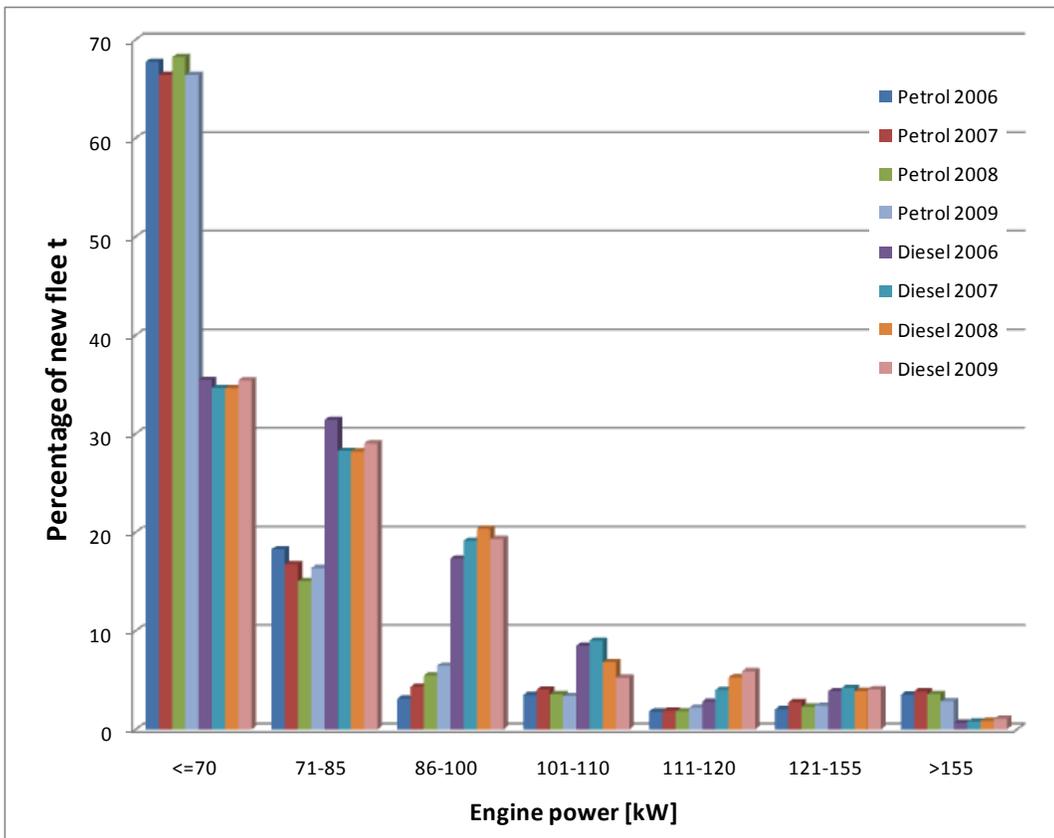


Figure 23: Engine power distribution of the new Belgian vehicle fleet for petrol and diesel cars from 2006 to 2009.

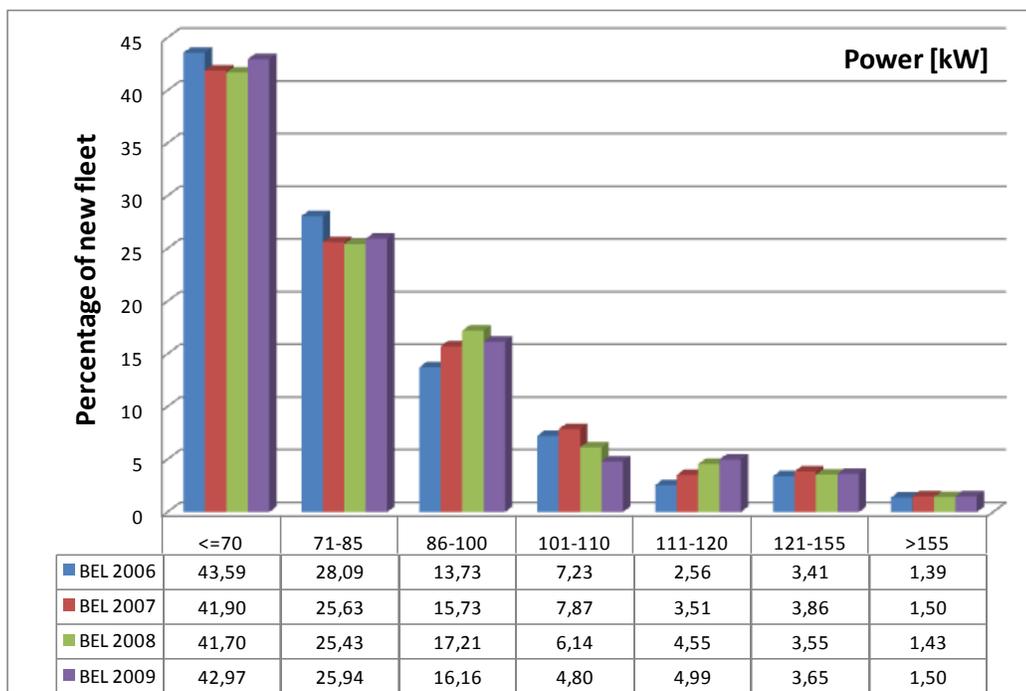


Figure 24: Engine power distribution of the new Belgian fleet from 2006 to 2009.

Figure 25 shows that in general the lower the engine power of a vehicle, the higher its Ecoscore will be. For all assessed years, the Ecoscore goes down gradually for the consecutive power classes. There is however an exception in the 111-120 kW category, which has a higher average Ecoscore than the previous class. This means that efforts have been made to improve the environmental impact of these powerful cars. Compared to 2006, the Ecoscores in 2009 have increased for all power classes, with the strongest effect in the higher power classes. The strongest increase occurred in the 121-155 kW power class, where the Ecoscore is 15 % higher than in 2006.

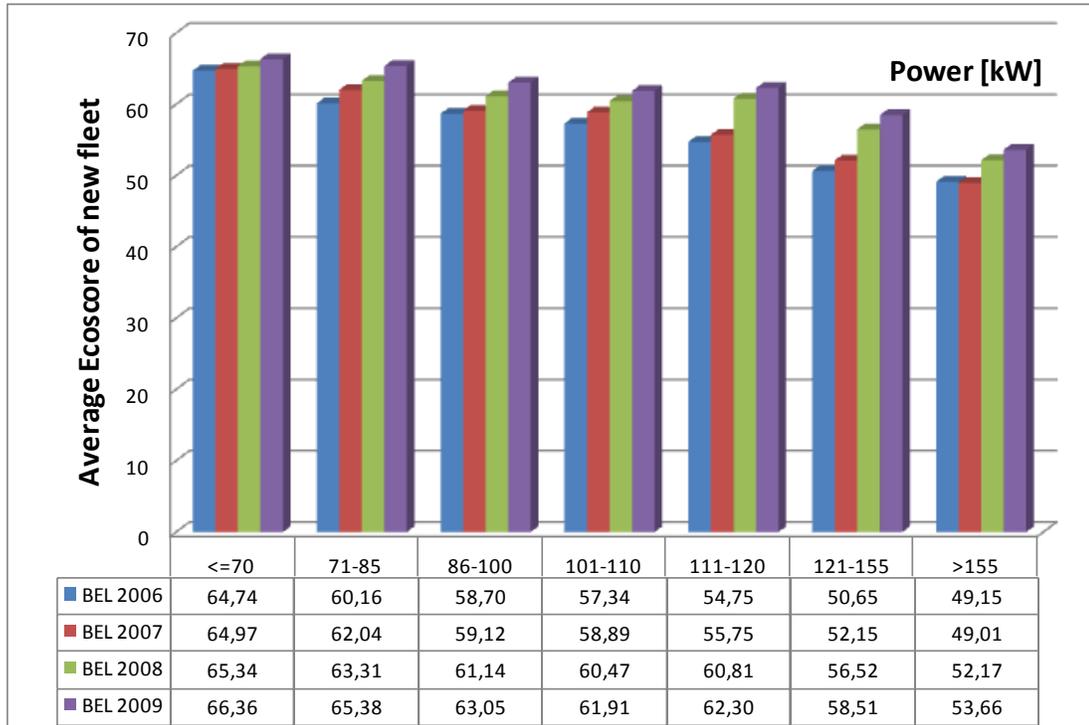


Figure 25: Ecoscore in function of engine power of the new Belgian fleet from 2006 to 2009.

When comparing the Ecoscores of the different fuel types (Figure 26), LPG cars have the best score for all power classes, except for the highest power class (>155 kW), where diesel scores slightly better. Petrol vehicles score better than diesel cars in the lower classes, up to 100 kW. In the power category of 101-120 kW, but especially for >155 kW, diesel cars have a better environmental performance than petrol cars.

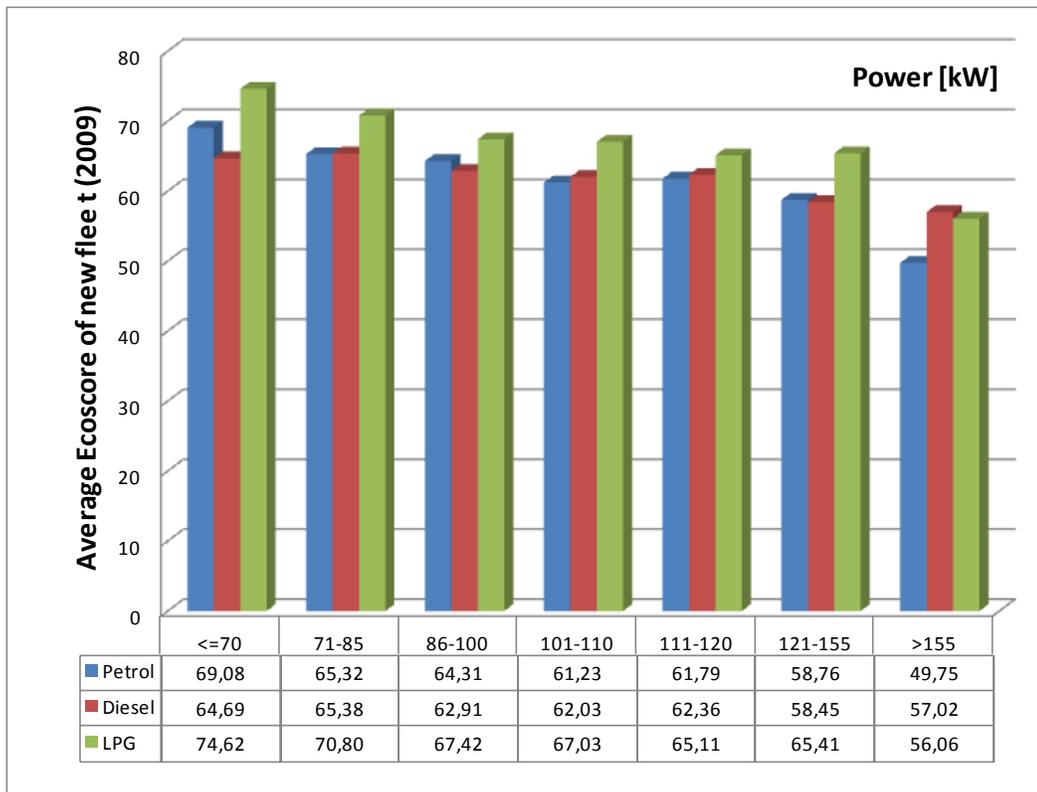


Figure 26: Ecoscore in function of engine power of the new Belgian fleet in 2009, for different fuel types.

3.4 CO₂ emissions

First of all it must be noted that an extra filter has been applied on the CO₂ emissions in the registration databases. Since some records are found of vehicles with extremely low or high CO₂ emissions, these records have not been taken into account for the calculations below. More precisely, vehicles with less than 50 and more than 700 g/km CO₂ were excluded and removed from the analyses. For the new registrations, this means that only 1 to 2 % (2006 to 2009) of the cars are excluded from the analyses. Within the second hand car registrations, this number goes up to 79 %, due to the high number of zero values in the database (see chapter 6.4).

The average CO₂ emission of the new Belgian fleet in 2009 was 142 g/km, a decrease of 8 % compared to 2006 (Figure 27). In 2007, there was only a very small reduction of the CO₂ emissions, which has changed strongly in 2008 and still in 2009. In all regions, the same trend is observed, with the strongest overall decrease in the BCR (-8,28 %). The new Walloon fleet has the lowest average CO₂ emission (135 g/km), Flanders the highest (151 g/km).

Figure 28 shows that diesel cars still have the lowest average CO₂ emissions (141 g/km in 2009) of the conventional fuels, but the difference with petrol cars (144 g/km) is decreasing over time. All fuels have decreased their average emissions, but the strongest improvement was made by petrol cars (8,65 % lower than in 2006). The average emission of CO₂ for LPG cars is a lot higher than for the other fuels, with 171 g/km.

The new petrol and diesel vehicles have been grouped into CO₂ classes according to the CO₂ labeling system, making a distinction between petrol and diesel cars. In 2009, a majority of 53 % of the new

petrol cars has a CO₂ emission between 131 and 160 g/km, although this share has dropped from 58 % in 2008 (Figure 29). The next most populated CO₂ emission class used to be the 161-190 g/km category, which had a share of 24 % in 2007, but only 14 % in 2009. The less CO₂ emitting class of 101-130 g/km has increased dramatically in 2009 from 15 to 26 % over one year. The shares of the most consuming cars (>190 g/km) are overall decreasing. In 2009, for the first time petrol cars emitting less than 100 g/km CO₂ have been registered (1421 cars). So in general, a positive trend is seen towards less CO₂ emitting cars.

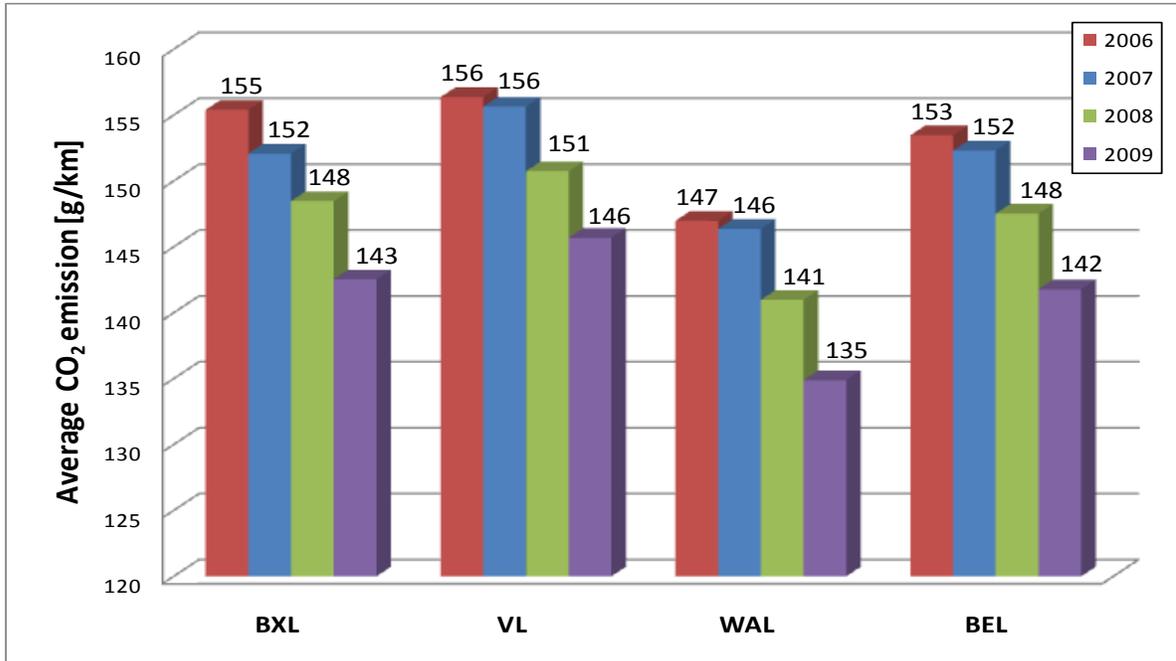


Figure 27: Average CO₂ emission of the new fleet in Belgium and the different regions from 2006 to 2009.

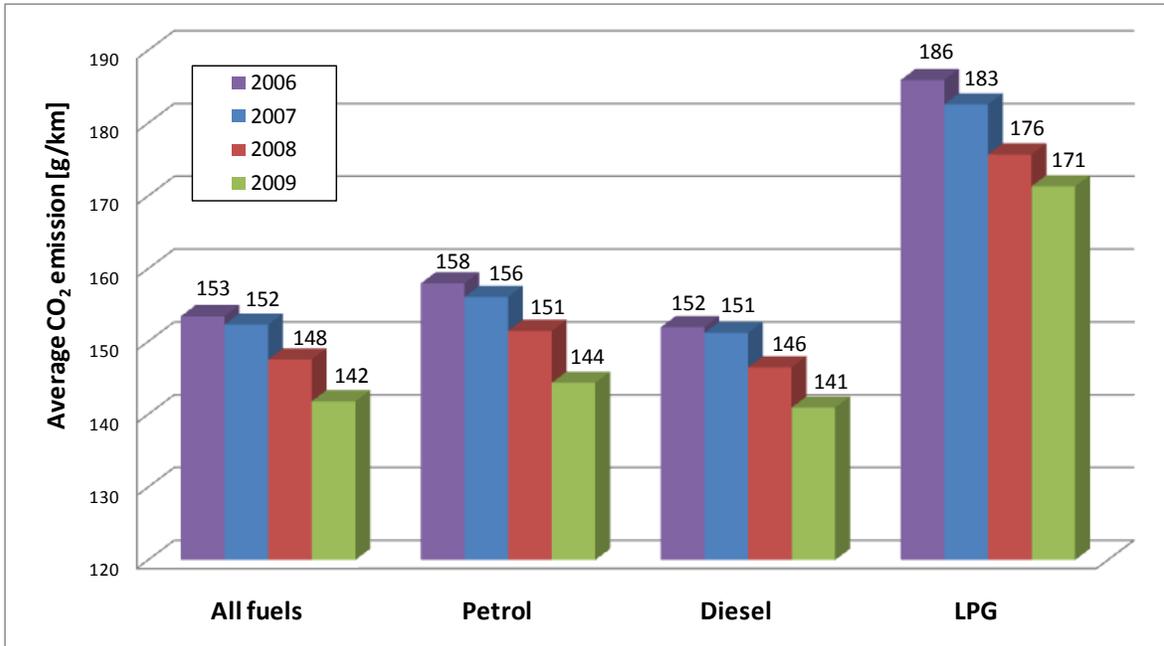


Figure 28: Average CO₂ emission of different fuel types in the new Belgian fleet from 2006 to 2009.

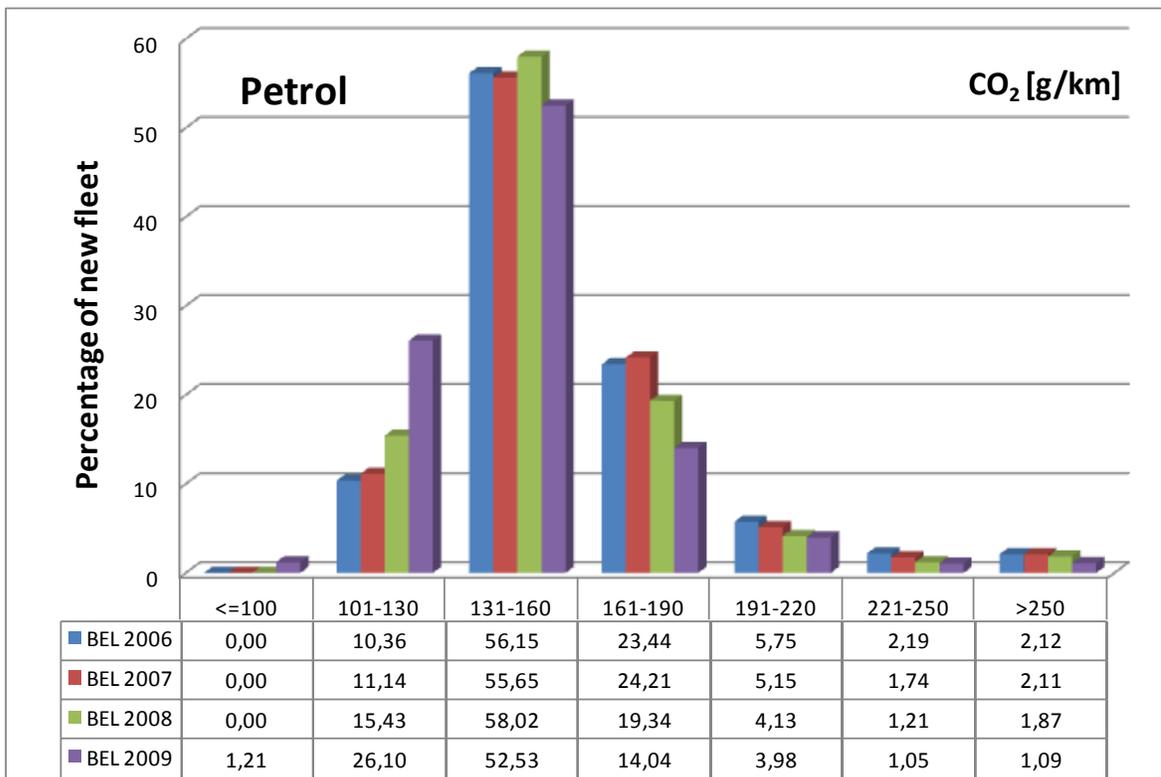


Figure 29: Average CO₂ emissions of the new Belgian petrol fleet from 2006 to 2009.

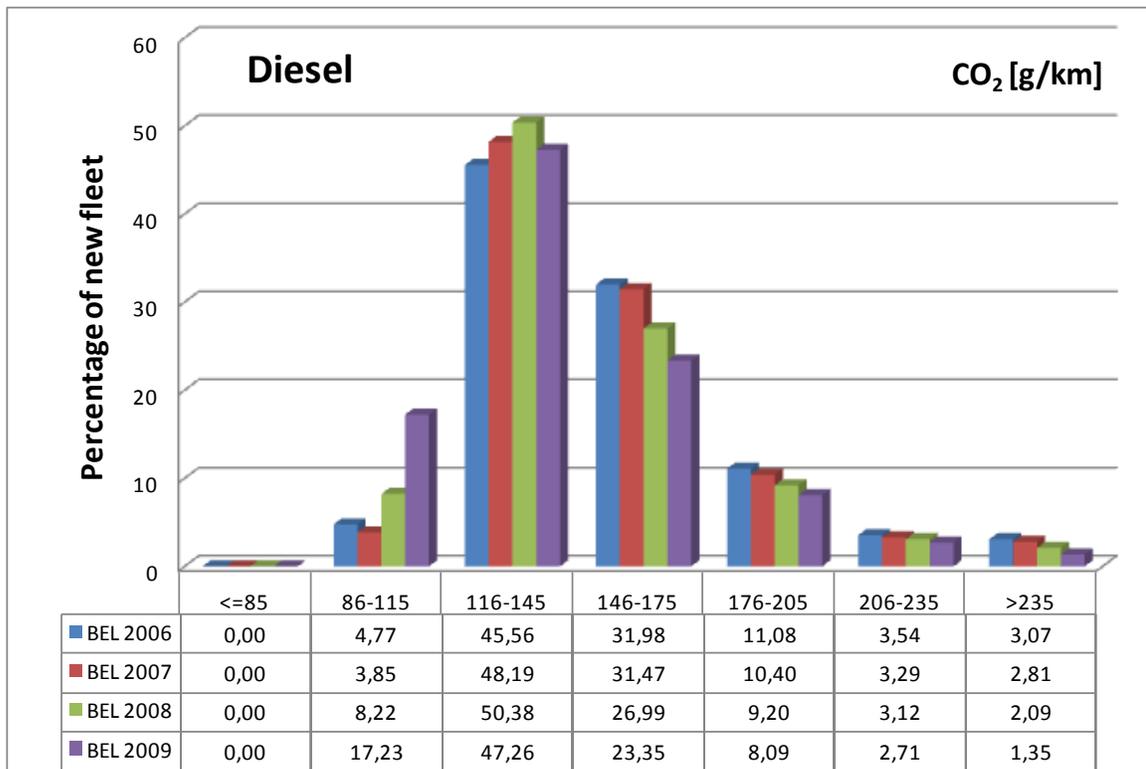


Figure 30: Average CO₂ emissions of the new Belgian diesel fleet from 2006 to 2009.

The most populated CO₂ category for diesel cars is the 116-145 g/km category (47 % in 2009) (Figure 30). The next most populated class is still the 146-175 g/km category, although its share has dropped from 32 % in 2006 to 23 % in 2009. Also the shares of the more consuming cars (>175 g/km) have overall decreased over the last four years. This is compensated by the 86-115 g/km CO₂ class, which has increased strongly from 5 % (2006) to 17 % in 2009. So as for the petrol cars, also diesel cars show a positive trend towards lower CO₂ emissions.

As can be expected, the Ecoscore goes down with increasing values for CO₂ emissions, as can be seen in Figure 31 (petrol) and Figure 32 (diesel). The Ecoscores for petrol cars are still generally higher than for diesel cars. Diesel cars however have seen a stronger improvement of their environmental performance than new petrol cars, especially for the high CO₂ emitting cars (above 176 g/km). The strongest improvement for diesel cars has occurred in the >235 g/km class (+14 % in 2009 vs 2006). Diesel cars have continually improved their environmental performance over the last four years. For petrol cars, there has been less improvement. For some categories, the average Ecoscore has even slightly decreased. This means that diesel cars may still have a margin for further improvement, petrol cars are closer to their limit and should turn more towards the use of hybridization to further reduce their environmental impact.

It has also been investigated which share of the newly registered cars applies for a discount on the purchase price based on the CO₂ emissions. This discount amounts to 3 % for cars belonging to natural persons emitting between 105 and 115 g/km CO₂, or to 15 % when emitting less than 105 g/km. In Belgium, 7,42 % of the new cars could apply for a 3 % discount in 2009, 5,73 % for a 15 % discount. In 2008 these numbers were a lot lower, respectively 4,28 and 1,97 %.

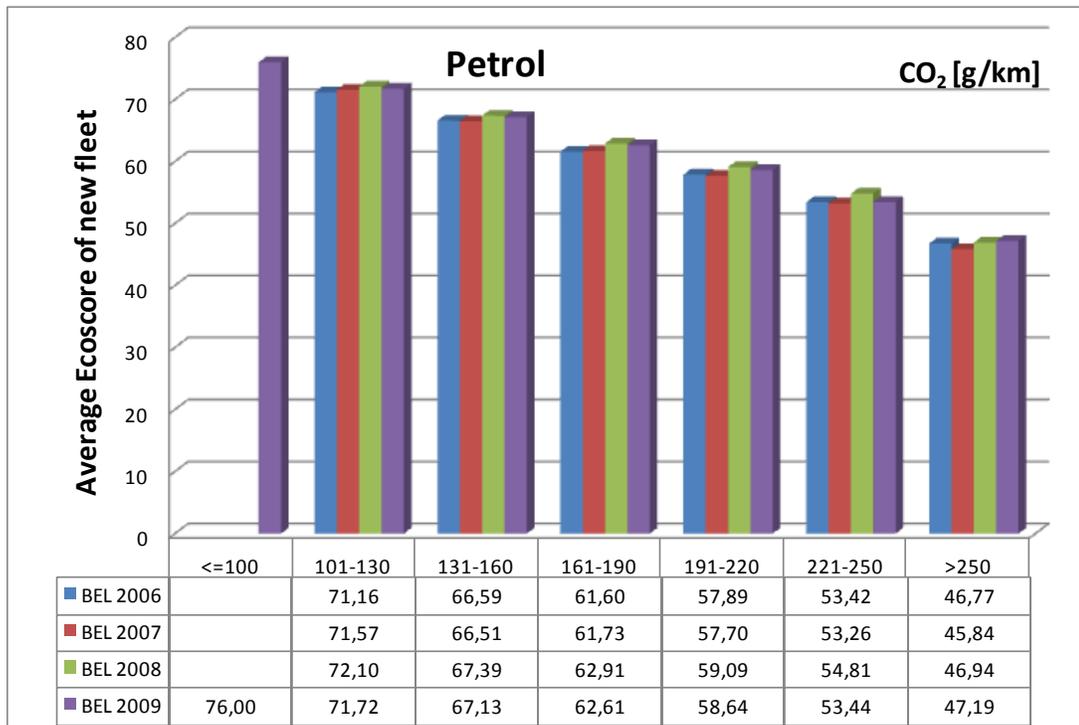


Figure 31: Ecoscore in function of the CO₂ emission of new petrol vehicles in Belgium from 2006 to 2009.

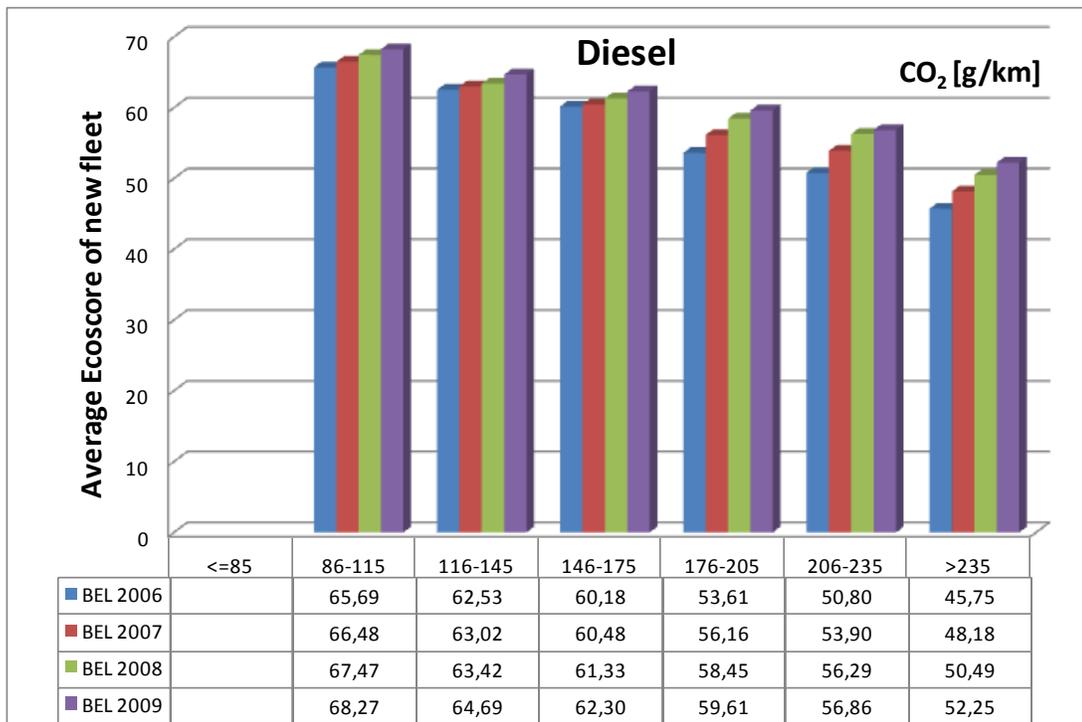


Figure 32: Ecoscore in function of the CO₂ emission of new diesel vehicles in Belgium from 2006 to 2009.

3.5 Particulate Matter (PM) emissions

Since the emissions of particulate matter (PM) are only regulated for all types of diesel cars and for direct injection petrol cars starting from September 2009 (complying with the Euro 5 standard), these analyses have been performed only on new diesel cars. For this indicator, a different approach was used, where we only looked at the presence or absence of a particulate filter with diesel cars, instead of at the average emissions. A car has been assumed to be equipped with a soot filter when it emits less than 11 mg/km of PM. This limit value was suggested by the Flemish government, as to certainly include all cars with particulate filters.

The share of new diesel cars equipped with a soot filter has strongly increased in all the regions, with the highest absolute numbers for Flanders, and then followed by Wallonia and Brussels (Figure 33). Brussels however has the highest relative number of filter-equipped diesel cars: 63 % in 2009, compared to 57 % for the new Belgian fleet (Figure 34). In Flanders, 60 % is equipped with a filter and 49 % in Wallonia. These shares have seen a spectacular increase over the four assessed years: from 21 % in 2006 to 57 % in 2009. The strongest increase has occurred since 2008, which is probably linked with the introduction of the Euro 5 standard in 2009, which makes it necessary for diesel cars to have a filter to comply with the stringent PM limits. The high share of diesel cars with a soot filter in the BCR can be explained by their large number of company car registrations (see chapter 4.3). These cars have a high renewal rate and hence comply with the most recent emission standards.

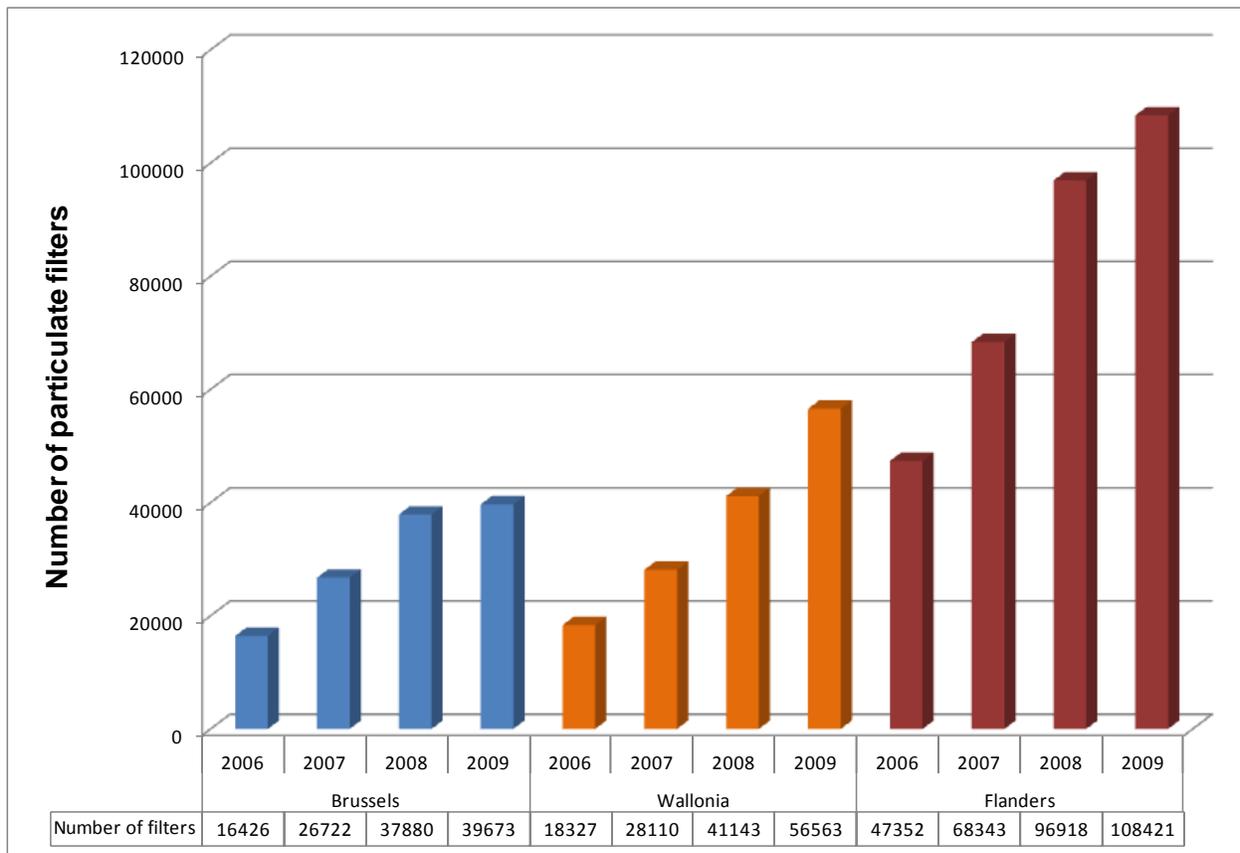


Figure 33: Absolute number of diesel cars equipped with a particulate filter in the new Belgian fleet from 2006 to 2009.

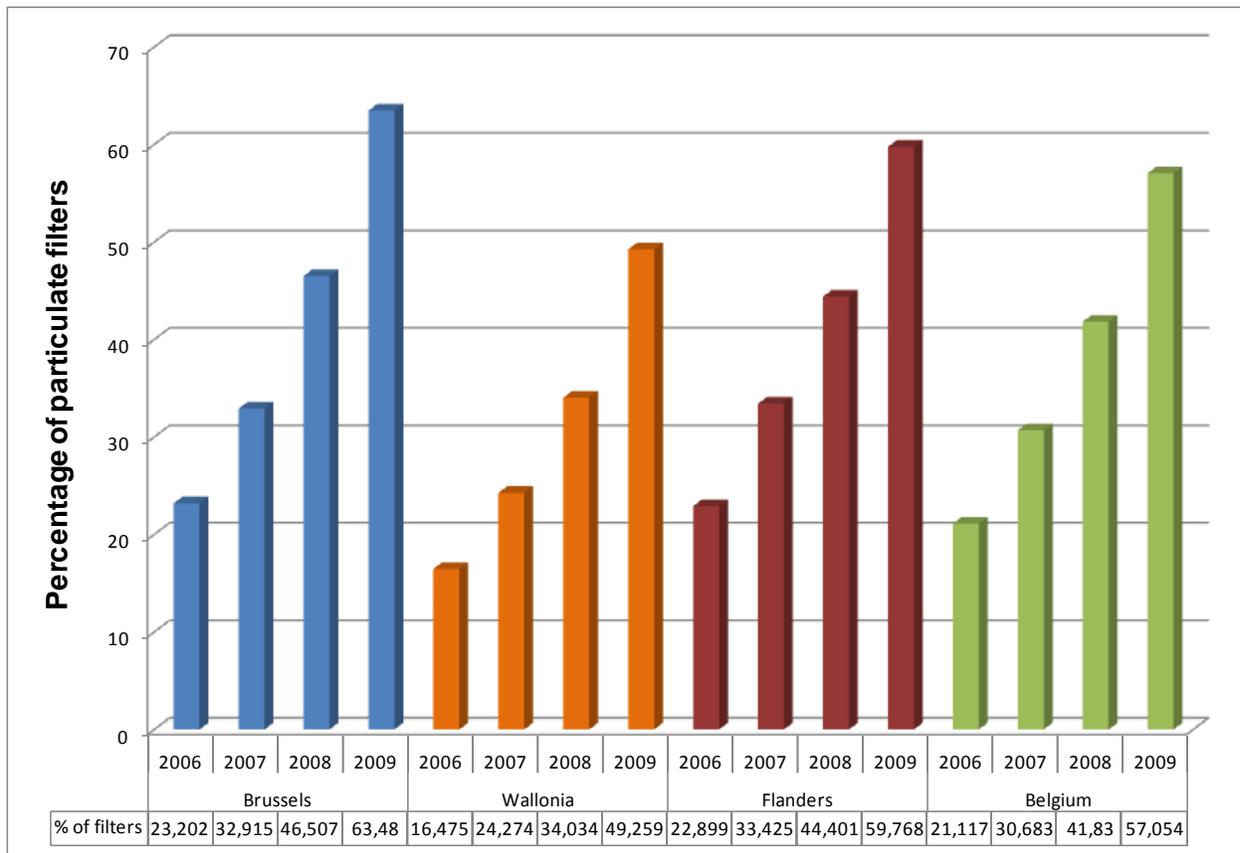


Figure 34: Percentage of diesel cars equipped with a particulate filter in the new fleet for the different regions, from 2006 to 2009.

Figure 35 shows the distribution of diesel cars equipped with a particulate filter over the different Euro classes. It is clear that in the fleet of 2006, the majority (68 %) are Euro 4 cars without particulate filter. In 2009 however, this share has shrunk to 42 % and more cars are equipped with a filter. While in 2006 only 21 % had already this filter, in 2009 this was 57 %, consisting of 36 % Euro 4 and 21 % Euro 5 diesel cars.

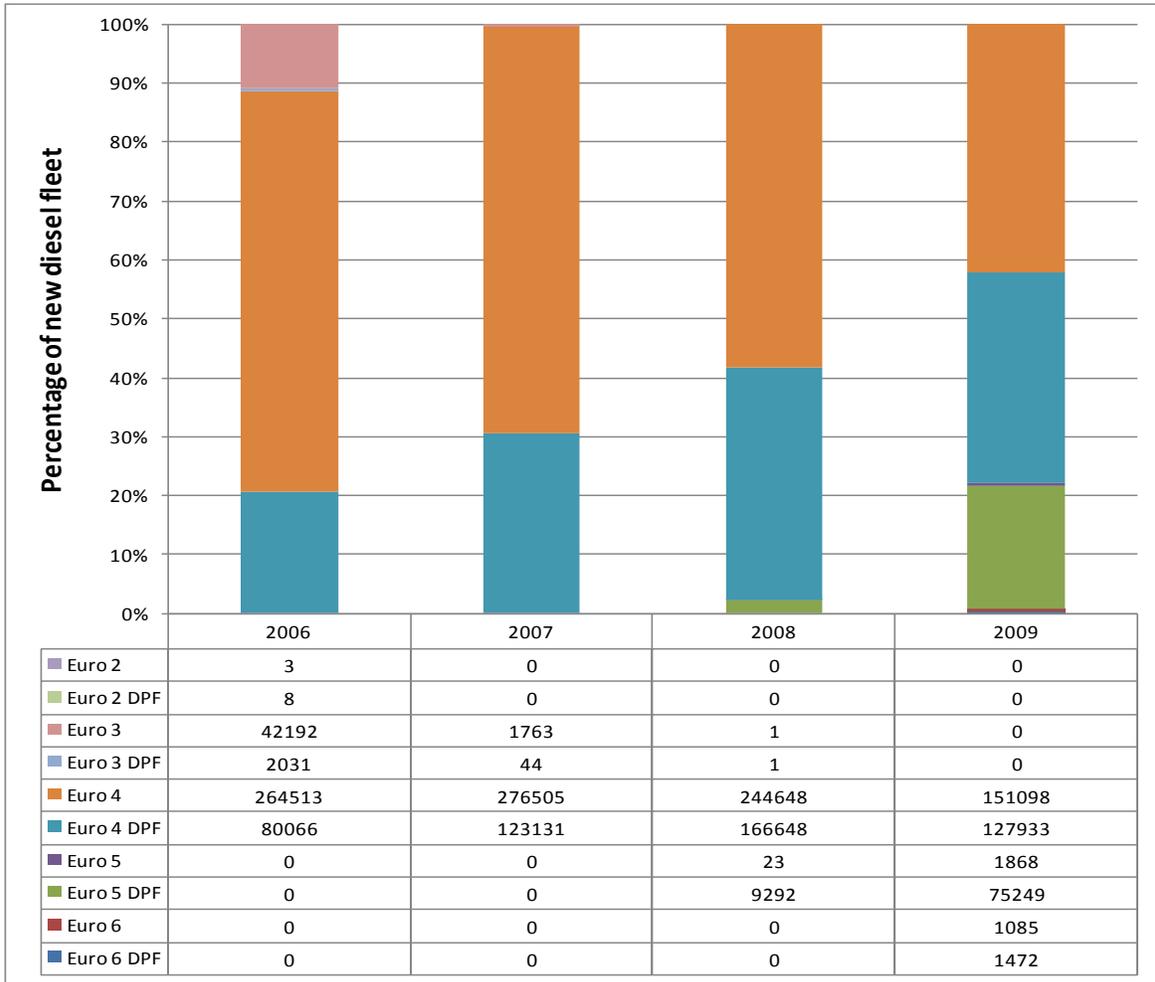


Figure 35: Distribution of new diesel cars with or without particulate filter (DPF) for the different Euro classes in Belgium, from 2006 to 2009.

4. The impact of company cars on the new vehicle fleet

In VITO's report of the total vehicle fleet³, as well as in the new vehicle registrations, it has been noticed that the BCR often has a special position. Brussels for instance has a higher share of new registrations, diesel cars and particulate filters than the other regions. Also the average Ecoscore of the new fleet in Brussels has shown the strongest increase in Ecoscore over the last four years. These differences have been assumed to be caused by the high number of company cars registered in Brussels compared to the other regions and the specific characteristics of these company cars. Company cars are replaced on a regular basis, are influenced by other regulations, such as the CO₂ regulations for company cars and also the company image plays a role when buying these cars. To verify the above hypotheses, new fields have been added to the DIV database of new registrations of 2008 and 2009 with the following information:

Code	Number (2008)	Number (2009)	Meaning of code
1	307047	305320	Car owned by a natural person
2	228598	181663	Car owned by a legal body
3	2535	2767	Cars with special license plates
4	6	0	Cars with special license plates/owned by foreigners
5	1	0	Old data from the previous Registration Service without link to the National Persons Register
8	455	342	Cars owned by a natural person, put in a temporary register

Only the records with code 2 have been considered to be company cars, since it is not possible to distinguish company cars from the categories 3, 4 or 5. It is also indicated whether the legal body is a member of Renta, the Belgian Federation of Car Renters. These cars are considered to be 'leased' company cars, the others as 'bought' company cars. For cars owned by a natural person, only records with code 1 were taken into account, which is conform to the analyses performed by VITO on the total fleet.

4.1 Company car distribution

Of a total number of 538.642 newly registered vehicles in Belgium in 2008, 228.598 cars are company cars, so 42 % of the new fleet. The majority (54 %) of these company cars are leased cars. In 2009, less new vehicles were registered (490.094), but also the share of company cars has gone down to 37 %. The share of leased cars within the company cars has also dropped to 49 % in 2009. Figure 36 shows a clear distinction in the share of company cars between the different regions. As expected, Brussels has the highest share with 52 % leased and 24 % bought company cars in the new fleet of 2009. In Flanders, these shares are respectively 18 and 20 % of the new cars (2009). In absolute numbers however, Flanders has more leased and bought company cars than Brussels. Wallonia has only a minor amount of newly registered company cars, with a share of 0,02 % leased and 15 % bought company cars

³ "Analysis of the Belgian car fleet 2008", Michiel Vanderschaeghe & Tobias Denys, VITO, June 2009, 2009/TEM/R/185

in their new fleet of 2009. This shows that the share of bought company cars is quite similar between the different regions, the main difference however lies in the leased company cars. In this respect, the BCR holds a special position in Belgium. When comparing the new registrations for 2008 and 2009, all numbers have decreased, so less new cars are registered, both for private and company cars, which might be due to the economical crisis. Wallonia however, is the only region where a small increase of privately owned cars can be observed.

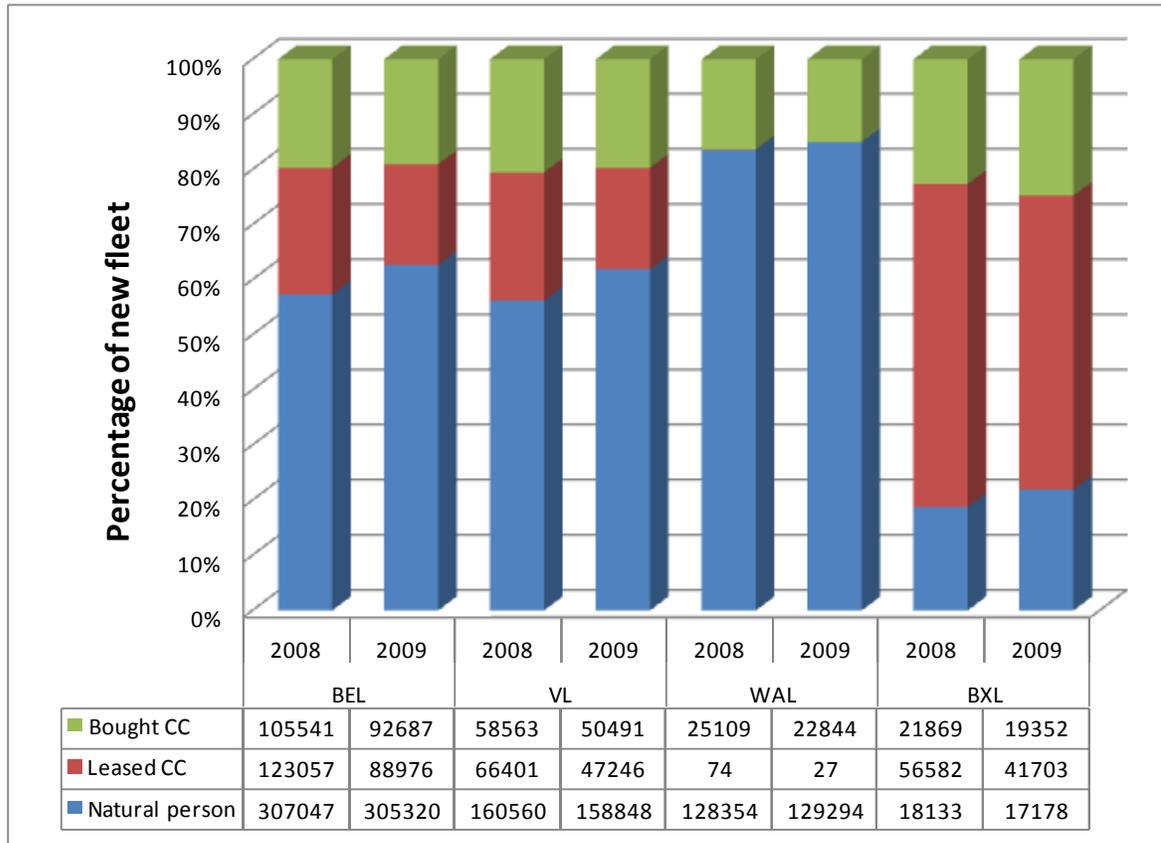


Figure 36: Distribution of leased and bought company cars (CC) and private cars (Natural person) in the new fleet for Belgium and the different regions in 2008 and 2009.

4.2 Company car fuel type distribution

In Figure 37, the distribution of the different fuel types for company and private cars is shown for 2009. For all regions, it is clear that the share of diesel cars is much higher within company cars compared to private cars. For Belgium, 91 % of the leased company cars run on diesel, compared to 68 % of the private cars. In Flanders, even 93 % of the leased company cars use diesel. The share of diesel within the bought company cars is a little lower than for leased cars, for Belgium this share amounts to 86 %. In Wallonia however, contrary to the other regions, the share of diesel is higher for the bought company cars than for the leased ones. This is explained by the very small number of leased cars in Wallonia (27 in 2009).

When comparing the years 2008 and 2009 (Figure 38), the absolute numbers decrease for company and private cars. Only for private cars, more petrol cars are registered in 2009 compared to the year

before. Also more CNG cars have been registered as bought company car. For all categories however, the share of petrol has increased, up to 3 % for private cars.

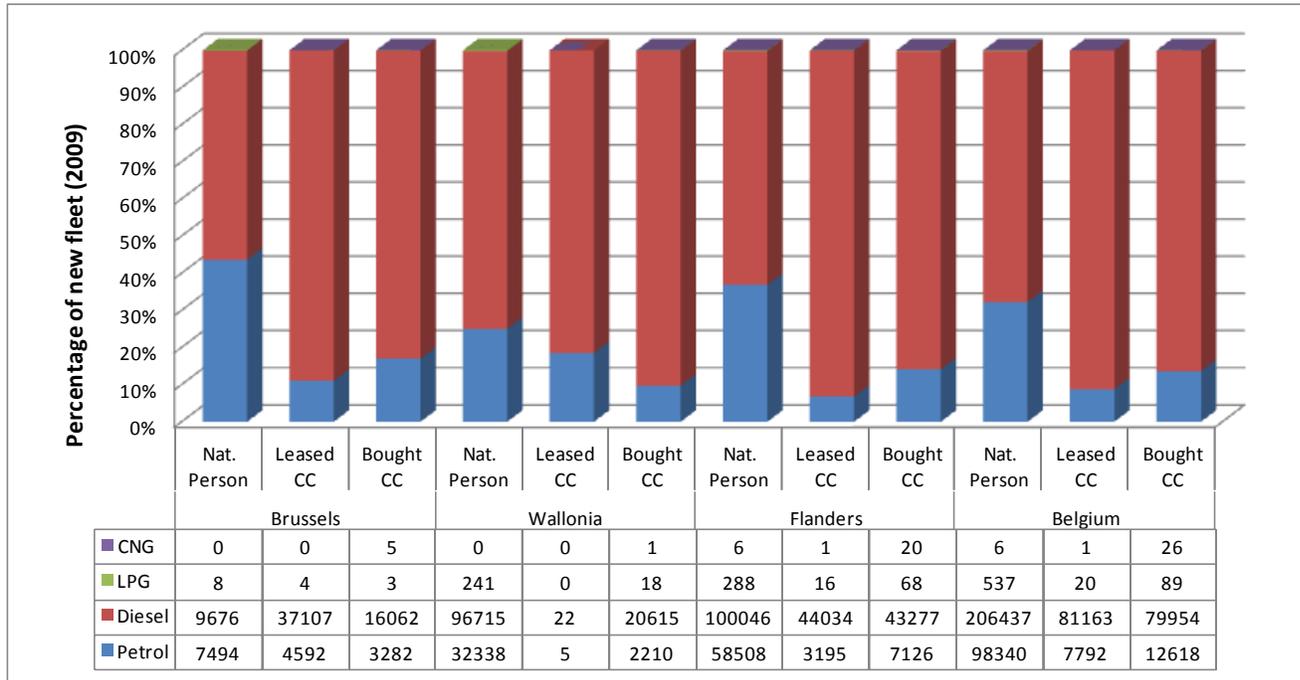


Figure 37: Fuel type distribution of leased and bought company cars (CC) and private cars for Belgium and the different regions in the new vehicle fleet of 2009.

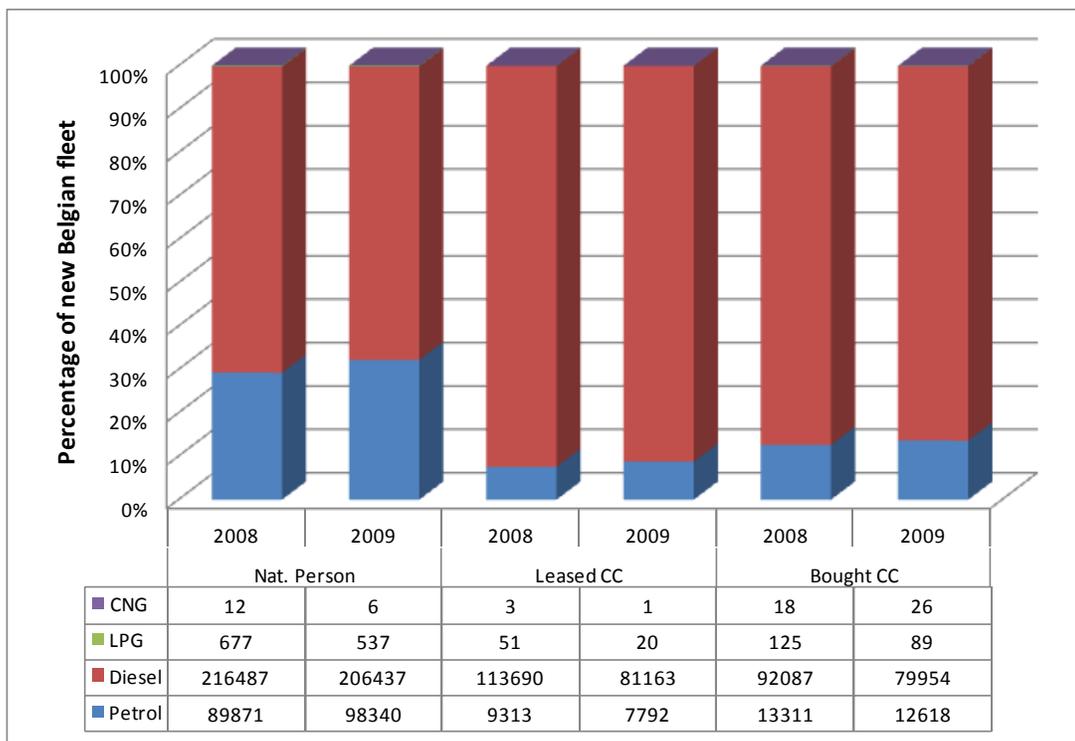


Figure 38: Fuel type distribution of leased and bought company cars (CC) and private cars for Belgium in the new fleet of 2008 and 2009.

4.3 Indicators of the company car fleet

When we take a look at the average indicators of the new Belgian fleet of 2008 and 2009 in Table 2, some clear trends can be observed. The average displacement, power, vehicle weight and CO₂ emissions are always highest for the bought company cars, followed by the leased company cars. So especially bought company cars are on the average more powerful, heavier and more consuming vehicles than private cars, which can be explained by the fact that these cars are generally larger cars. This is also reflected in the average Ecoscore: the highest Ecoscore is obtained by private cars (65,32 in 2009), followed by the leased company cars (64,49) which score better than bought company cars (62,78). When comparing these indicators for 2008 and 2009, the average displacement, weight and CO₂ emissions have decreased for the three studied categories. The only exception is the engine power, which has increased for all three, with the smallest increase for the private cars. This means that the average Ecoscore has increased in 2009, with the strongest impact on the leased company cars (+3 %).

Another indicator is the percentage of particulate filters on diesel cars (Table 2). Here we see that company cars perform much better than private cars. In 2009, 68 % of leased and 62 % of bought diesel company cars were equipped with a soot filter, compared to 50 % for private diesel cars. The share of cars equipped with a filter has also risen spectacularly: +19 % for leasings, + 12 % for bought company cars and + 15 % for private cars, in one year time. This is of course linked to the introduction of the Euro 5 emission standard in 2009, requiring the use of a filter.

Table 2: Average indicators (or percentage of new diesel cars) of the new Belgian fleet of 2008 and 2009, with a distinction between leased and bought company cars (CC) and private cars (Nat. person).

Indicator	Leased CC		Bought CC		Nat. Person	
	2008	2009	2008	2009	2008	2009
Avg. Displacement [cc]	1792,86	1773,72	1933,02	1910,64	1599,20	1574,49
Avg. Power [kW]	85,44	85,81	95,82	96,53	73,83	73,98
Avg. Weight [kg]	1509,18	1508,83	1570,82	1567,13	1374,15	1366,81
Avg. CO ₂ emission [g/km]	146,22	140,65	160,96	154,75	143,33	138,03
Particulate filter [%]	48,55	67,88	49,73	62,48	34,81	50,48
Avg. Ecoscore	62,65	64,49	61,37	62,78	63,88	65,32

The distribution of the CO₂ emissions shows a clear difference between the different types of company cars and private cars. Private cars and leased company cars show similar patterns for petrol cars: both are more represented in the lower CO₂ classes, while bought company cars are found more between the higher CO₂ classes (Figure 39). There is a clear positive trend in 2009 compared to the year before: the shares of the ≤130 g/km CO₂ class increase for all categories. For leased company cars, there's also an increase in the next class, but for the other categories the shares of this class and the next ones go down.

For both leased and private cars running on diesel, 69 % emits less than 145 g/km CO₂ (compared to 50 % for bought CC) in 2009 (Figure 40). Private cars, however, can be found twice as often in the <115 g/km CO₂ class as company cars, but they are less represented in the next class than leased cars. As for the petrol cars, bought diesel company cars are always the most represented in the highest CO₂ emission classes (>175 g/km). For the diesel cars, the same trend in time can be observed as for the petrol cars, with an exception for the bought company cars which also increase slightly in the 116-145 g/km class.

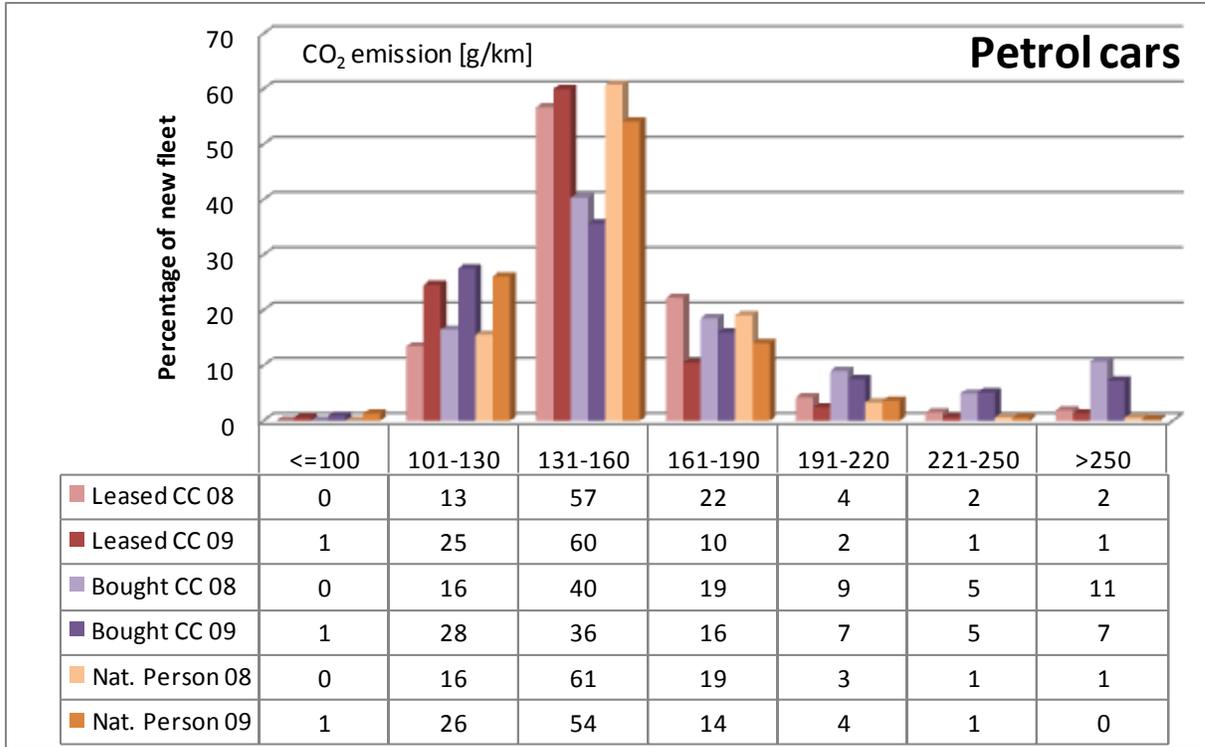


Figure 39: CO₂ emission distribution of petrol company cars (CC) and private cars (Nat. person) in the new Belgian vehicle fleet of 2008 and 2009.

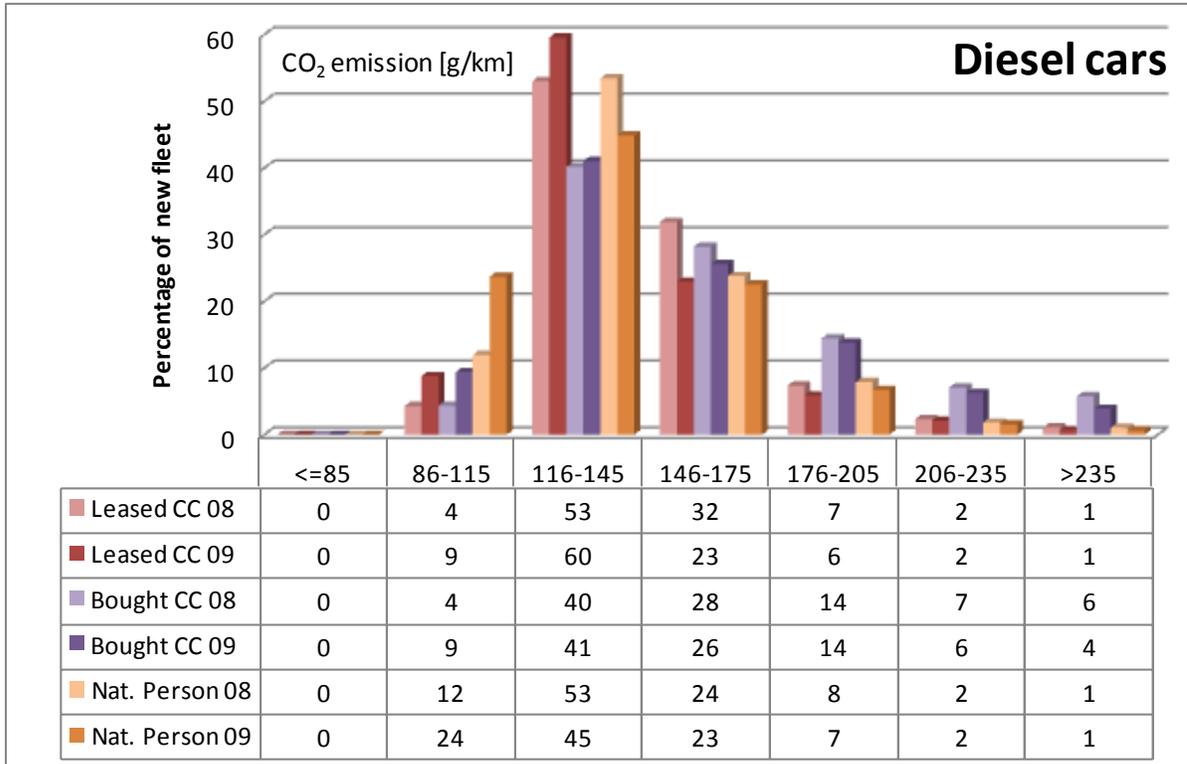


Figure 40: CO₂ emission distribution of diesel company cars (CC) and private cars (Nat. person) in the new Belgian vehicle fleet of 2008 and 2009.

Figure 41 shows of shares of the different vehicle types in the population of diesel cars equipped with a particulate filter. In the Belgian fleet, half of these cars are owned by natural persons, while the other half are company cars (in 2009). This corresponds to the distribution of the Flemish fleet. In Brussels however, only 13 % of these cars are private cars, the vast majority are company cars (62 % leased, 25 % bought). So as was already postulated earlier, the large share of particulate filters in Brussels is almost entirely due to the company cars registered in this region. In Wallonia, the opposite is seen. Here, 80 % are private cars, since only very few (leased) company cars are registered in this region. Compared to the previous year, in general the share of private cars has increased in all regions, so private cars are catching up with company cars regarding the equipment with particulate filters.

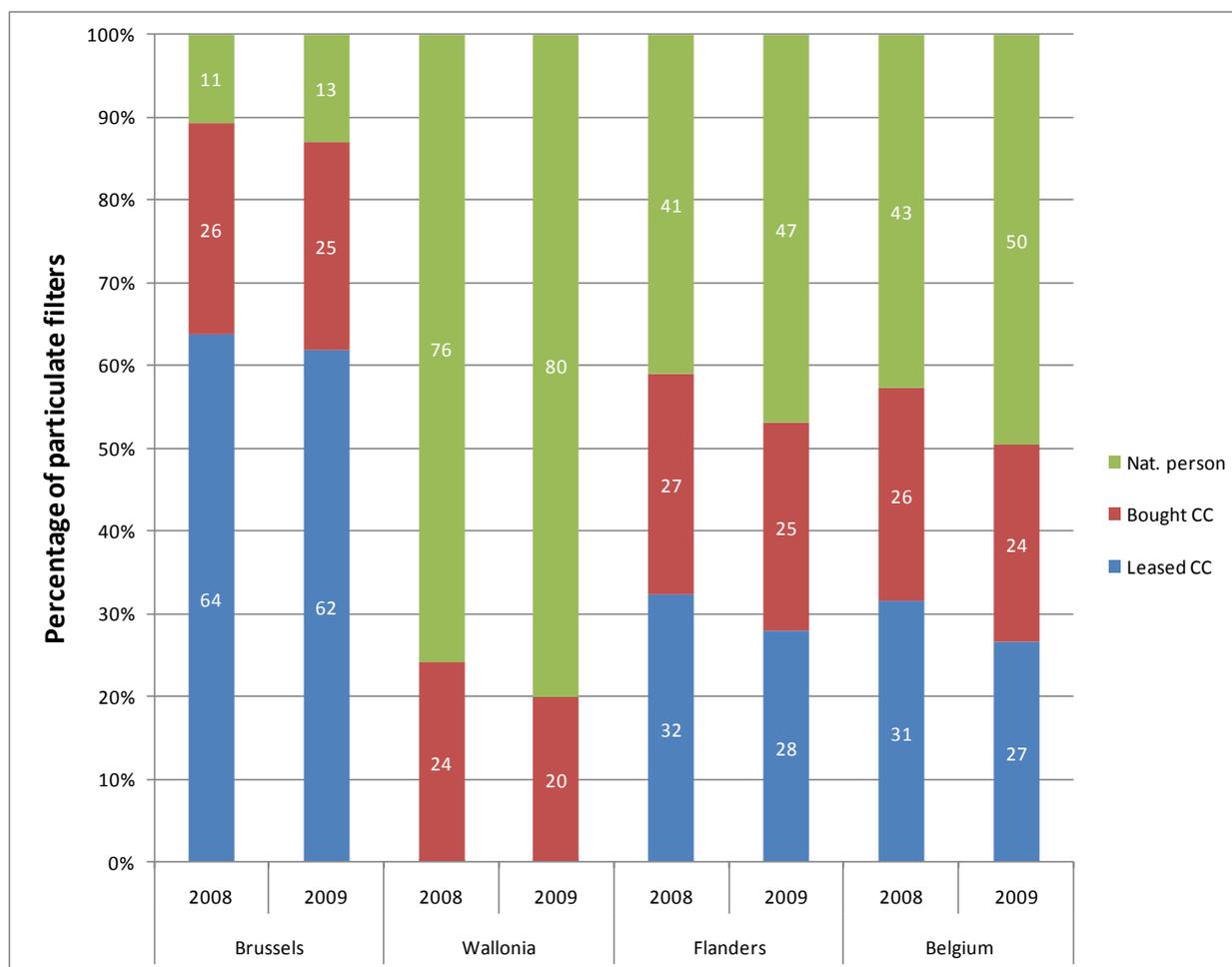


Figure 41: Distribution of the type of car (leased or bought company car/private car) within new diesel cars equipped with a particulate filter in Belgium for 2008 and 2009.

Finally, the distribution is presented of the Ecoscores of company and private cars in the new Belgian fleet of 2008 and 2009 (Figure 42). This figure shows that private cars tend to have higher Ecoscores, while company cars are more represented in the lower Ecoscore classes. The majority of every type of car is found in the Ecoscore class of 61-65, with the highest share for private cars (48 %) in 2008, followed by leased company cars (44 %) and bought company cars (41 %). In 2008, private cars showed the highest shares in all three classes above Ecoscore 60. In 2009 however, leased company cars have the highest shares between Ecoscore 60 and 70, above 70 private cars are still by far the most

populated (15 % versus resp. 7 and 6 % for leased and bought company cars). The shares of all vehicle categories in the Ecoscore classes below 60 have all decreased in 2009, while above 60 they have all increased, except for private cars in the 61-65 Ecoscore class.

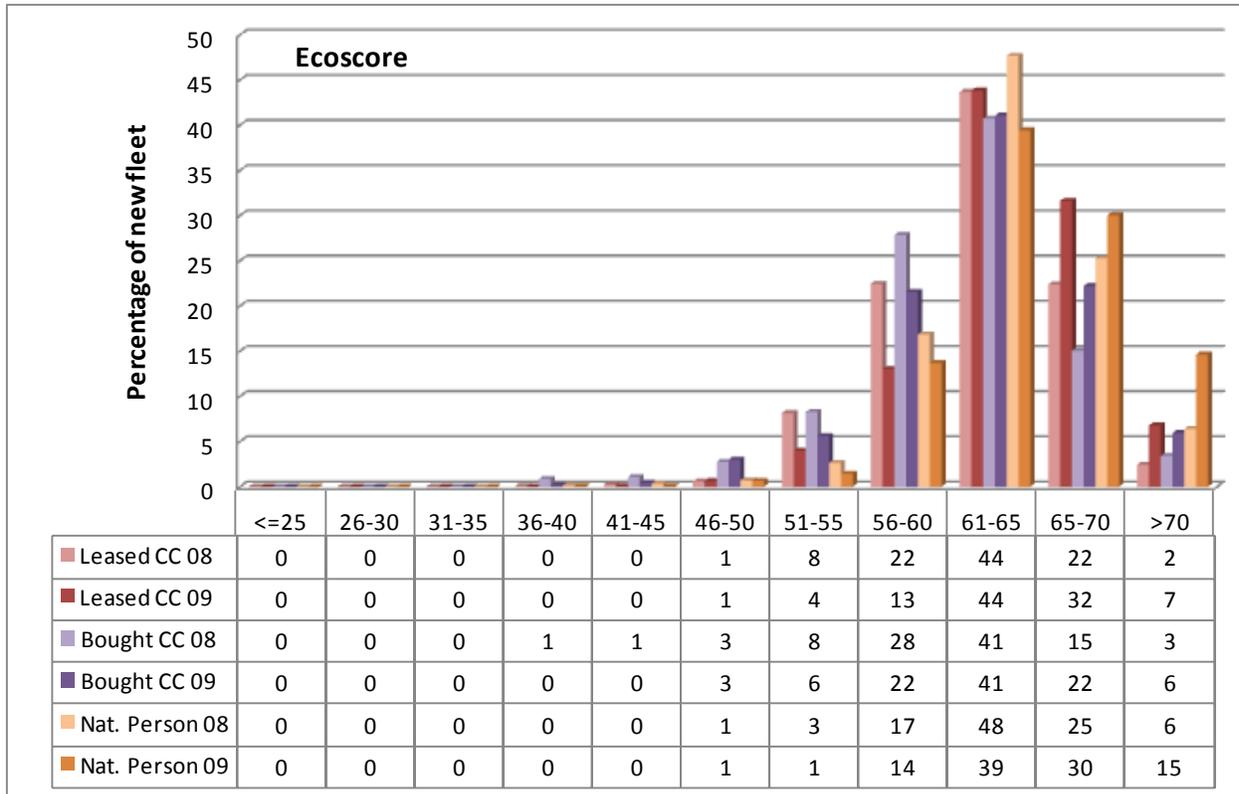


Figure 42: Ecoscore distribution of company cars (CC) and private cars (Nat. person) in the new Belgian vehicle fleet of 2008 and 2009.

5. Composition of the second hand Belgian vehicle fleet

5.1 Total numbers

In 2009, 670.440 passenger cars were registered as second hand (or “used”) cars at the Federal service for vehicle registrations (DIV). This means that 13 % of the total fleet of 2009⁴ was registered as used cars, compared to 9 % for newly registered cars. In Table 3 it can be seen that the number of second hand cars has decreased until 2008, after which an increase has occurred, except for the Brussels Capital Region. The decline and then growth were the strongest in Wallonia, Brussels has seen a continuous decrease of used car registrations. So while the new cars have seen a decline in 2009, more second hand cars were registered instead. In the years before, the new registrations were slightly increasing, while used cars were decreasing. Hence, registrations of new and used cars tend to be complementary to each other.

Table 3: Total number of second hand car registrations and annual growth/decline of the ‘used’ car fleet for the different regions and assessed years.

Year	2006	2007	2008	2009
Total number	704909	668349	656654	670440
Growth Belgium	--	-5,19	-1,75	2,10
Growth Flanders	--	-4,84	-0,85	2,48
Growth Wallonia	--	-5,91	-2,47	2,77
Growth BCR	--	-4,52	-3,63	-1,64

The used car fleet in Flanders consisted of 358.042 cars in 2009, compared to 237.155 in Wallonia and 75.243 in Brussels (Figure 43). In this figure, the same trends can be observed as in Table 3.

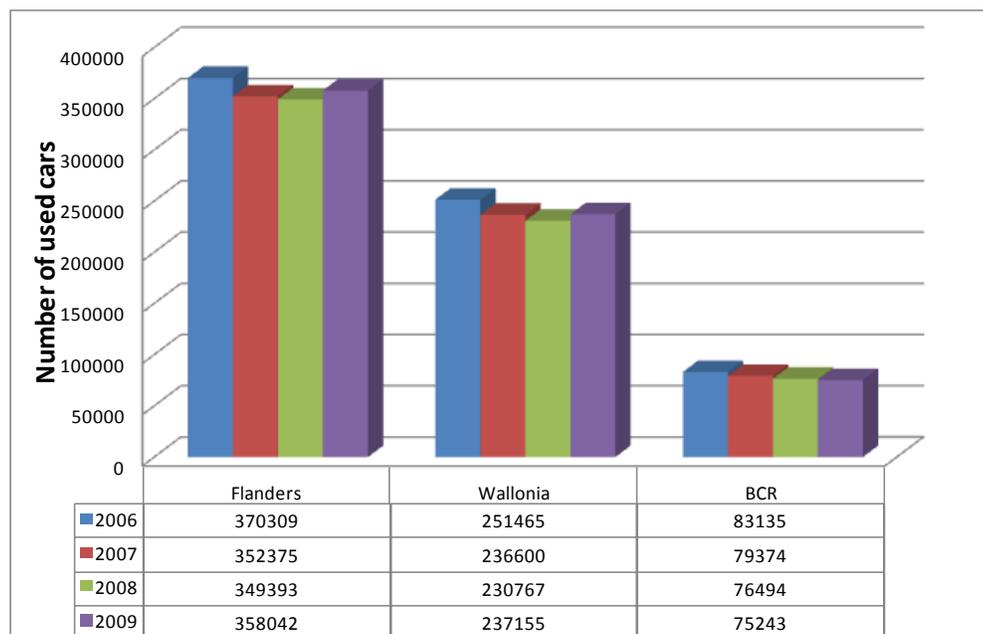


Figure 43: Number of used passenger cars registered in the different Belgian regions from 2006 to 2009.

⁴ On 01/08/2009, the total Belgian passenger car fleet amounted to 5.192.566, based on data from Statbel.

5.2 Fuel type distribution

Even more than for the new vehicles in Belgium, second hand cars show a ‘dieselification’ trend over the last years (Figure 44 and Figure 45). Since 2006, the share of used diesel cars has continually increased, while the share of petrol cars follows the opposite trend and is complementary. In contrast to new registrations, also in 2009 the increasing trend continues for second hand cars. This evolution occurs in all regions in a similar way, but the Flemish used fleet still has a slightly higher share of diesel cars (61 %) than the Brussels’ fleet (60 %). While in 2006, diesel and petrol cars were still more or less equally spread over the used fleet (52 % diesel, 46 % petrol), the balance has turned more and more towards diesel cars in the following years, with 60 % diesel and 39 % petrol cars in 2009. So diesel cars become increasingly popular on the second hand market and are less affected by the economical crisis than new cars of which the number has decreased in 2009.

For alternatively fueled cars, only minor numbers are registered as second hand cars: only 1 CNG car (in 2009) and 6 BEV’s (2006-2009). A lot more LPG cars are registered, although their numbers are decreasing strongly: -38 % since 2006.

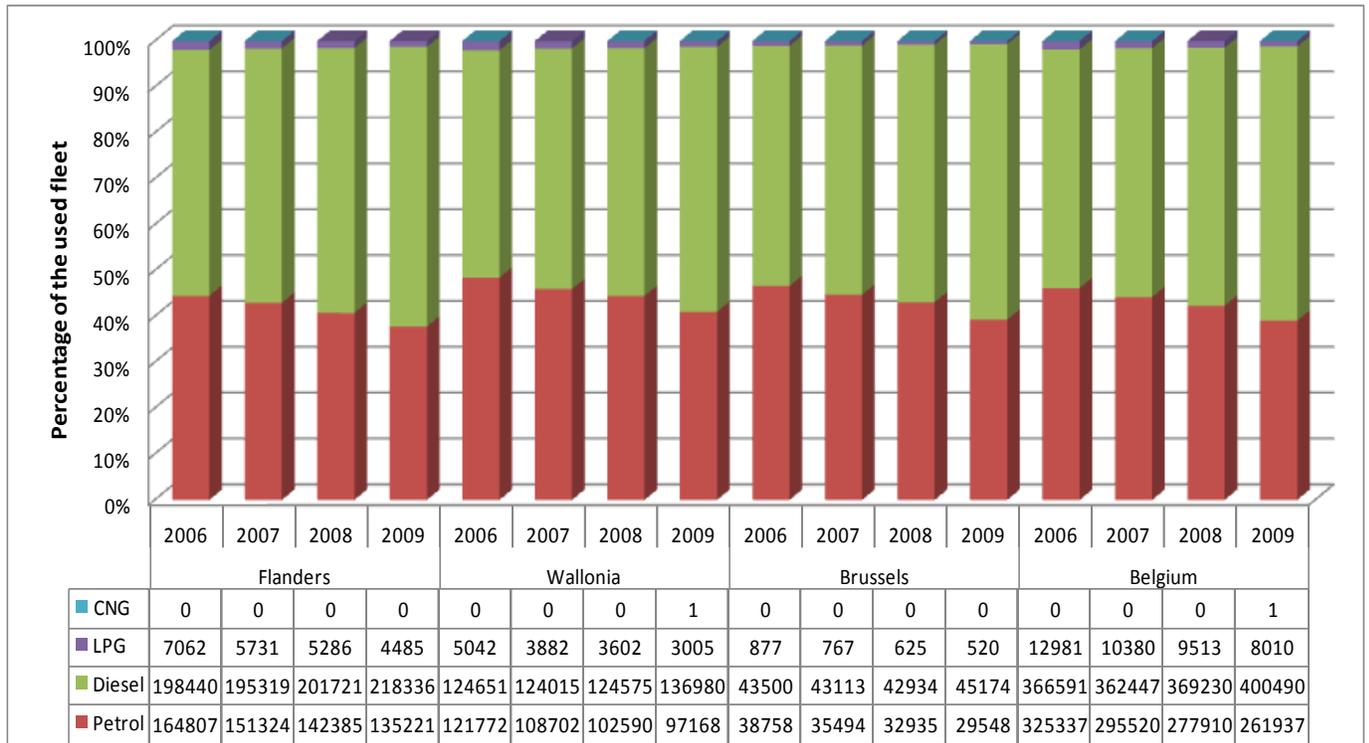


Figure 44: Shares and absolute numbers of diesel , petrol, LPG and CNG cars in the used fleet of Belgium and the different regions from 2006 to 2009.

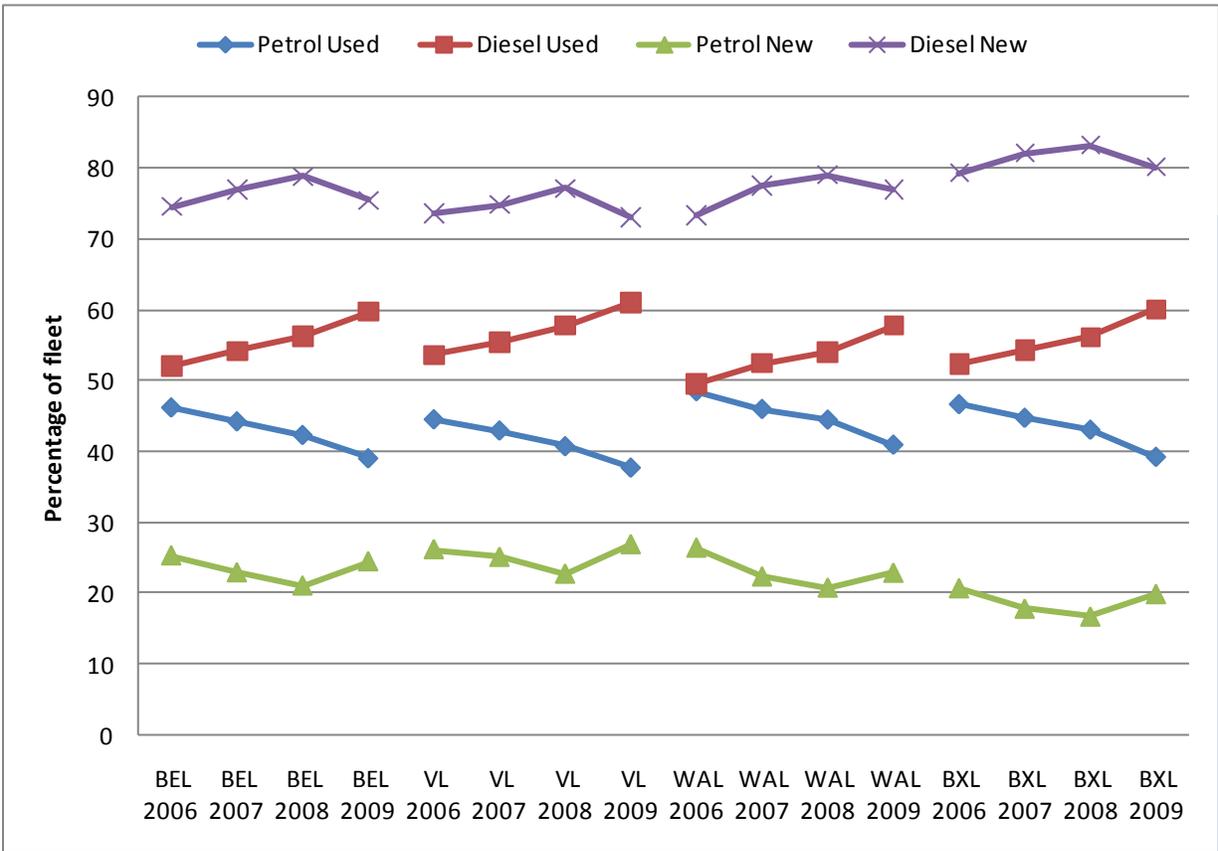


Figure 45: Shares of diesel and petrol cars in the used and new fleet and in the different regions from 2006 to 2009.

5.3 Distribution of registration years and Euro standards

The second hand cars registered in the four assessed years can be analysed based on their age, reflected in their first registration year and Euro standard they had to comply with. Figure 46 shows that in 2009, 68 % of second hand cars are less than 10 years old. The share of cars younger than 5 years has increased strongly in 2009 compared to the previous years, from 29 % in 2006 to 38 % in 2009. In the same way, the share of very old cars has decreased in 2009. So there is a trend towards an increasing interest in second hand cars, especially recent ones.

When comparing this trend for the different regions (Figure 47), Brussels and Wallonia have a similar evolution, but especially the used Flemish fleet stands out. The share of recent cars is bigger than for the other regions and has increased in 2009 even more to 41 % (versus 31 % for BCR and 35 % for Wallonia). So the Flemish second hand fleet seems to be younger than for the other regions. The share of cars of 10-14 years old is the biggest in Brussels (28 % in 2009) and the smallest in Flanders (20 %).

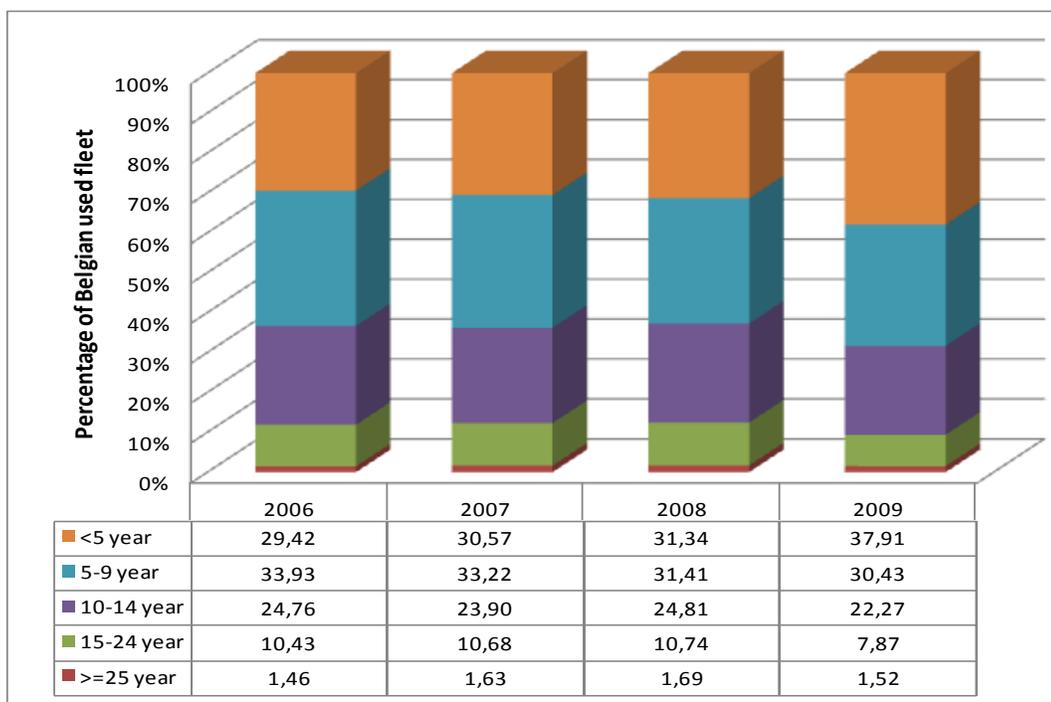


Figure 46: Age distribution of the used Belgian fleet registered from 2006 to 2009.

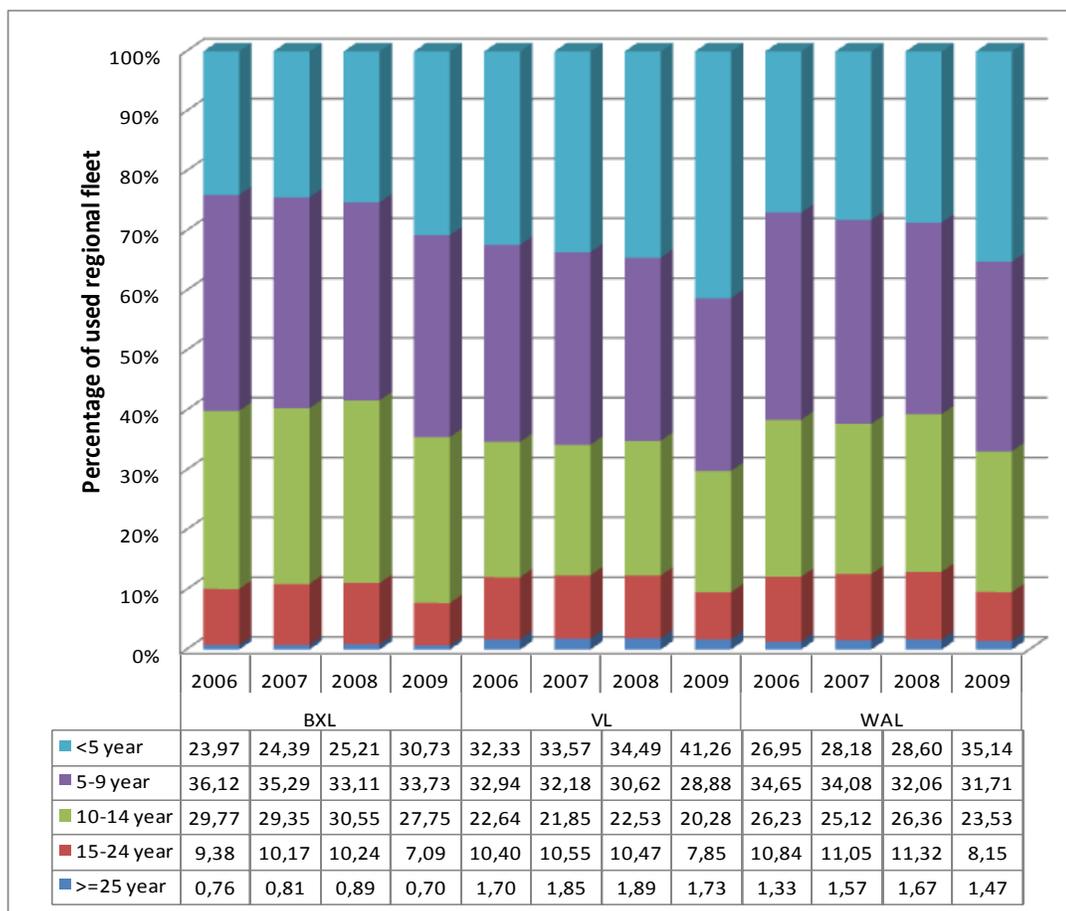


Figure 47: Age distribution of the used Belgian fleet for the different regions, registered from 2006 to 2009.

In Figure 48 (and Figure 49 for Flanders), the Euro standard distribution is presented for the different fuel types of the second hand car fleet in Belgium. For the older Euro 0 (before 1993), Euro 1 (1993-1996) and Euro 2 (1997-2000) petrol and diesel cars, the numbers go down continually over the four assessed years, while the number of Euro 3 (2001-2005) has remained more or less constant and the more recent Euro 4 (2006-2010) cars have strongly increased. This is the normal event where older second hand cars in the fleet are replaced by younger ones, complying with more stringent emission standards.

A strong difference between petrol and diesel can be observed. For all assessed years, the majority (40 % or more) of the diesel cars are Euro 3 cars, while more or less 20 % are Euro 2 and this share decreases even more with the age of the car. The share of Euro 4 diesel cars has increased dramatically from 3 % in 2006 to 29 % in 2009. The majority of the petrol cars on the other hand are Euro 2 cars (27-30 %), but there is a lot less difference with the other classes. The number of second hand petrol cars complying with Euro 0, 1 and 2 has decreased since 2006, but compared to diesel cars they circulate longer on the second hand market. The number of Euro 4 petrol cars is also increasing, but at a lot slower pace than diesel cars.

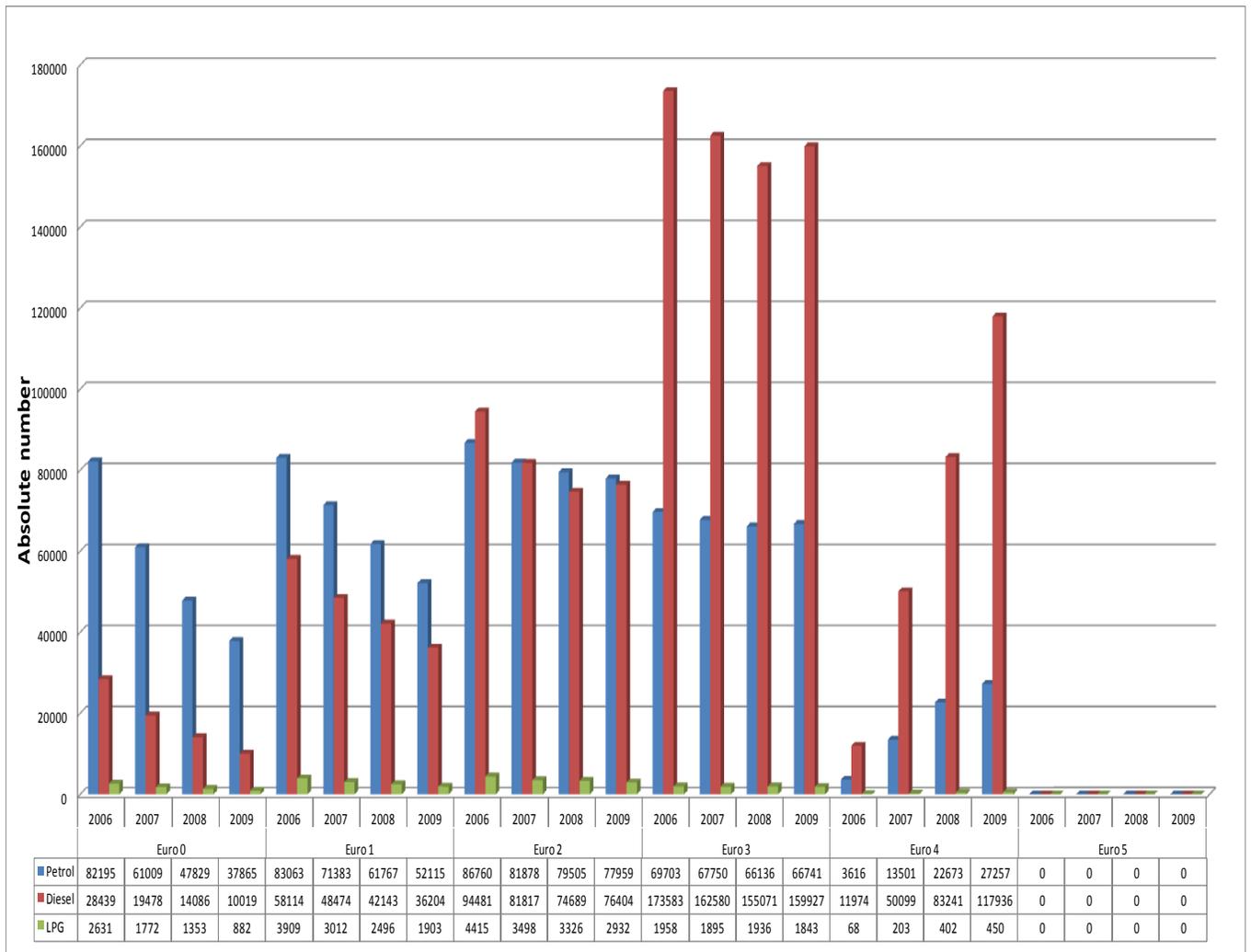


Figure 48: Distribution of the Euro standards for the Belgian used fleet, registered from 2006 to 2009.

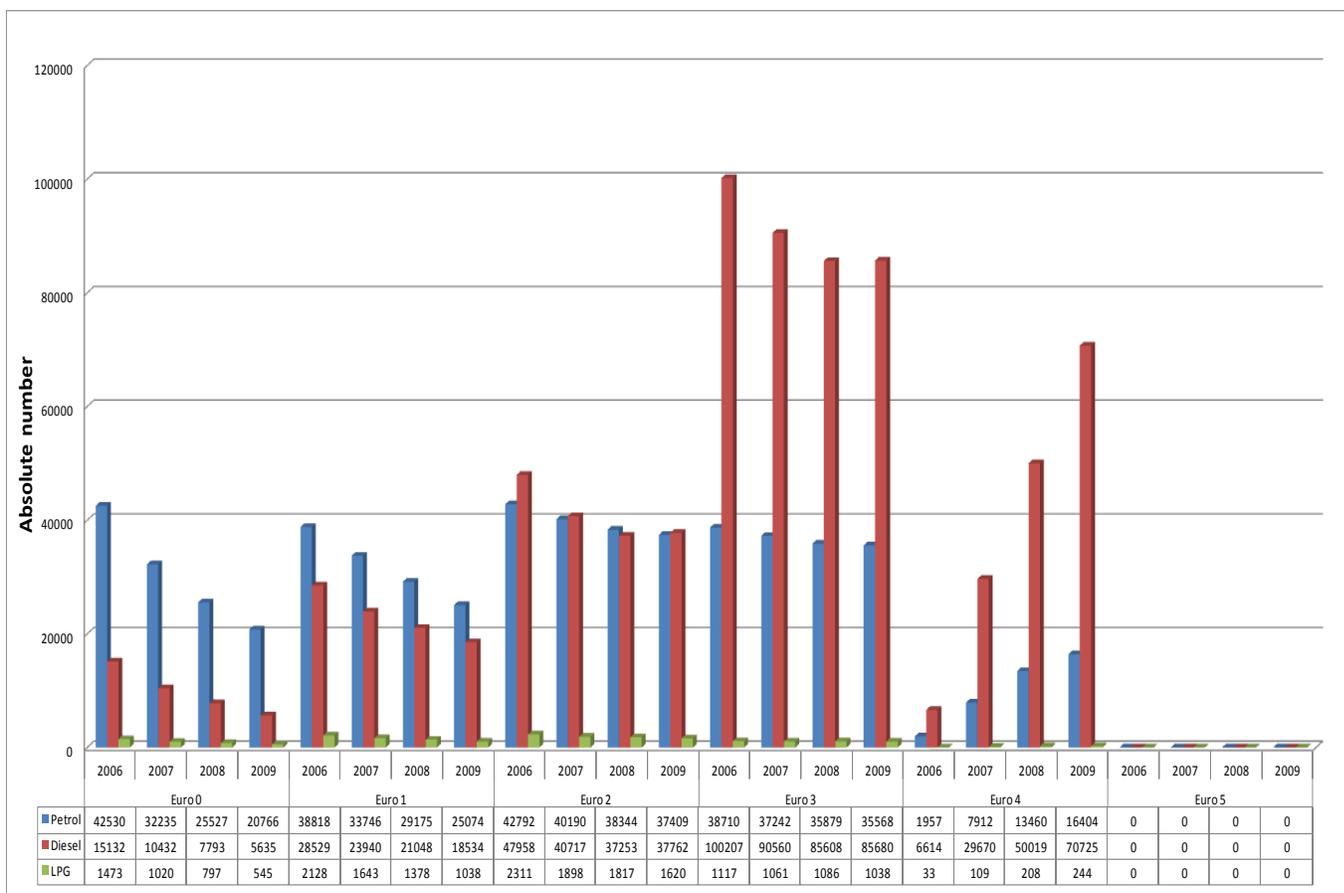


Figure 49: Distribution of the Euro standards for the Flemish used fleet, registered from 2006 to 2009.

5.4 Ecoscore distribution

Since the used vehicle fleet is composed of older, more polluting cars, their average Ecoscore is a lot smaller than for the new fleet (Figure 50). The average Ecoscore of the Belgian second hand vehicle fleet of 2009 was 52,88, compared to 64,67 of the new fleet. As for the new cars, also the used cars have improved their environmental performance over the last four years, namely with 9 %. The different regions have similar average Ecoscores, although the used fleet in Wallonia has had the best Ecoscores over all four years. The Ecoscore of the used fleet in Flanders however is increasing a little stronger than the other fleets.

When we take a look at the average Ecoscores of the different fuel types of the used fleet in Belgium, the same general results are seen as for the new cars (Figure 51). Again LPG cars have the highest average Ecoscore (62,71 in 2009), followed by petrol (56,52) and then diesel (50,31). The Ecoscores of the petrol and diesel cars are improving over the last years, while LPG has remained quite stable. Diesel cars have improved stronger than petrol cars during these years, more precisely with 13 % (versus 7 % for petrol).

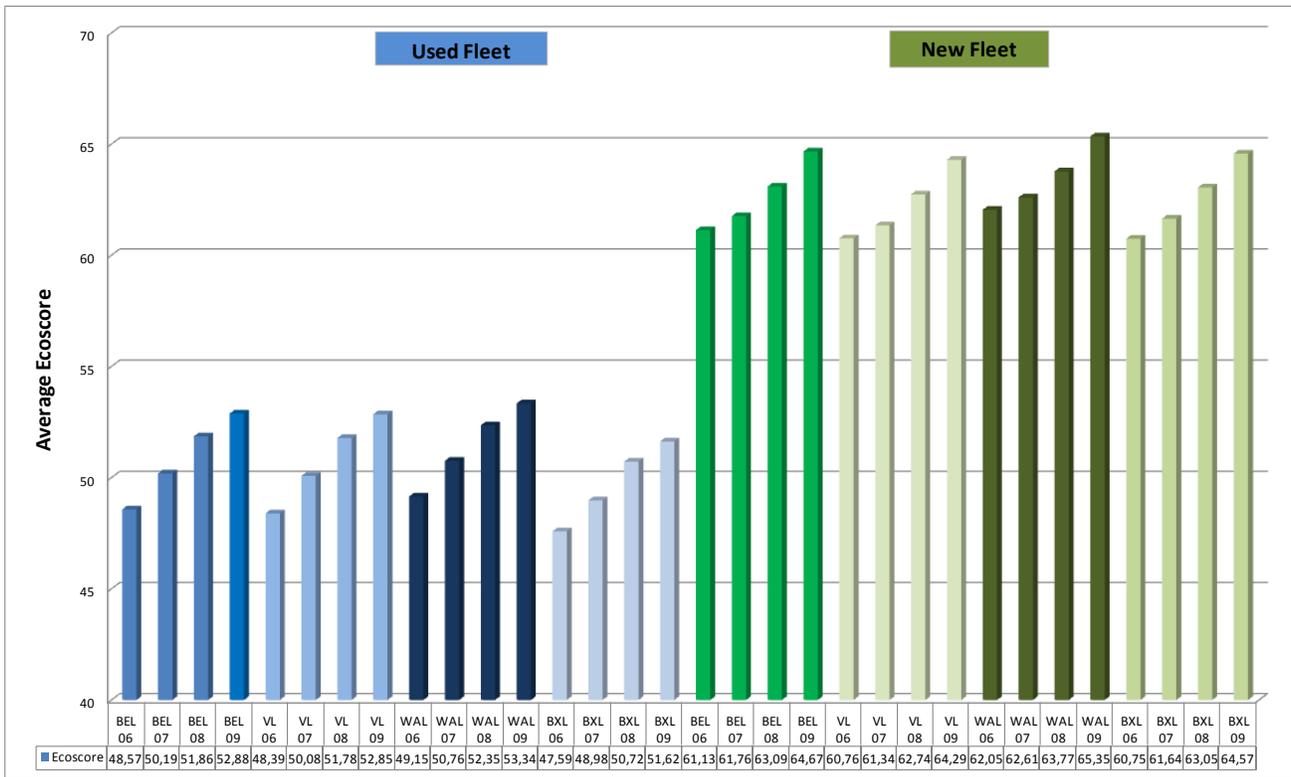


Figure 50: Average Ecoscore of the used (blue bars) and new (green bars) vehicle fleet in Belgium and the different regions from 2006 to 2009.

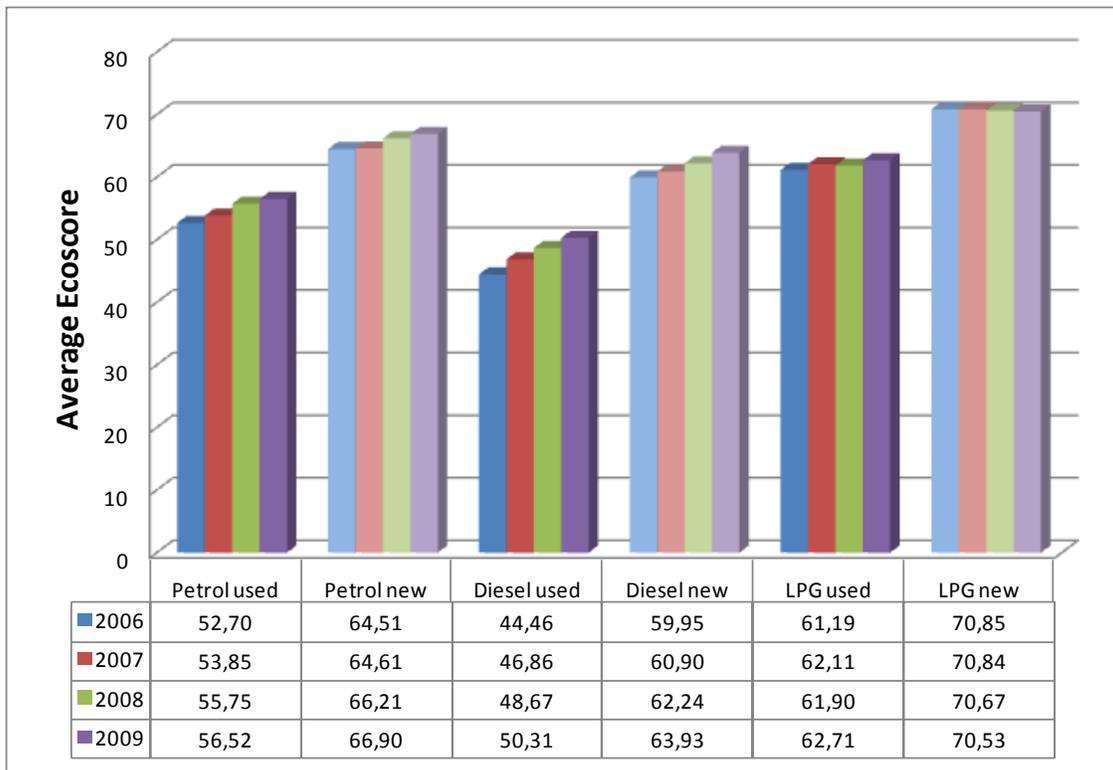


Figure 51: Average Ecoscore of the different fuel types of the used and new Belgian vehicle fleet from 2006 to 2009.

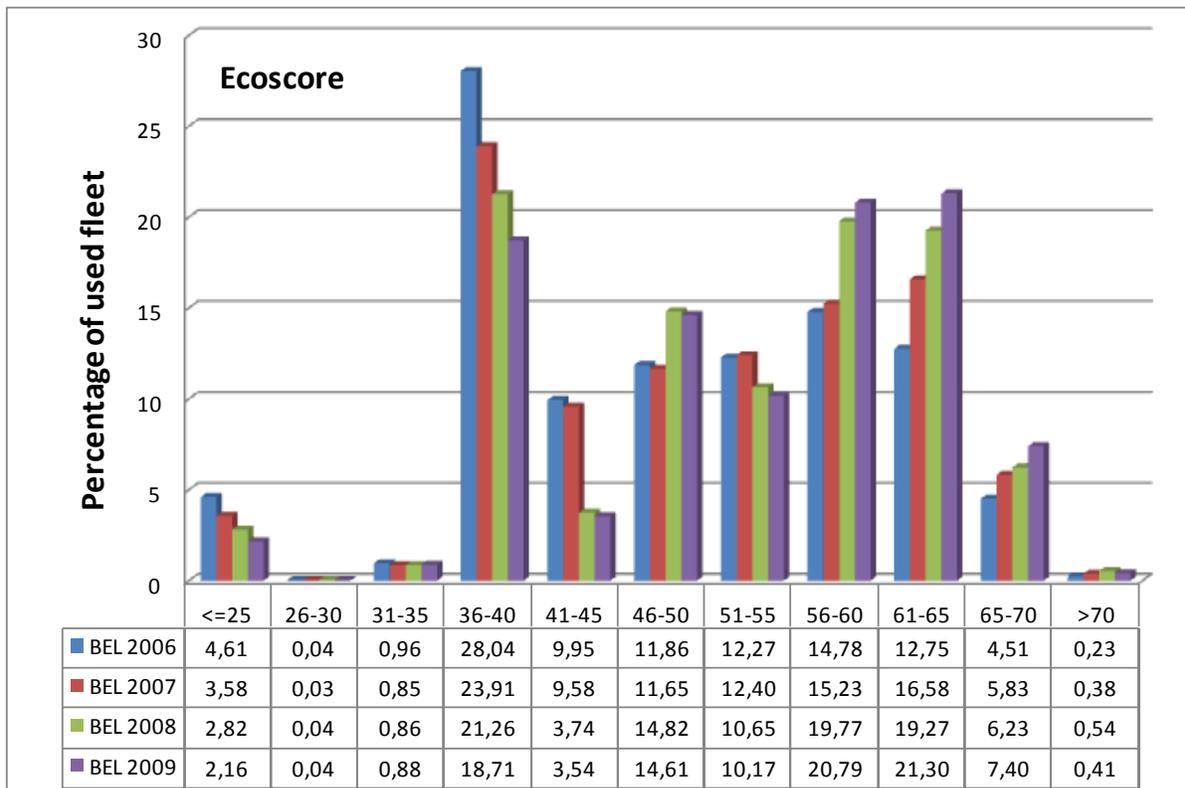


Figure 52: Ecoscore distribution of the used fleet in Belgium from 2006 to 2009.

Over the last four years, there has been a clear shift from lower Ecoscores (≤ 55) towards higher Ecoscore classes (Figure 52). From 2006 to 2008, the Ecoscore class of 36-40 was the most populated, while in 2009 it was the 61-65 class. In 2009, 50 % of the used cars had an Ecoscore higher than 55, compared to 32 % in 2006. This means that the environmental performance of the used car fleet is clearly improving.

The Ecoscore distribution profile of the used fleet differs from the new fleet, as shown in Figure 53. The new cars show a peak in the 61-65 Ecoscore class, while the used cars are more equally spread over the classes between Ecoscore 36 and 70.

When comparing the Ecoscore distribution of the different regions in Figure 54, Wallonia is best represented in the higher Ecoscore classes (>55), while the used fleet of the BCR has always higher percentages in the lower classes (≤ 50). This is also reflected in the average Ecoscores of Figure 50.

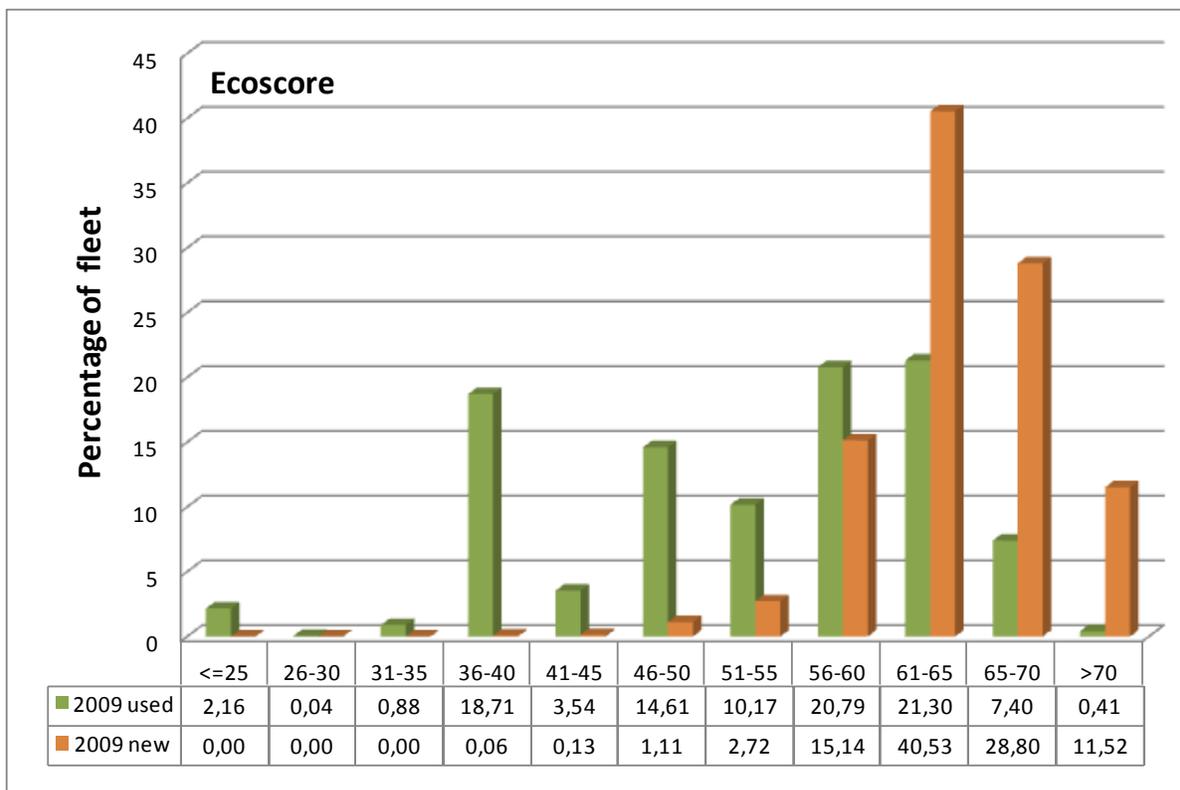


Figure 53: Comparison of the Ecoscore distribution for used and new Belgian cars in 2009.

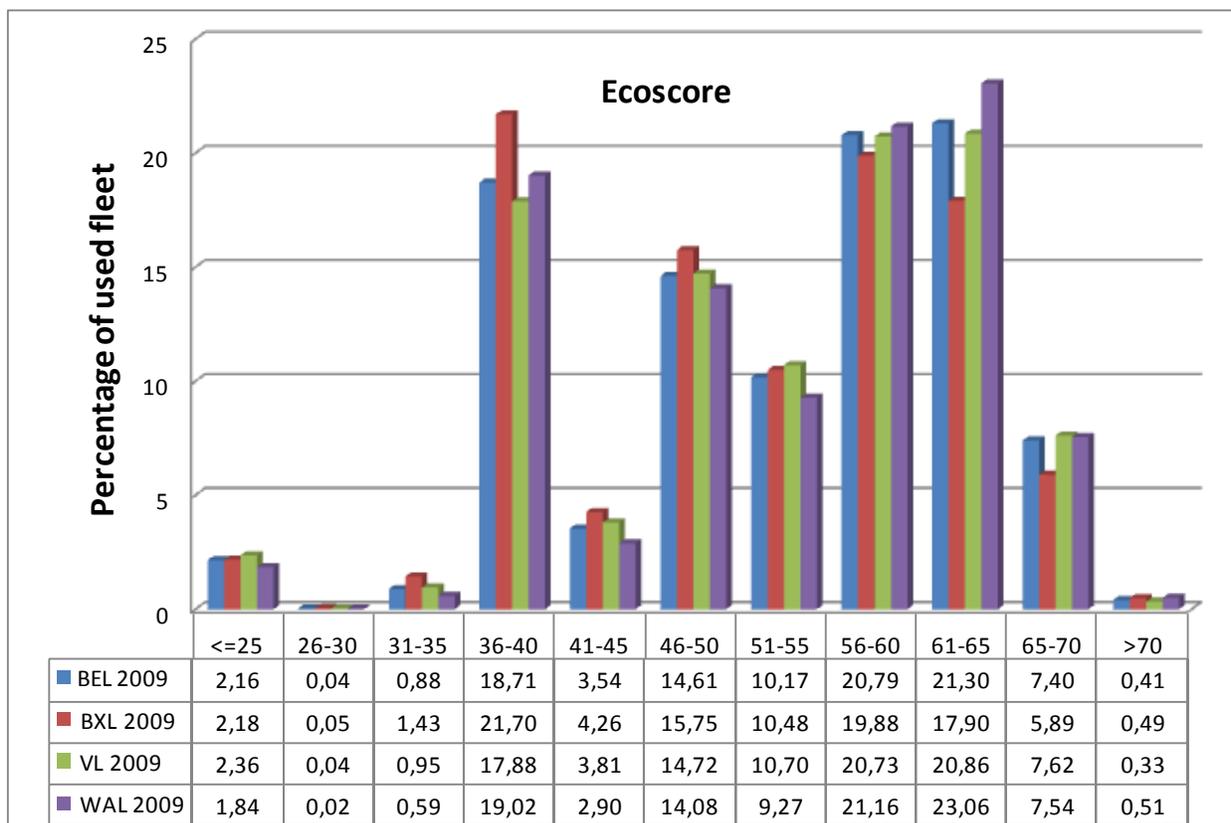


Figure 54: Ecoscore distribution of the used fleet for Belgium and the different regions in 2009.

6. Analysis of vehicle and emission parameters of the used fleet

6.1 Vehicle weight

First of all it should be noted that the majority of second hand car registrations has blank or zero vehicle weight in the database. In 2009, 60 % of all used cars are excluded from the vehicle weight analyses. For 2006, even 79 % has blank or zero vehicle weight.

The average vehicle weight of the used Belgian fleet has increased over the last four years from 1395 kg in 2006 to 1424 kg in 2009 (+2 %), and this for all regions (Figure 55). The average weight of the newly registered vehicles is, despite the downfall in 2009, still higher, more precisely 1431 kg. The used fleet of the BCR used to be heavier than the Flemish fleet, but the latter has now caught up and reached the same level as the Brussels' fleet. The Walloon fleet is by far the lightest. Also the fleet in Flanders has seen the strongest increase in vehicle weight (+2,40 %).

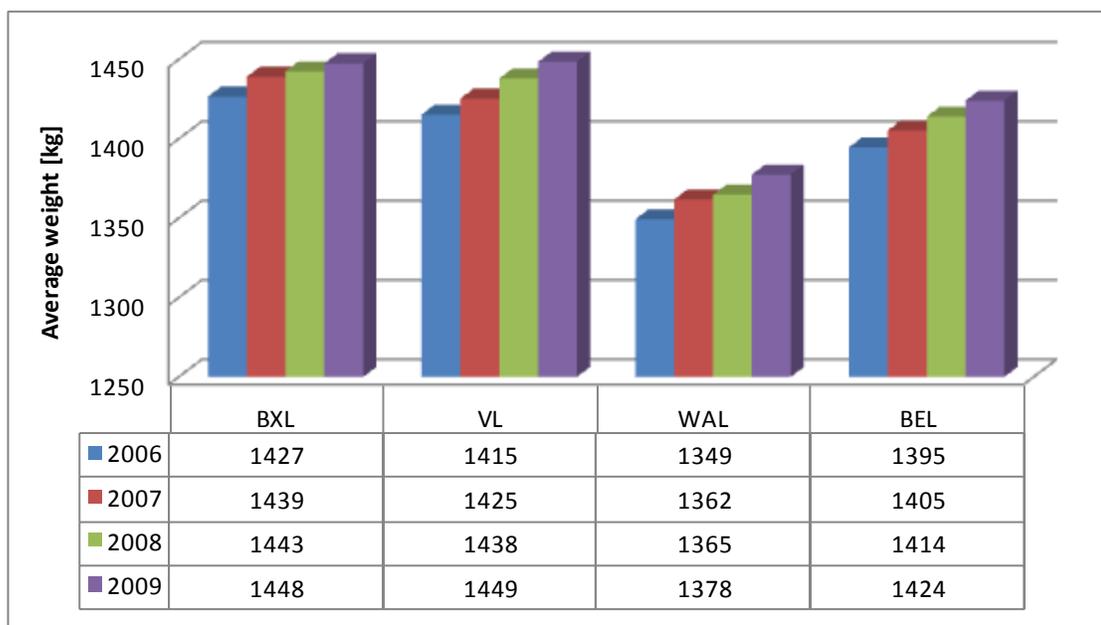


Figure 55: Average vehicle weight for the used fleet of the different Belgian regions from 2006 to 2009.

The weight distribution of used cars is very straightforward: every year less and less second hand cars are registered of the lower weight classes (≤ 1500 kg), and more and more cars with higher weights (> 1500 kg) (Figure 56). 36 % of the cars have a weight between 1251 and 1500 kg, 27 % between 1501 and 1750 kg. So also for the used cars, a clear tendency exists towards heavier cars. These heavier cars are more often diesel cars, as can be seen in Figure 57. Petrol cars are most represented in the 1001-1250 kg class (51 %), while diesel and LPG cars are found more in the 1251-1500 kg category (39 and 41 % resp.). This corresponds to the distribution of fuel types in the new vehicle fleet (see Figure 10).

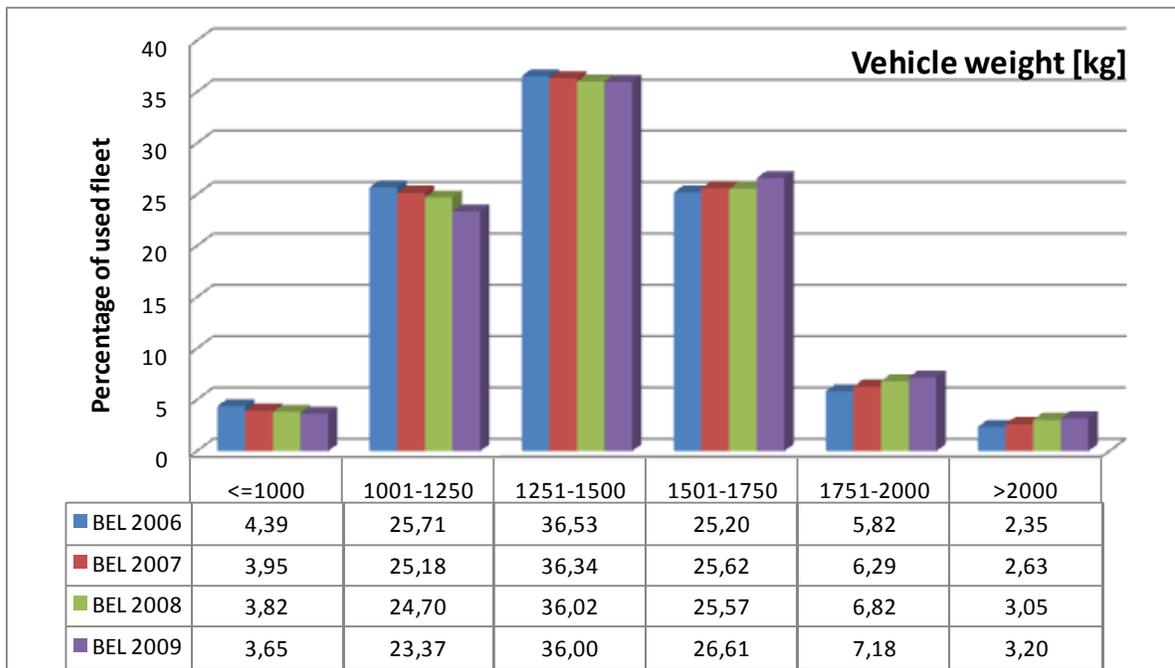


Figure 56: Vehicle weight distribution of used cars in the Belgian fleet from 2006 to 2009.

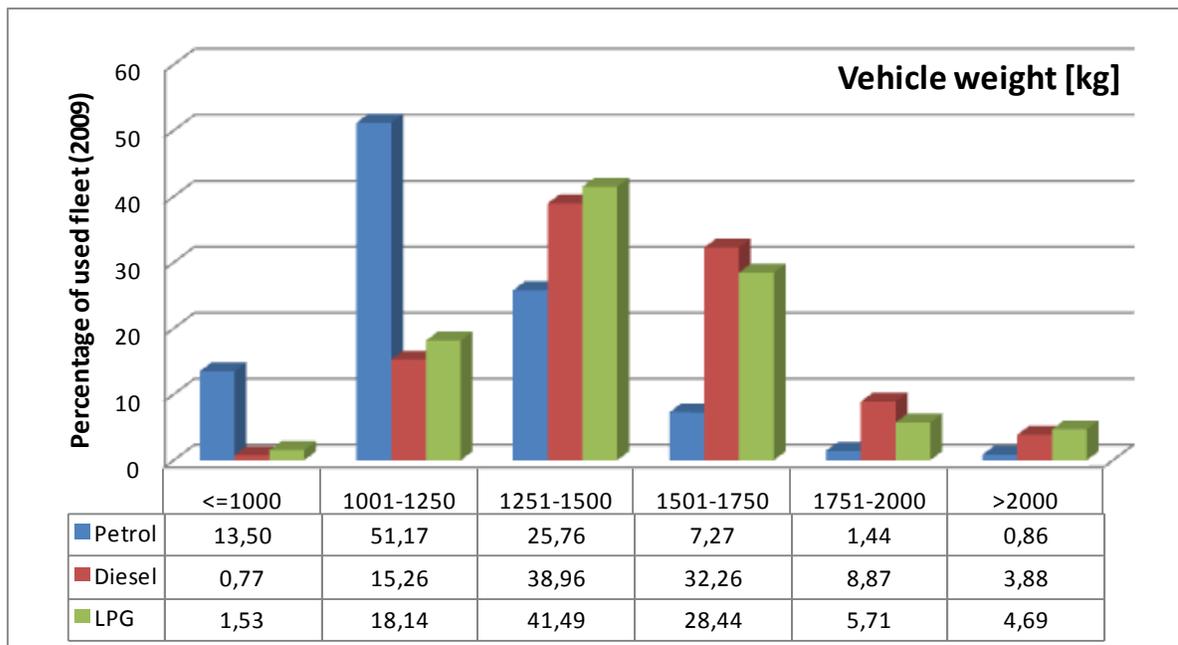


Figure 57: Vehicle weight distribution of different fuel types for used Belgian cars in 2009.

As for the newly registered cars, also the used cars have higher Ecoscores for lower vehicle weights (Figure 58). The Ecoscore has increased for each assessed year, with an exception for the lowest weight class (≤ 1000 kg). Within lower weight classes, there appears to be few space for improvement of the environmental performance, while heavier cars can still improve more. The strongest improvement has occurred in the >2000 kg class (+7 %).

LPG cars have the highest Ecoscores for all weight classes (Figure 59). When comparing used petrol and diesel cars, petrol has higher Ecoscores than diesel for cars weighing up to 1750 kg. Within higher weight classes, there is a switch in this relationship and diesel cars can even perform slightly better than petrol cars. This switch was also observed with the new cars, but already happens around 1250 to 1500 kg and is more pronounced (see Figure 12).

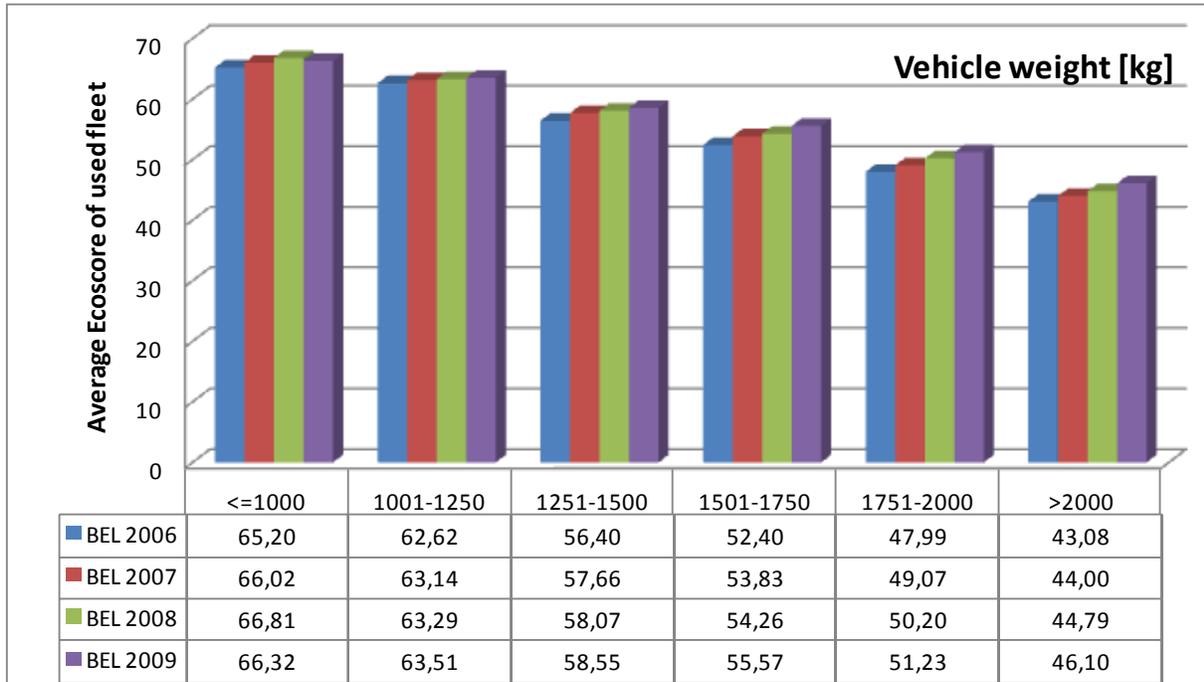


Figure 58: Average Ecoscore in function of the vehicle weight for the used Belgian fleet from 2006 to 2009.

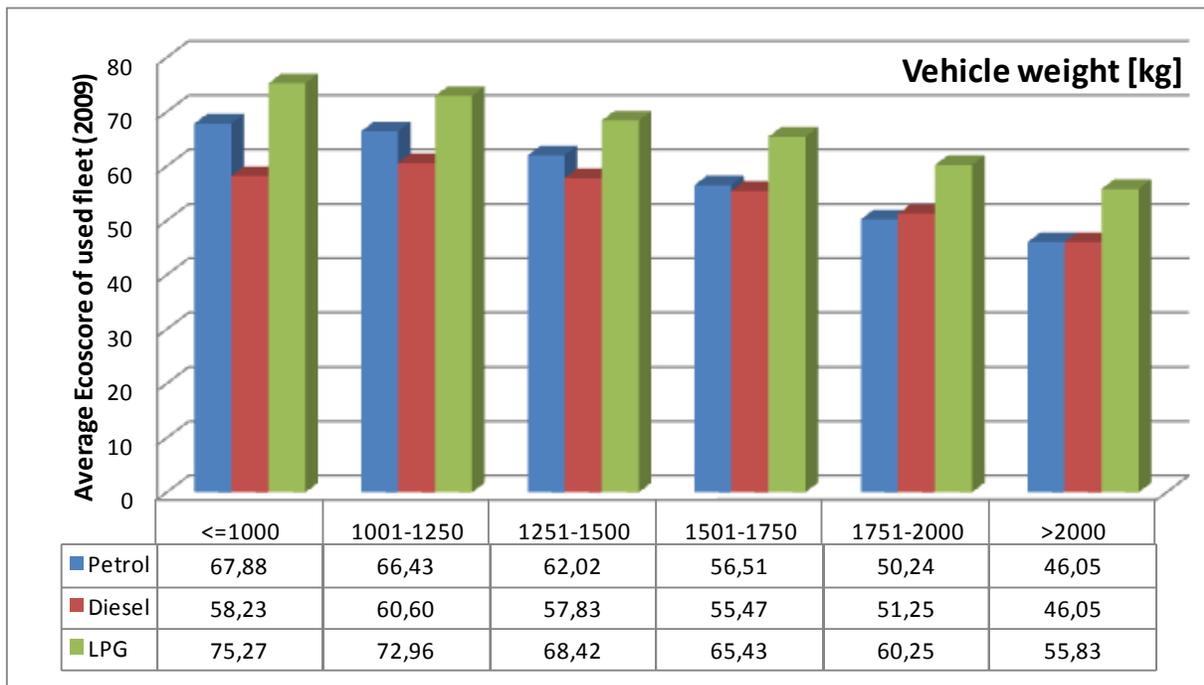


Figure 59: Average Ecoscore in function of the vehicle weight for different fuel types of the used fleet of 2009.

6.2 Engine displacement

In 2009, the average engine displacement of the used Belgian fleet was 1744 cc, which is an increase of 1 % since 2006 (Figure 60). The new cars had a lower average cylinder capacity of 1676 cc in 2009. The Brussels' fleet used to have the highest engine displacement, but in 2009 Flanders has caught up on them. Again the Walloon region has the lowest average (1669 cc). The Flemish fleet has seen the strongest increase over the four assessed years.

The distribution pattern of the cylinder capacity is similar as for new cars: the majority (58 % of the used and 63 % of the new cars) has a cylinder capacity between 1400 and 2000 cc, followed by the ≤ 1400 cc category (Figure 61). From 2006 to 2008, there was only little change in the shares of the different displacement classes. In 2009, less of the lowest category (≤ 1400 cc) are registered and more of the higher ones (1401 up to 3500 cc).

As for the new cars, there is a clear distinction between the displacement distribution of the different fuel types (Figure 62). Petrol cars tend to have a lower engine displacement than diesel and LPG cars. 61 % of used petrol cars are found in the ≤ 1400 cc category, while the majority of diesel (76 %) and LPG cars (62 %) are represented by the 1401-2000 cc class. Compared to the new cars, the classes with higher cylinder capacity (especially the 2001-3500 cc class) are more populated for all fuel types of second hand cars, implying the presence of more cars with heavy engines compared to new cars.

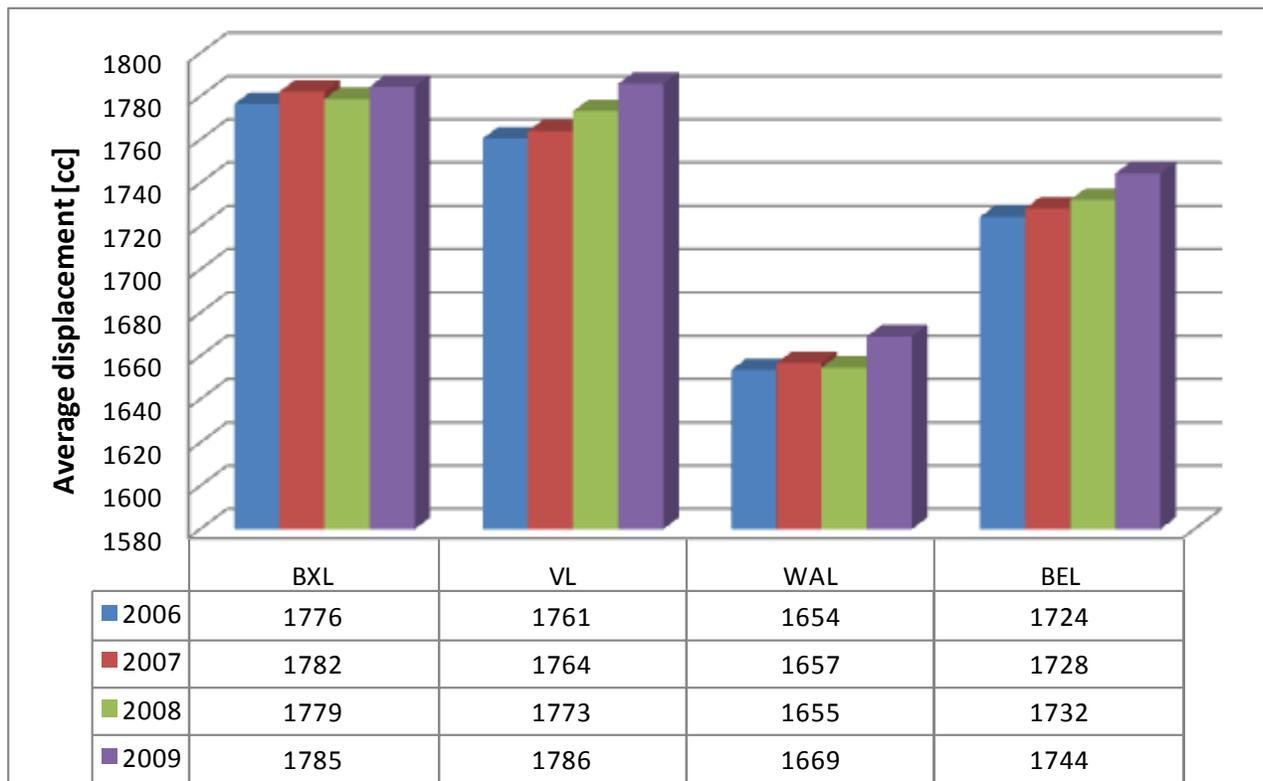


Figure 60: Average displacement of the used fleet for Belgium and the different regions, from 2006 to 2009.

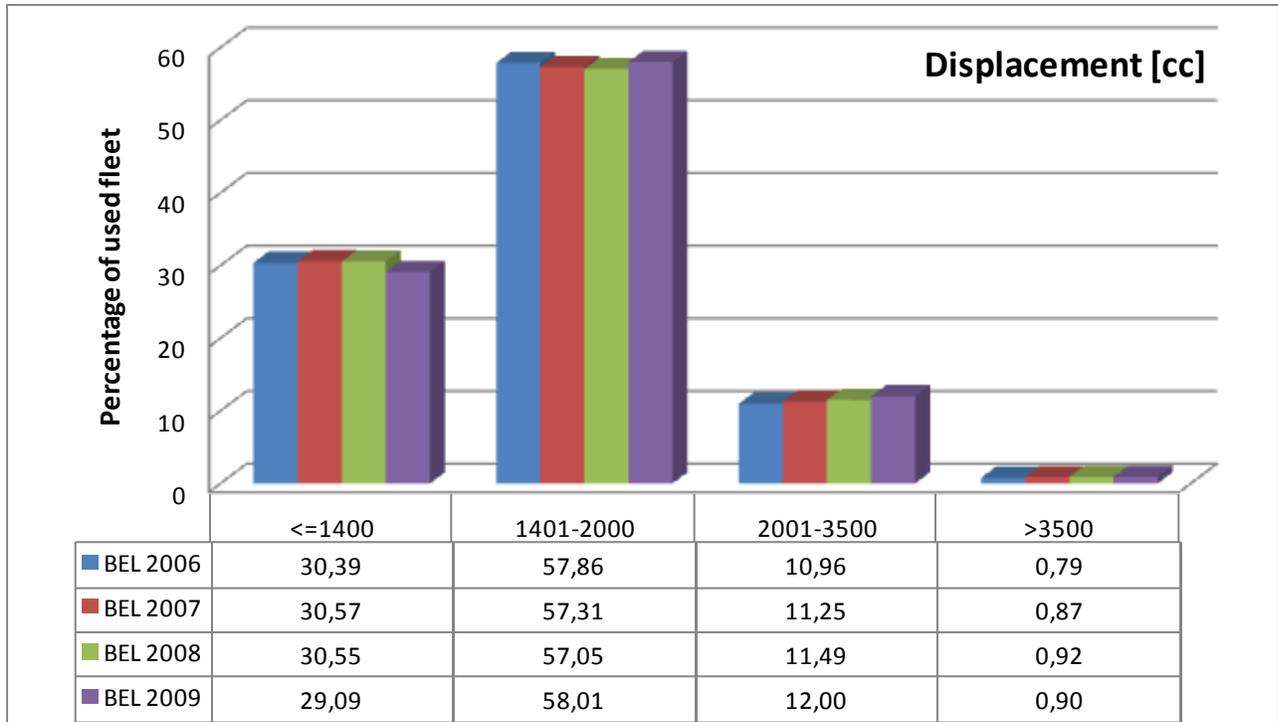


Figure 61: Engine displacement distribution for the used Belgian fleet from 2006 to 2009.

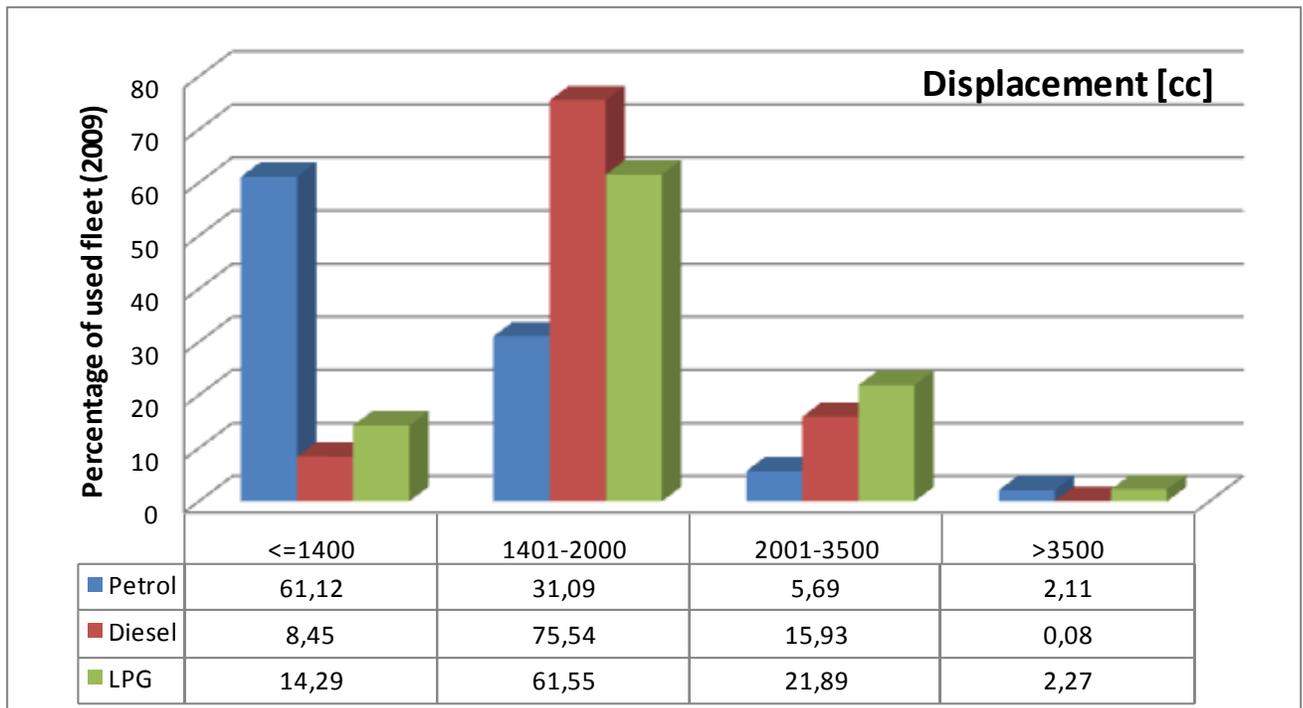


Figure 62: Engine displacement distribution for the different fuel types of the used Belgian fleet in 2009.

Figure 63 shows how the Ecoscore decreases with increasing engine displacement. For all displacement classes, the Ecoscore has increased for each assessed year. The strongest improvement of the environmental performance is found in the 1401-2000 cc class, with 10 %.

For all classes, LPG cars again have the highest Ecoscores (Figure 64). For this indicator, petrol cars only perform better than diesel in the 1401-2000 cc class. In all other configurations, diesel cars have a better Ecoscore than petrol. For new cars, petrol performed better in the lowest (≤ 1400 cc) and highest displacement class (>3500 cc).

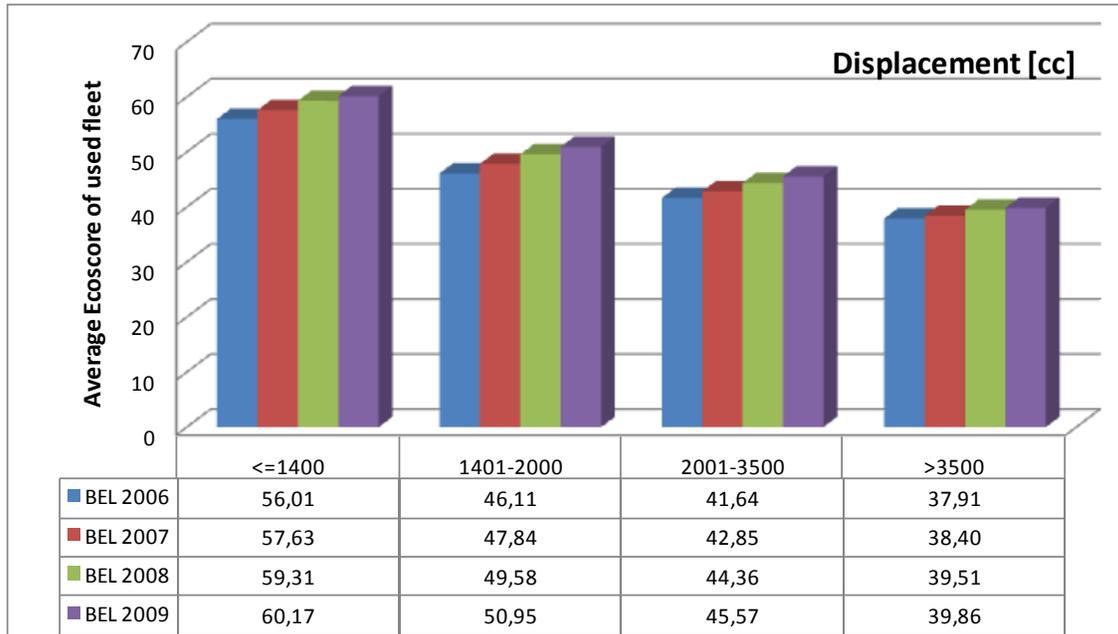


Figure 63: Average Ecoscore in function of the engine displacement of the used Belgian fleet from 2006 to 2009.

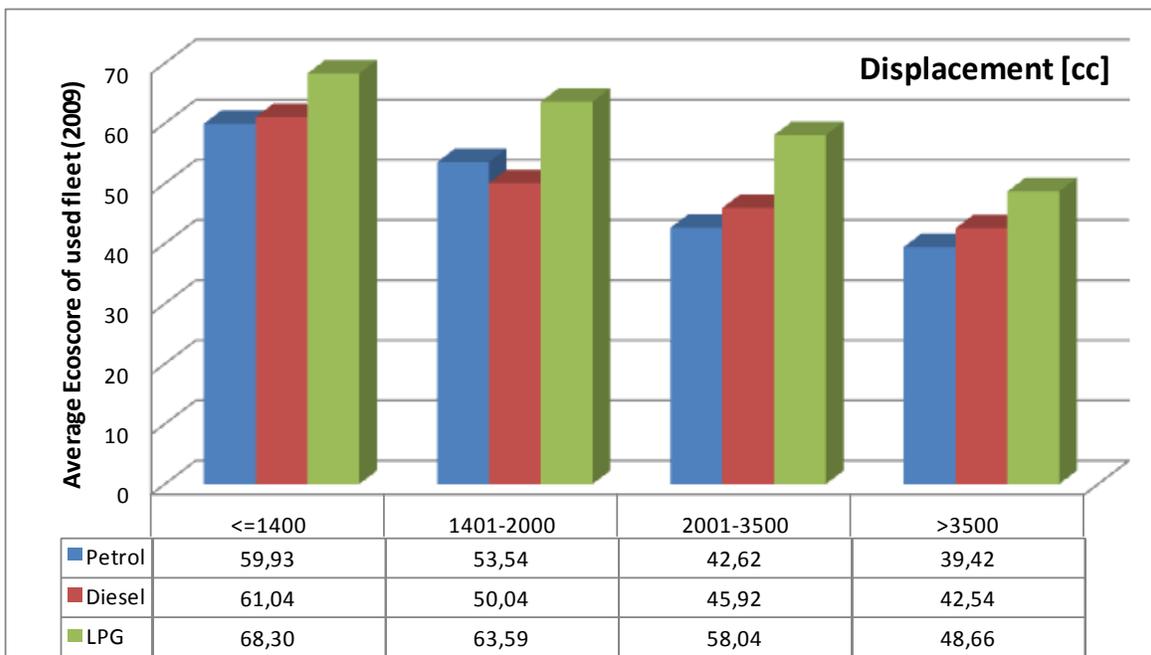


Figure 64: Average Ecoscore in function of the engine displacement for different fuel types of the used Belgian fleet of 2009.

6.3 Engine power

The average engine power of the used Belgian fleet in 2009 was 74 kW, coming from 71 kW in 2006 (increase with 4 %). Flanders has the highest average power over all assessed years (77,63 kW in 2009), followed by Brussels (74,91 kW) and Wallonia (69,54 kW). The Flemish fleet has also experienced the strongest increase in average power, with 5 % (Figure 65).

As for the new registrations, the second hand registrations show a similar downward distribution trend from low- to high-powered vehicles, so the higher the engine power, the less populated each category becomes (Figure 66). In 2009, 53 % of the used vehicles had an engine of 70 kW or less, 23 % had an engine power between 71 and 85 kW, and so on. The power classes below 85 kW have become less populated over the last four years, while the higher power classes have become more populated. So there is a clear trend from less to more powerful second hand cars over the last years.

The large majority of petrol cars (67 %) has an engine power of ≤ 70 kW, while the next most populated class (71-85 kW) contains only 15 % of the petrol cars (Figure 67). Used diesel cars display the same downward trend, but with a smaller slope. The majority of diesel cars has an average power of ≤ 70 kW (45 %), the next most populated class of 71-85 kW contains 28 % of the diesel cars. Used LPG cars are more equally divided over the power classes up to 110 kW.

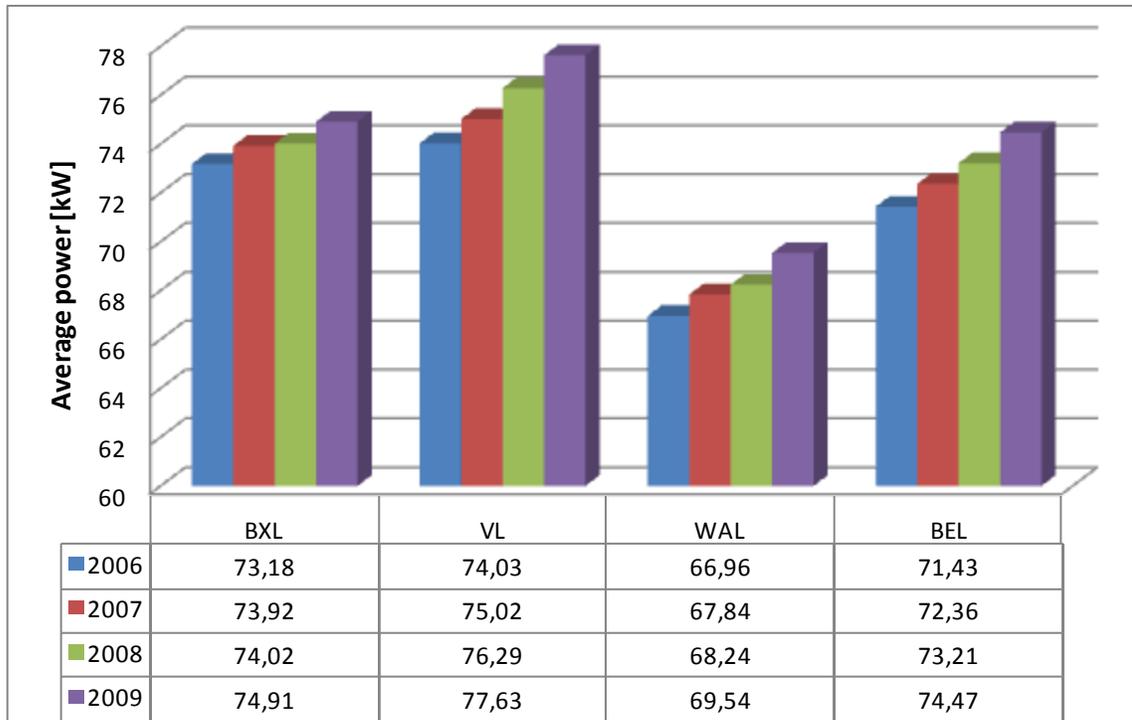


Figure 65: Average engine power of the used fleet for Belgium and the different regions from 2006 to 2009.

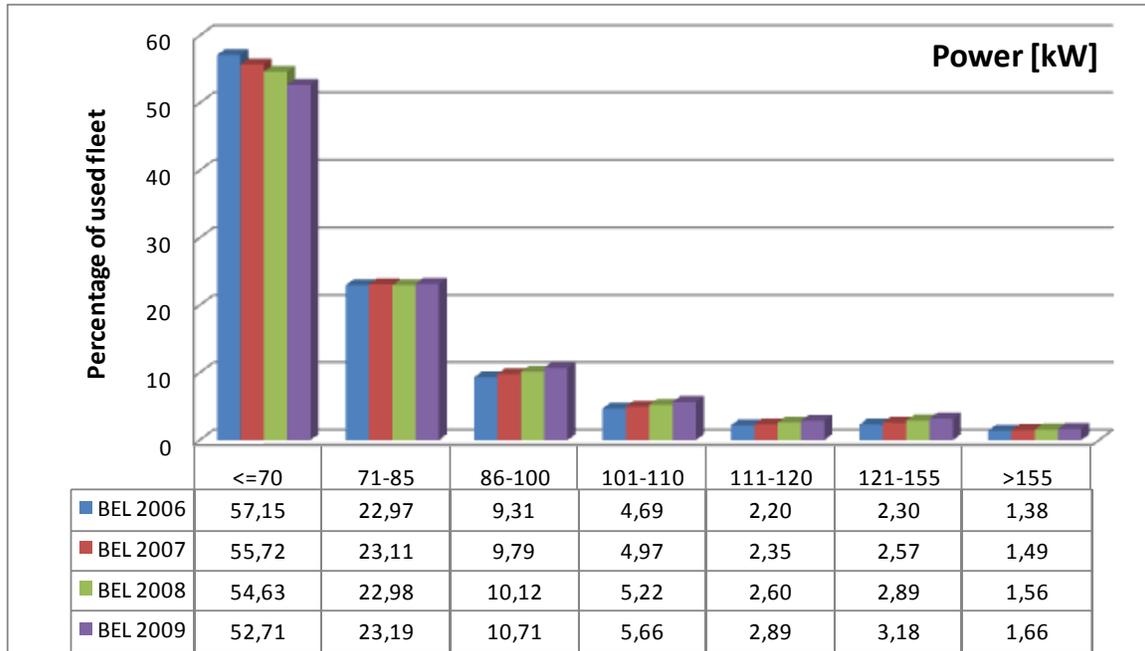


Figure 66: Engine power distribution of the used Belgian vehicle fleet from 2006 to 2009.

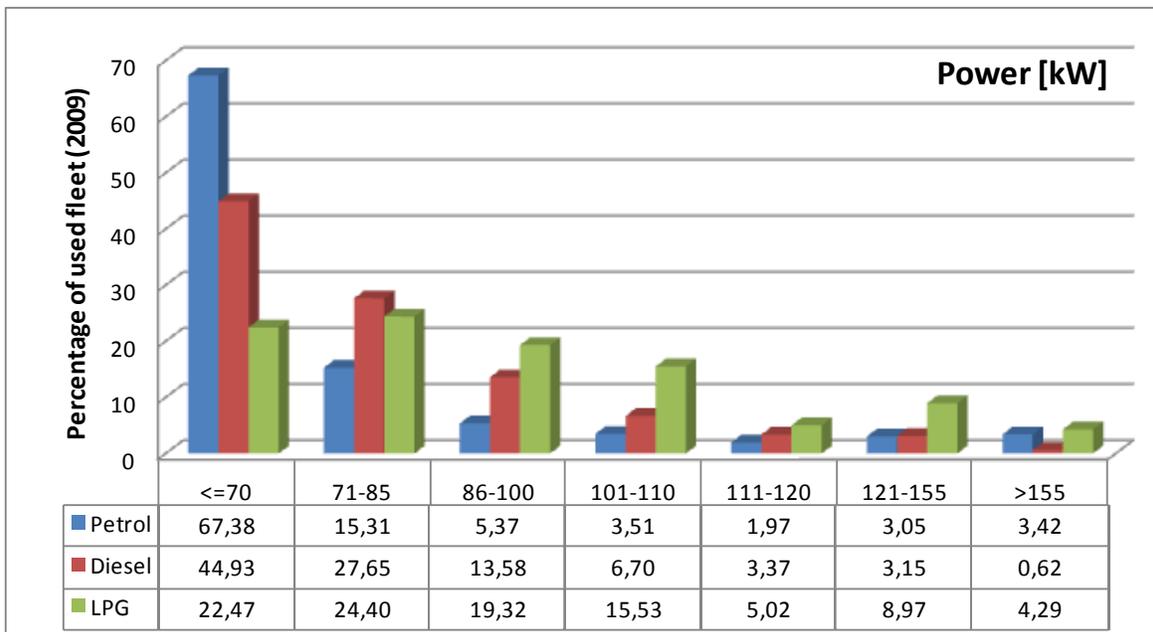


Figure 67: Engine power distribution of the used Belgian vehicle fleet in 2009 for different fuel types.

Figure 68 shows clearly that the Ecoscore gradually decreases with increasing engine power of the vehicle. For each power category, the average Ecoscore has increased since 2006. This increase was the strongest for vehicles with an engine power between 100 and 155 kW.

When comparing the Ecoscores of the different fuel types (Figure 69), LPG has again the highest Ecoscores for all power classes. Used petrol cars perform better from an environmental point of view than diesel cars for all power classes up to 120 kW. For more powerful cars, the Ecoscore of diesel cars is higher than for petrol cars.

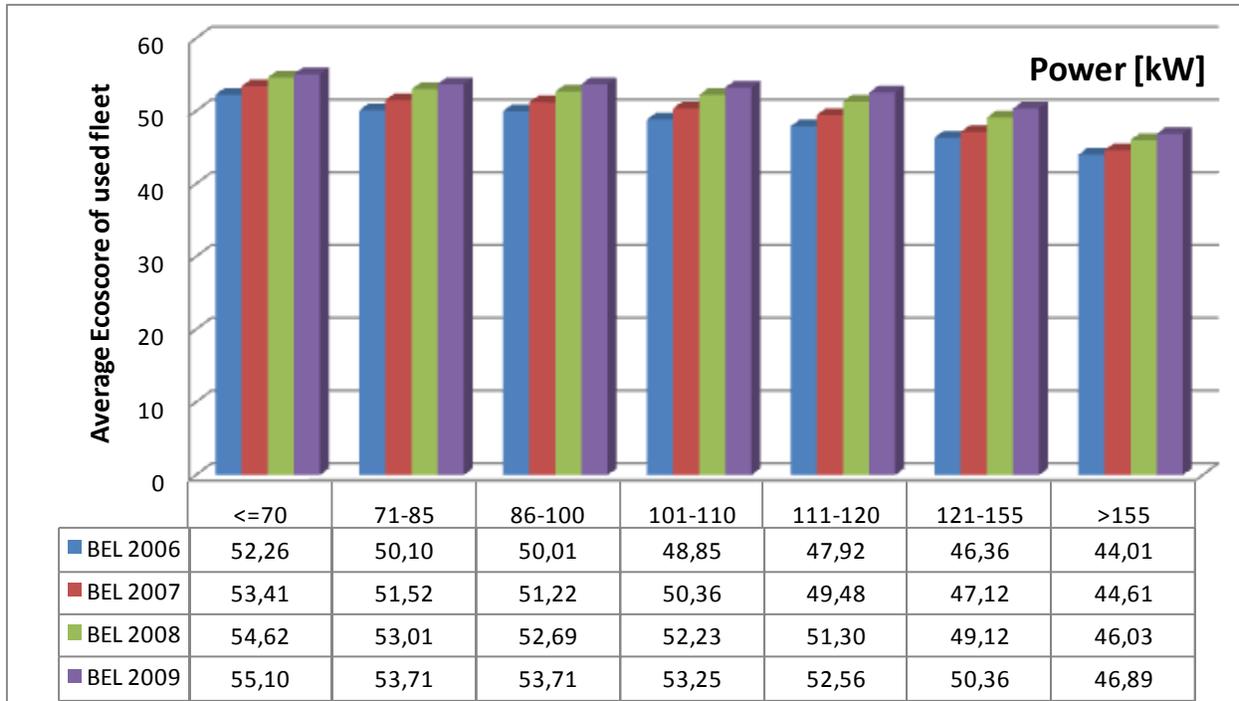


Figure 68: Average Ecoscore in function of engine power of the used Belgian fleet from 2006 to 2009.

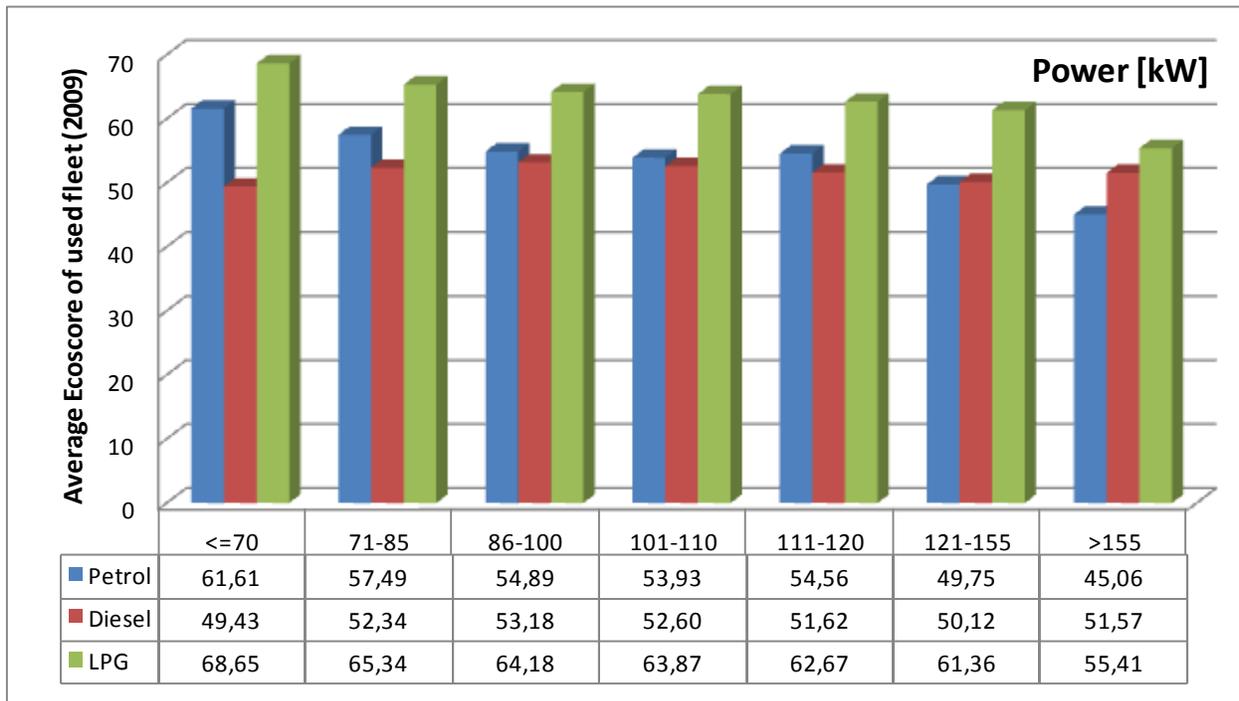


Figure 69: Average Ecoscore in function of engine power of the used Belgian fleet in 2009 for different fuel types.

6.4 CO₂ emissions

First of all it should be mentioned that the database contains a large amount of blank or false (values below 50 and above 700 g/km) cells for CO₂ emissions for the second hand cars, more precisely 60 % in 2009 (even 79 % in 2006). Therefore the analyses have been performed on less vehicles compared to most of the other indicators.

The average CO₂ emission of the used vehicle fleet in Belgium in 2009 was 154,33 g/km, compared to 141,78 g/km for the new fleet (Figure 70). This Belgian average has slightly decreased since 2006 (155,08 g/km). The Brussels' fleet has the highest average values for all assessed years, but has also seen the strongest decrease, to 159 g/km in 2009. The Flemish fleet has remained quite stable with values around 157 g/km and the Walloon fleet has the lowest average CO₂ emissions with 149 g/km in 2009.

The majority of used petrol cars (54 %) has a CO₂ emission between 131 and 160 g/km, followed by the 161-190 g/km class (25 % in 2009) (Figure 71). 42 % of used diesel cars belong to the 116-145 g/km category, followed by 32 % in the 146-175 g/km category for 2009 (Figure 72). For petrol cars, there is an increase in the lower classes up to 160 g/km, while the higher CO₂-emitting classes decrease in relative numbers. A similar trend is observed for the used diesel cars of which the shares slowly increase up to 145 g/km, while the shares of the higher classes slowly decrease or stagnate.

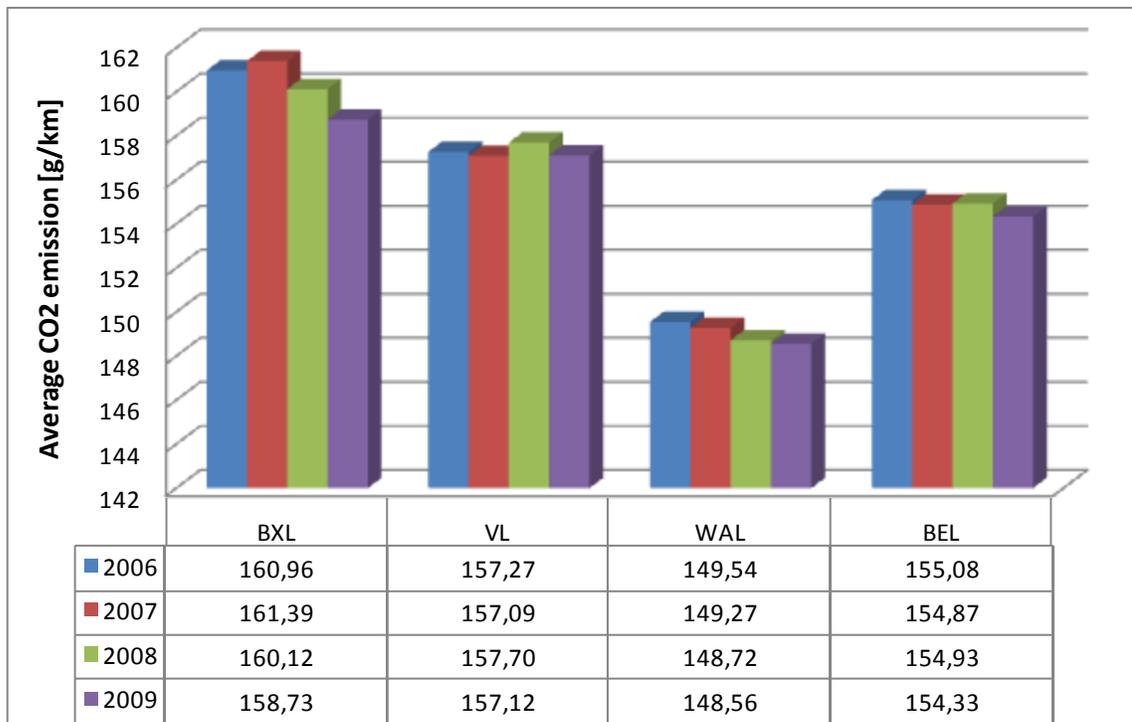


Figure 70: Average CO₂ emission of the used fleet in Belgium and the different regions from 2006 to 2009.

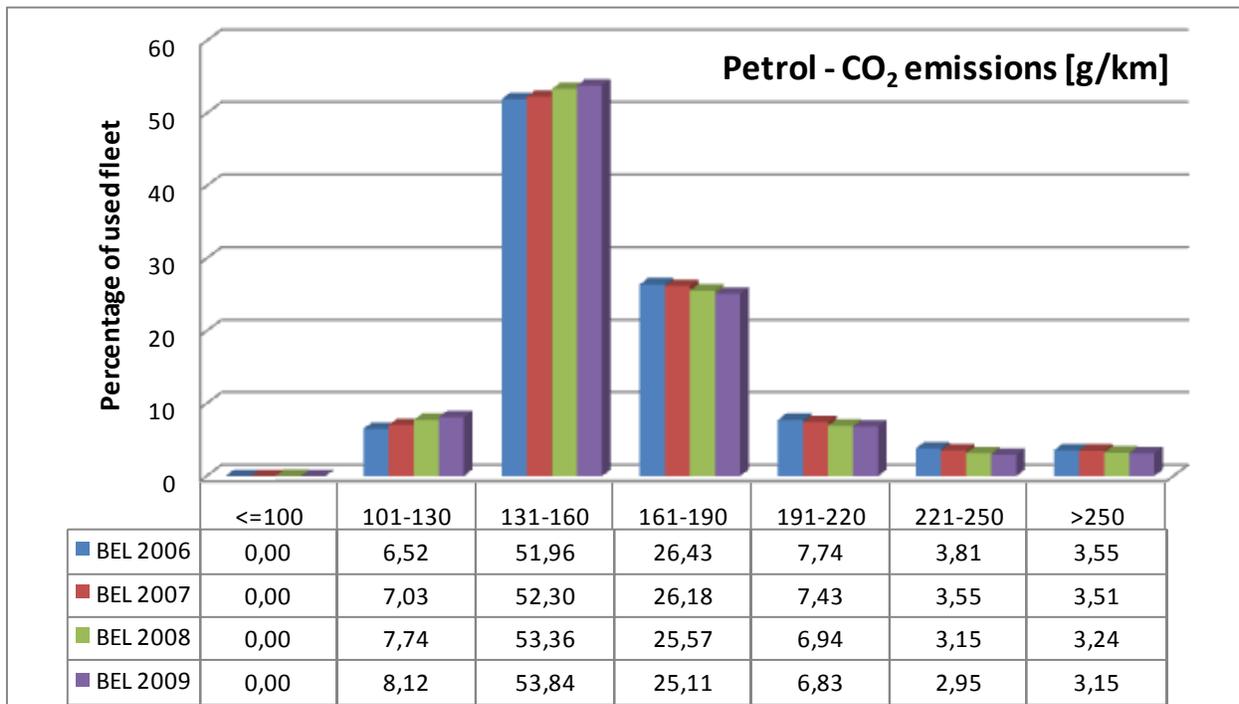


Figure 71: CO₂ emission distribution of the used Belgian petrol fleet from 2006 to 2009.

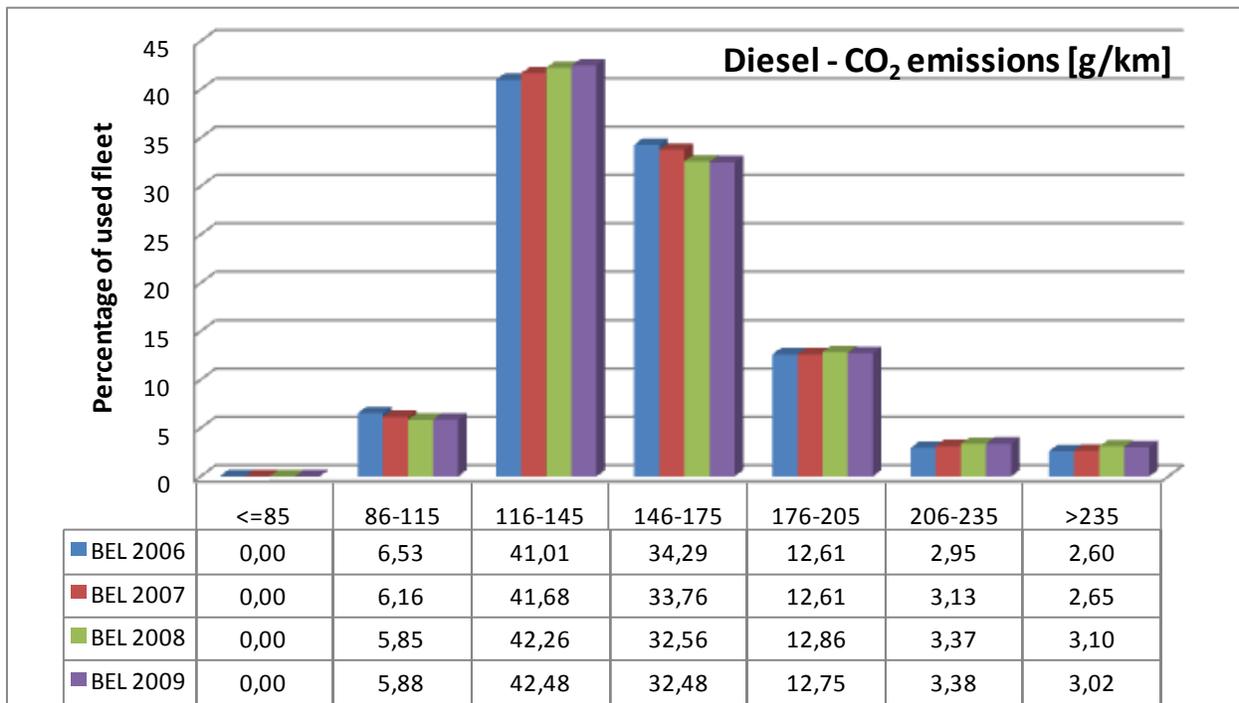


Figure 72: CO₂ emission distribution of the used Belgian diesel fleet from 2006 to 2009.

As seen in Figure 73 (petrol) and Figure 74 (diesel), the Ecoscore decreases with increasing CO₂ emissions for used petrol and diesel cars. The petrol cars show little or no improvement in their Ecoscore over the four assessed years. Diesel cars have started improving their CO₂ emissions and hence

their Ecoscore from 116 g/km onwards, but the strongest improvements were made with the more consuming cars. The bigger jumps in the lowest class are due to the fact that only maximum 5 cars are registered in this category each year.

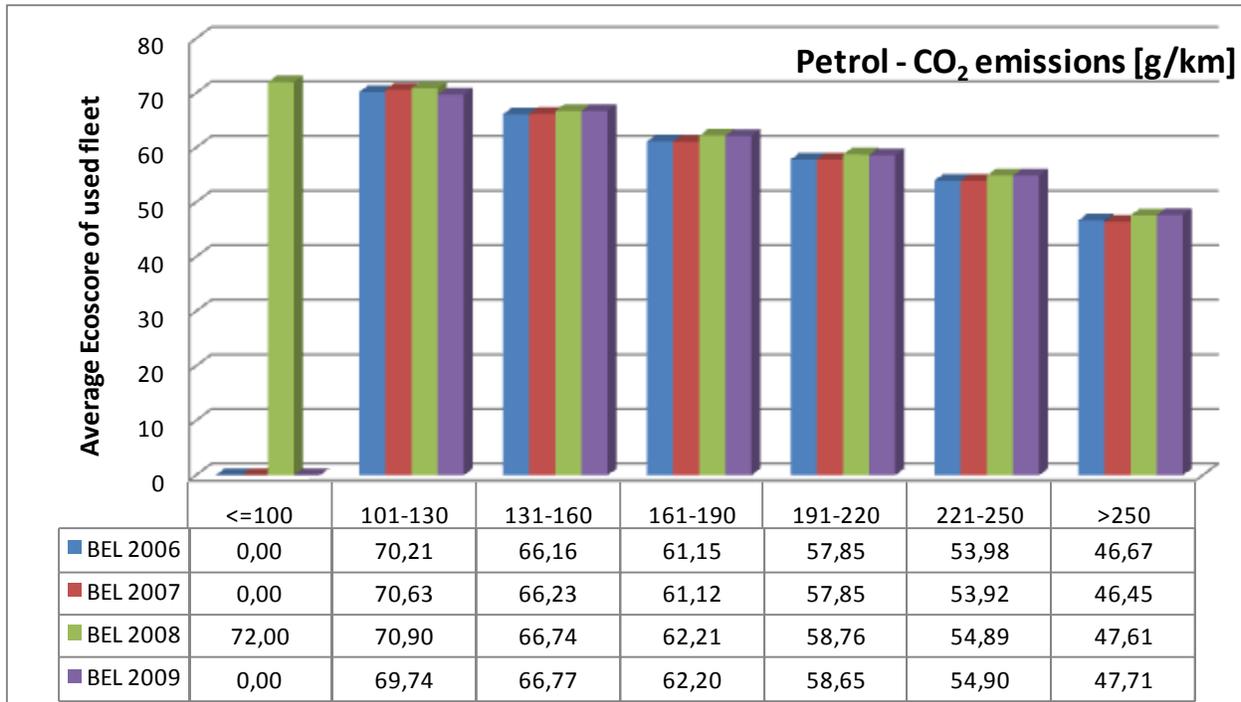


Figure 73: Ecoscore in function of the CO₂ emission of used petrol vehicles in Belgium from 2006 to 2009.

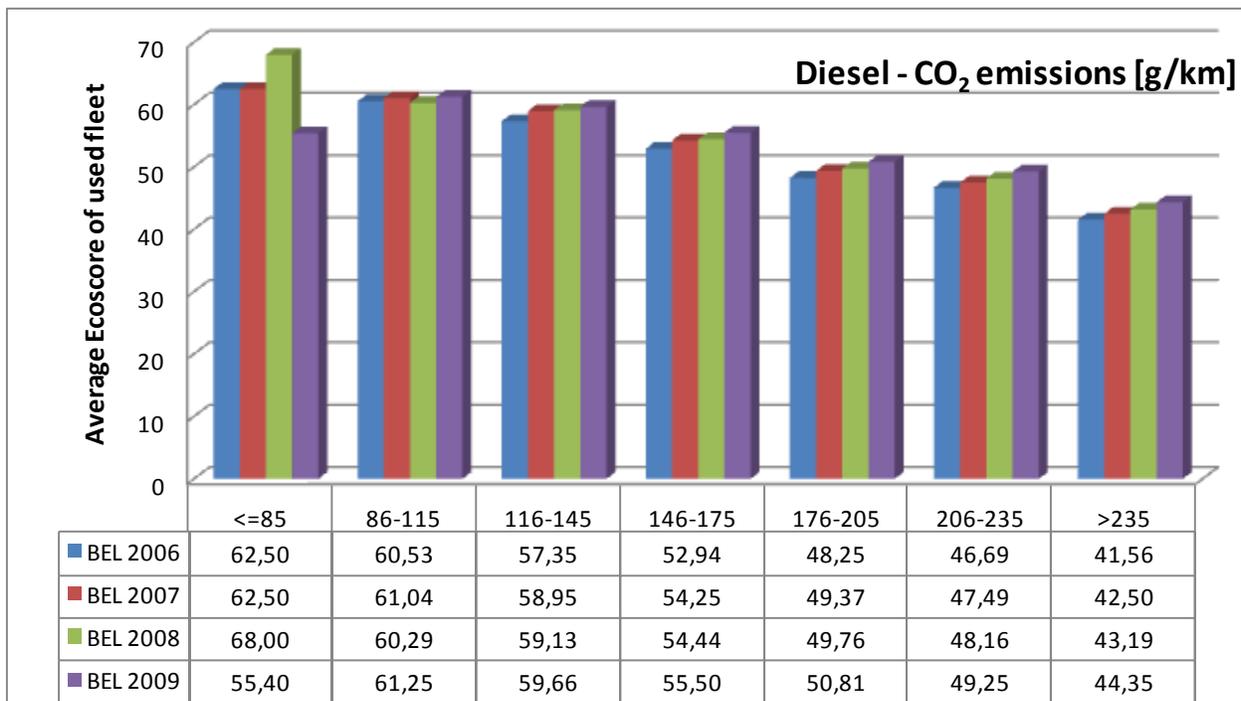


Figure 74: Ecoscore in function of the CO₂ emission of used diesel vehicles in Belgium from 2006 to 2009.

6.5 Particulate Matter (PM) emissions

As for CO₂ emissions, the database also lacks a large amount of PM emissions for diesel cars; in 2009 this was 52 %. Hence the presented analyses couldn't be performed on all second hand vehicle registrations.

The share of second hand diesel cars equipped with a soot filter has increased in Belgium from 7 % in 2006 to 18 % in 2009 (Figure 75, Figure 76). A similar increase is observed in the different regions, although the second hand fleet in Flanders shows higher shares of diesel cars with a filter (20 %) than Brussels (18 %) and Wallonia (15 %). As expected, a lot less second hand cars already have this filter compared to new cars. Also, the distortion for BCR due to the high number of new company cars, is no longer visible and the different regions show a more equal distribution.

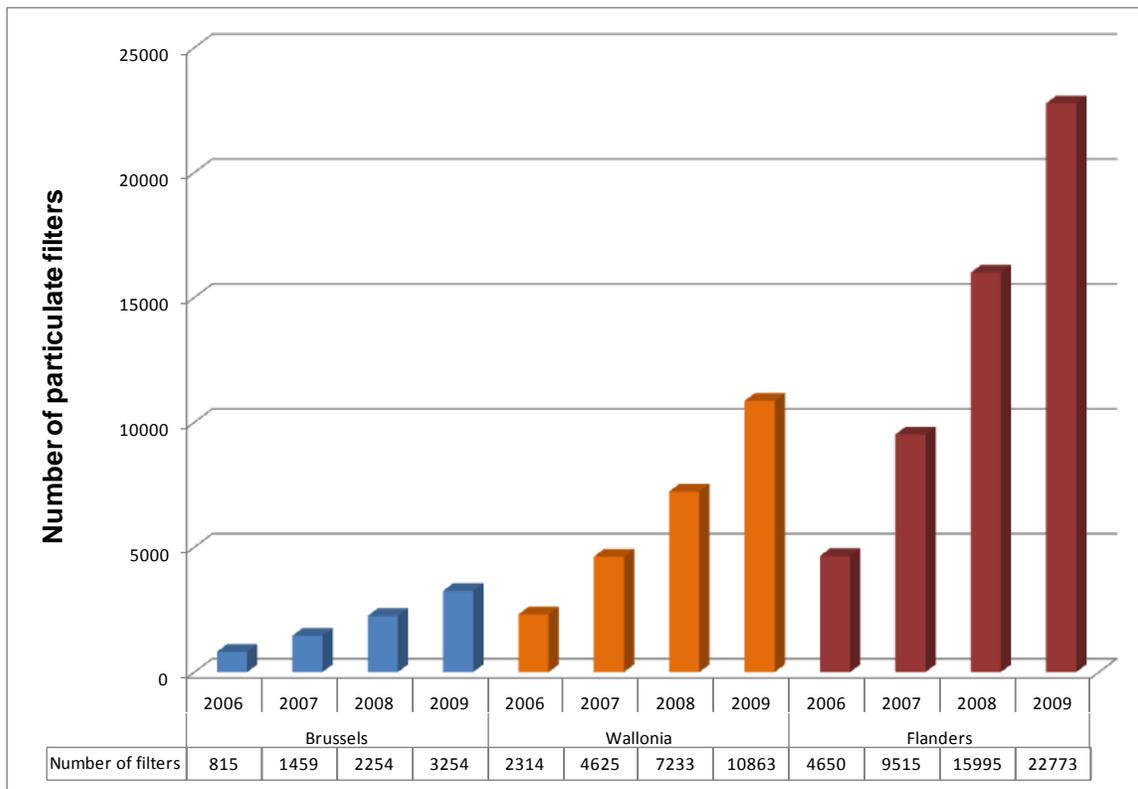


Figure 75: Absolute number of second hand diesel cars equipped with a particulate filter for the different regions, from 2006 to 2009.

Figure 77 shows the distribution of diesel cars equipped with a particulate filter over the different Euro classes. It is clear that in the fleet of 2006, the majority (71 %) are Euro 3 cars without particulate filter. In 2009 however, this share has shrunk to 39 %. By 2009 the share of Euro 4 cars without filter has increased from 21 to 43 %. Also more and more second hand diesel cars are equipped with a filter. While in 2006 only 7 % had already this filter, in 2009 this was 18 %, consisting of 16 % Euro 4 and 2 % Euro 3 diesel cars. So soot filters are mainly used with more recent Euro 4 cars and only minor numbers of Euro 3 cars are equipped with this filter.

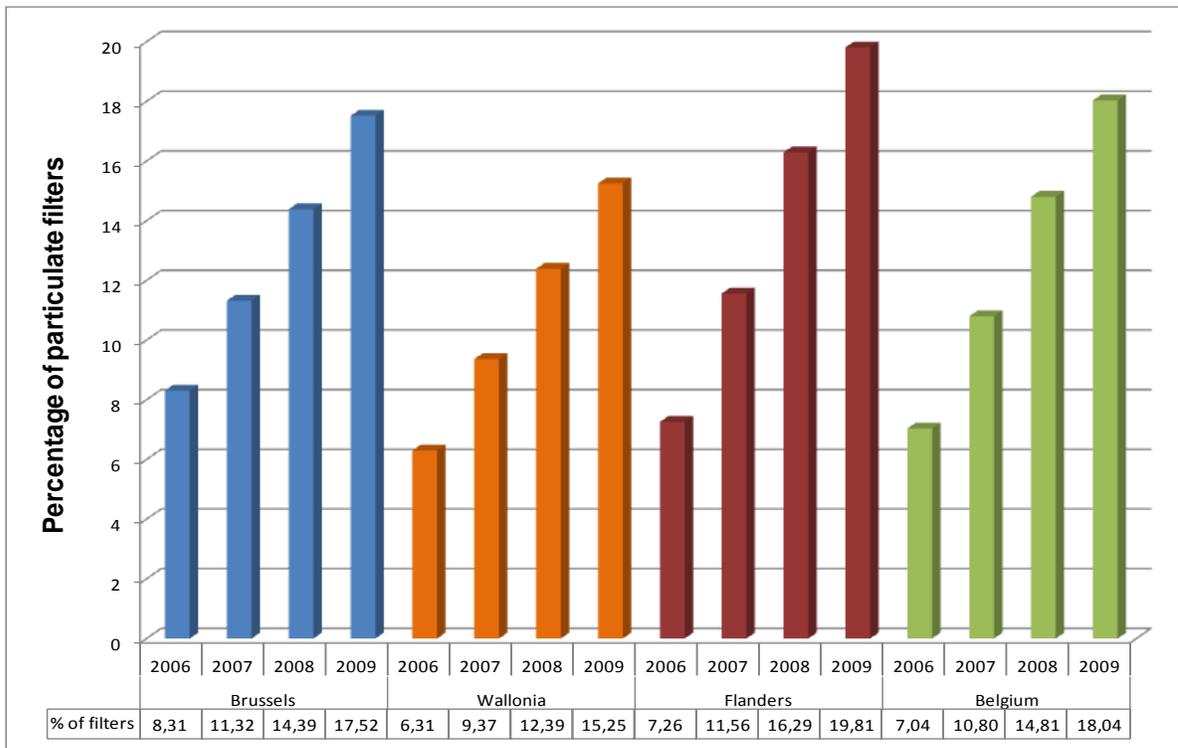


Figure 76: Relative number of second hand diesel cars equipped with a particulate filter for Belgium and the different regions, from 2006 to 2009.

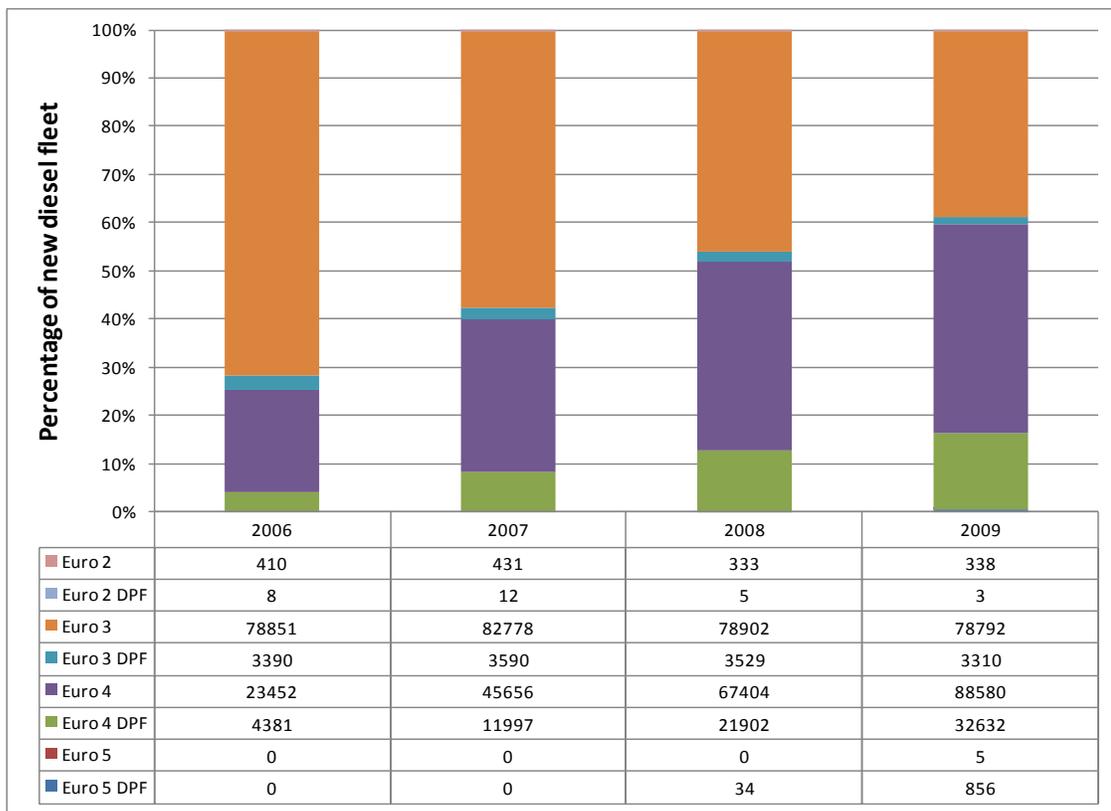


Figure 77: Distribution of second hand diesel cars with or without particulate filter (DPF) for the different Euro classes in Belgium, from 2006 to 2009.

7. Conclusions

7.1 Conclusions on the new and second hand vehicle fleet

7.1.1 Total numbers

- In 2009, 9 % less new passenger cars were registered than in 2008, with a total of 490.094 registrations. This decrease was observed in the BCR and Flanders, in Wallonia it remained more or less status quo. The share of new vehicles compared to the total fleet is a lot higher in the BCR (16 %) compared to Flanders and Wallonia (± 9 %).
- In 2009, 670.440 second hand passenger cars were registered in Belgium, making up 13 % of the total fleet, compared to 9 % for the newly registered cars. While the new cars have decreased, the second hand cars have increased with 2 %. From the assessed years it can be seen that second hand and new cars tend to have a complementary evolution in time. The trends can be an effect of the economic crisis, which has had its strongest influence up to now in 2009.

7.1.2 Fuel type distribution

- The share of diesel in the new fleet has increased from 2006 to 2008 to 79 %, after which a downfall was seen in 2009 to 75 %. In the second hand fleet, a continuous increase has occurred up to 2009 to 60 %. The share of petrol cars is complementary, since only minor numbers of alternatively fuelled vehicles (LPG, CNG, battery electric vehicle) are registered (<1 %).
- When comparing the different regions, BCR has the largest proportion of new diesel cars (80 %), followed by Wallonia and Flanders. For the second hand cars, the Flemish fleet has a somewhat higher share of diesel cars than the Brussels' fleet and more compared to the Walloon fleet.
- Diesel becomes ever more popular on the second hand market and the sales are less influenced by the crisis, while new diesel cars are registered less, maybe due to the higher sensitivity of company cars to the economic crisis. Petrol cars seem to be less influenced by the crisis, their number has decreased with only 6 % in 2009 for new registrations, while new diesel cars have decreased with 13 %.

7.1.3 Age of the second hand fleet

- 68 % of the second hand cars in 2009 were less than 10 years old. The share of cars younger than 5 years has increased strongly from 29 % in 2006 to 38 % in 2009. The share of very old cars has decreased in the same way. So there seems to be an increasing interest in second hand cars, especially more recent ones.
- The second hand fleet in Flanders seems to be younger than for the other regions. The share of cars of 10-14 years old is the biggest in Brussels (28 % in 2009) and the smallest in Flanders (20 %).
- Second hand diesel cars are mainly Euro 3 and Euro 4 cars, while petrol cars are more spread over the different Euro standards and ages. Of the oldest Euro 0 and Euro 1 cars, the majority runs on petrol fuel. So petrol cars tend to circulate longer on the second hand market and have a longer lifespan than diesel cars.

7.1.4 Ecoscore

- The new Belgian vehicle fleet had an average Ecoscore of 64,67 in 2009, the second hand fleet an average of 52,88. Wallonia has the highest averages for both new and second hand cars. The average Ecoscore has increased over the assessed years with 6 % for the new and 9 % for the second hand fleet.

- For both new and second hand cars, BEV, CNG and LPG cars have the highest average Ecoscore, followed by petrol and then diesel cars. Diesel cars are however improving twice as fast as petrol cars.
- New cars are centered strongly around the 61-65 Ecoscore class, while second hand cars are more spread over the different classes. This is due to the fact that second hand cars represent many different ages and Euro standards and thus much variation in environmental performance.

7.1.5 Vehicle weight

- The new Belgian fleet has become heavier up to 2008 (1444 kg), but has lost weight again in 2009 to 1431 kg. The weight of the second hand car fleet has increased continuously up to 1424 kg, for all regions. Wallonia has the lightest fleets (new and second hand), Brussels and Flanders are very similar. The Flemish second hand fleet has had the strongest weight increase. So there is an evolution towards heavier cars, both new and second hand, due to the demand for more luxury and safety. The economic crisis however might have led to change towards lighter cars, which are less expensive.
- The dieselification trend, as well as the demand for more luxury and safety in vehicles, has caused the average weight to increase. Diesel cars are on the average heavier than petrol cars. The downfall of the average weight of the new fleet seems to go together with a downfall of the number of new diesel cars. So the decrease in vehicle weight might be due to the small 'shift' from diesel to petrol in the new fleet.
- The higher the vehicle weight, the lower its Ecoscore. LPG cars display the highest average Ecoscore for all weight categories. Petrol cars perform better than diesel cars up to 1250 kg for new cars and up to 1750 kg for second hand cars. So heavy diesel cars are less polluting than heavy petrol cars, which is due to the higher sensitivity of the performance of petrol cars to weight variations.

7.1.6 Engine displacement

- The new fleet had an average displacement of 1676 cc in 2009, 2 % lower than in 2006. The second hand fleet has a higher average displacement of 1744 cc, which has increased with 1 % since 2006. In 2009, more new cars with a smaller engine were registered and less with a more powerful engine. The opposite is seen for the second hand car registrations in that same year. So here, the economic crisis might have an effect on the choice towards less powerful vehicles within new cars, but an opposite effect on second hand cars.
- The Brussels' fleet has the highest average displacement (new and used), but is closely followed by Flanders. Wallonia has the lowest average values overall. The second hand Flemish fleet has shown the strongest increase over the last four years.
- Petrol cars have a lower displacement on the average than diesel cars. Also new petrol and LPG cars follow a downsizing trend, new diesel cars on the other hand show higher engine displacements.
- The smaller the vehicle's engine, the higher its Ecoscore. The Ecoscore also increases stronger towards higher engine displacements. LPG cars have the highest Ecoscore for all displacement categories. Petrol cars perform better than diesel for the smallest and largest engines of new cars and only for 1401-2000 cc engines of second hand cars, in all other cases diesel cars have a better Ecoscore.

7.1.7 Engine power

- The new Belgian fleet had an average engine power of 81 kW in 2009, an increase of 2 % since 2006, but still slightly lower than for 2008. The second hand fleet had an average of 74 kW, an increase of 4 %. Flanders has the highest average values (new and second hand), Wallonia the lowest. There is a clear trend towards more powerful engines, however in 2009, possibly due to the financial crisis, more new vehicles from the lowest power classes are registered and less from the highest classes. The second hand cars show again the opposite trend.
- Diesel cars are in general more powerful than petrol cars. Only the most powerful class (>155 kW) is more populated by petrol than diesel cars due to the presence of heavy (sports) cars.
- The higher the engine power, the lower the Ecoscore. The Ecoscores have increased for all power classes over the different assessed years, with stronger improvements for the most powerful cars within the new registrations. For second hand cars, the Ecoscore increase is similar for the different classes. Petrol cars perform better than diesel up to 100 kW for new cars and 120 kW for second hand cars. Very powerful diesel cars thus have a better environmental performance than petrol cars.

7.1.8 CO₂ emissions

- The average CO₂ emission of the new fleet in 2009 was 142 g/km, a decrease of 8 % since 2006. The second hand fleet has a higher average value of 154 g/km, a decrease of only 0,5 %. The second hand Brussels' fleet has the highest average for 2009, but also the strongest decrease. The Flemish fleet has the highest value for the new fleet, but again the strongest decrease in Brussels. The Walloon fleet emits the least CO₂ for both their new and second hand cars. So there is in general a positive trend towards less CO₂-emitting cars for both the new and second hand fleet.
- The Ecoscore decreases with increasing CO₂ emissions. The Ecoscores of petrol cars are still generally higher than for diesel cars. Petrol cars show however few improvement in their Ecoscore (both new and second hand), while diesel cars have more margin for further improvement. The strongest improvements are again made in the most consuming categories.

7.1.9 PM emissions

- In 2009, 57 % of the new diesel cars emitted less than 11 mg/km PM and is assumed to be equipped with a particulate filter, coming from 21 % in 2006. The strongest increase has occurred since 2008, which may be linked to the introduction of the new Euro 5 emission standard. From this share of 57 % equipped with a filter, 36 % are Euro 4 and 21 % Euro 5 diesel cars.
- For second hand cars, 18 % had a soot filter in 2009, compared to 7 % in 2006. From this share of 18 % with a filter, 16 % are Euro 4 and only 2 % Euro 3 diesel cars.
- The BCR has the highest share of new diesel cars equipped with a particulate filter (63 %), which may be due to their high share of company cars. In Flanders, 60 % of the new cars is equipped with a filter, in Wallonia this is 49 %. For the second hand cars, the differences between the regions are less pronounced: Flanders has the highest share of diesel cars with filters (20 %), followed by Brussels (18 %) and Wallonia (15 %).

7.1.10 General conclusions on the indicators of the new and second hand fleets

- In 2009, less new passenger cars were registered in Flanders and BCR, while Wallonia remained stable. The number of second hand cars seems to be complementary to the new ones, since the economic crisis has created more interest in second hand cars, especially of less than 5 years old. For new cars, less diesel cars are bought, possibly due to the higher sensitivity of company cars on the financial crisis, while diesel cars are more popular on the second hand market.
- Alternatively fueled cars have the highest average Ecoscore. Petrol cars have higher Ecoscores than diesel cars, but in the higher ranges of the assessed indicators, diesel performs better. Also, diesel cars are improving their Ecoscore twice as fast as petrol cars.
- The average weight, displacement and power have continually increased for the second hand cars, while their CO₂ emissions have decreased. The new cars have shown the same trends up to 2008. In 2009 however, there has been a shift towards lighter and less powerful cars, as well as to more petrol cars.
- For the different assessed indicators (displacement, power, weight, CO₂), Wallonia always has the lowest average values. This is also reflected in the fact that Wallonia displays the highest Ecoscores. BCR and Flanders have very similar average values over the different fuel types and indicators.

7.2 Conclusions on the new company car fleet

- Of the new passenger car registrations in Belgium, 42 % was registered as a company car in 2008. Of these company cars, 54 % are leased cars. In 2009, less new cars were registered, but also the share of company cars has dropped to 37 %, of which 49 % are leased.
- The BCR has a special position in Belgium regarding their share of company cars: 76 % of the new cars are company cars (52 % leased, 24 % bought). Flanders has a total share of 38 % company cars (18 % leased, 20 % bought), although it outnumbers Brussels in absolute numbers. Wallonia has only a minor amount of new company cars (0,02 % leased and 15 % bought company cars). In all regions, less new company cars were registered in 2009, possibly due to the financial crisis. Only in Wallonia, the numbers of privately owned cars have slightly increased.
- Almost all new company cars run on diesel fuel: 91 % of the leased and 86 % of the bought company cars in Belgium, while only 68 % of the new private cars uses diesel.
- Private cars show the highest Ecoscore (65,32) and lowest values for the different assessed parameters (displacement, power, weight and CO₂). Company cars are heavier, more powerful and more consuming than private cars. There is however a strong difference between leased and bought company cars. Leased cars have better Ecoscores (64,49 versus 62,78) and are lighter, less powerful and less consuming than bought company cars. Hence, due to their higher replacement rate, leased company cars are making more progress towards the environmental performance of private cars.
- Company cars are more often equipped with a particulate filter than private cars: 62% of the bought and 68 % of the leased company cars have a PM filter, compared to 50 % of the private cars in 2009.