BEV's contribution non-ETS Belgium

Transport & Environment - November 2019

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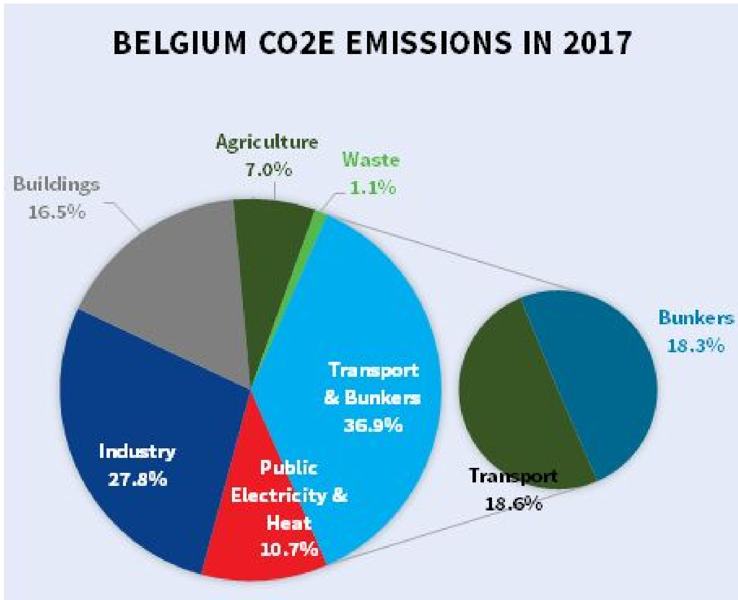
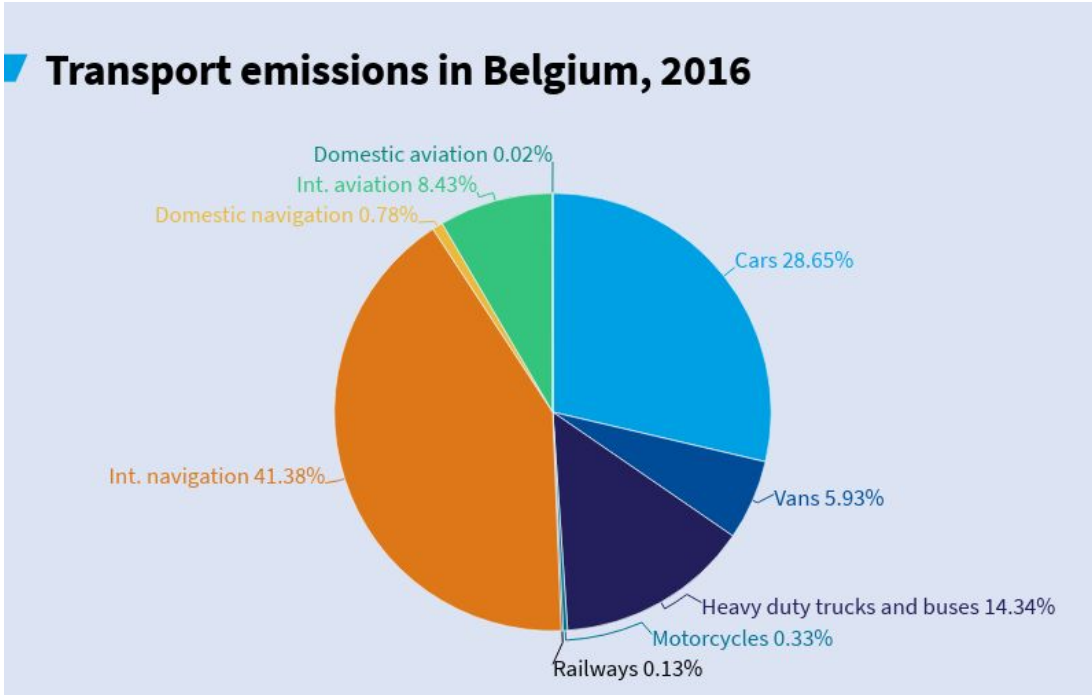
Introduction

Transport is by far Belgium’s biggest GHG emission source.



Heavy fuel oil sold mostly in Antwerp is the largest transport emitter:



However, international emissions are not an integral part of GHG inventories, just a memo item, and therefore they tend not to be included in national targets. So excluding international bunkers, the graphs would look like:

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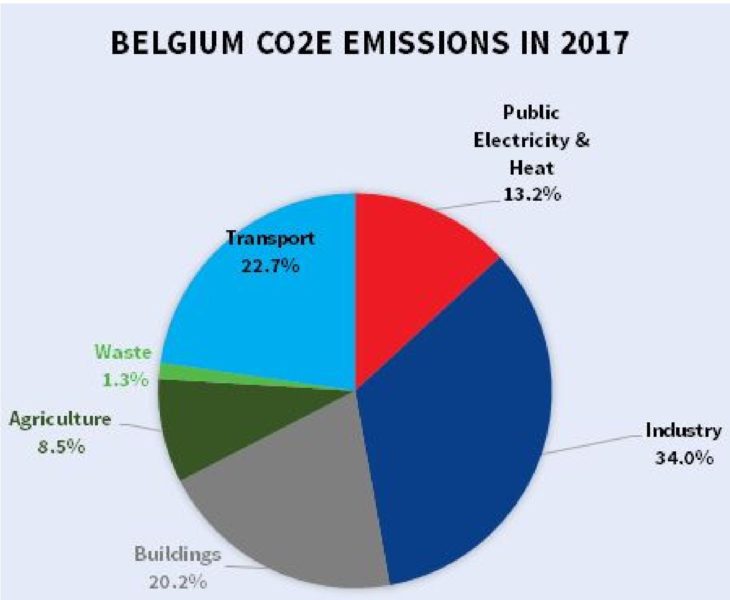
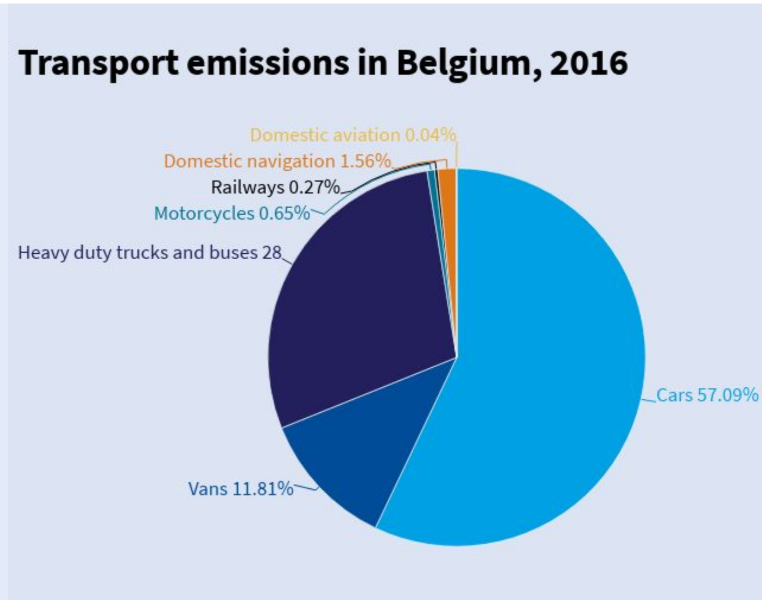
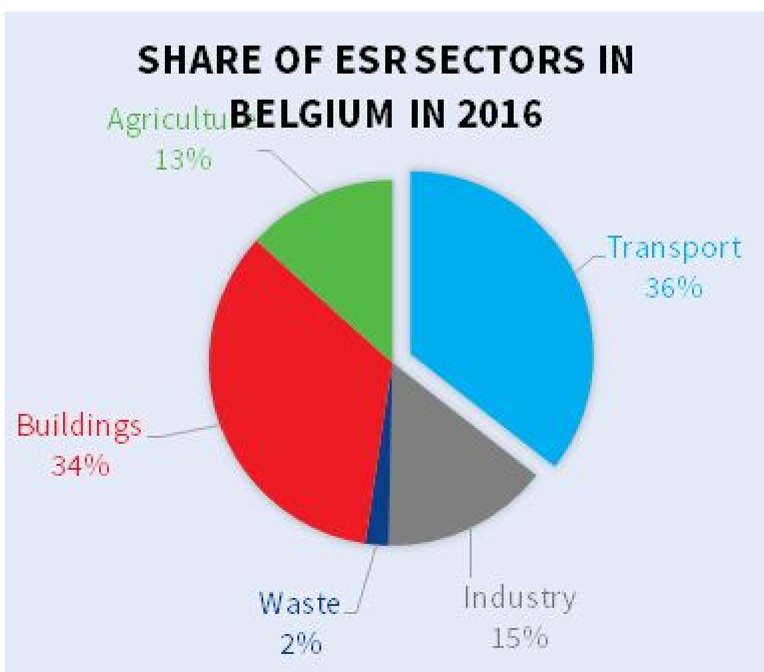




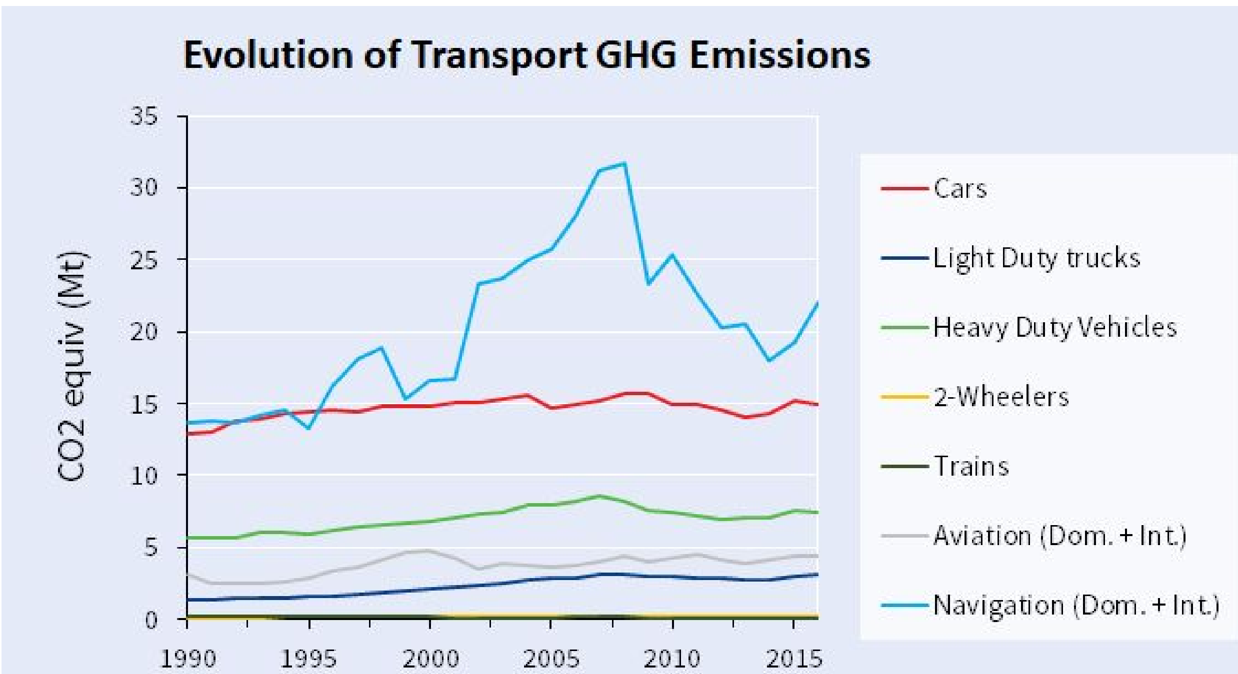
Even if transport is not the largest sector once international bunkers are included, emissions under the ETS is not directly responsible of the country itself, but the installations.

Belgium has a non-ETS target of -35% target by 2030 compared to 2005 levels. Within those sectors, transport is the largest:



Within the ESR, road transport represents 98% of the emissions. 58% of road transport emissions are from cars.

Therefore, in order to achieve Belgium's 2030 targets, reducing car emissions is key. Likewise, in order to achieve 2050 targets, emissions from cars need to go down to zero. However, emissions from car have more or less stagnated and slightly increase compared to 1990:



According to latest data reported to the European Commission, Belgium has a fleet of 5,730,974 passenger cars. This paper looks into how the sale of zero-emission cars in the next decade could contribute to achieve 2030 climate targets. We will model a number of scenarios: different ambition of EVs sold in 2030 (80% and 100%), and the difference between company cars and the rest of the fleet. Even if transport is not the only sector within the ESR, we assume it would make its fair contribution.

According to data by the Service public fédéral Mobilité et Transports, cars registered in Belgium travelled in 2016 84,3 billion vehicle-kilometers (vkm). According to the same source, on average cars registered in Belgium travelled 14,999 km per year.

Company cars represent an important percentage of the car fleet in Belgium. The definition of company cars changes among authors. Normally there are two categories: *voiture de société* (registered by a company) and *voiture-salaire* (given to an employee). According to the source above, Belgium has 445,419 *voitures-salaire*. However, other sources[1] estimate this value to be as high as 625,000, representing 11% of the fleet. The difference might be explained by the difference in definition. For this exercise, we will use the higher figure. As we couldn't find information for load factors specifically for company cars, we just took the national average. We also assumed that all retired company cars, as relatively new, are sold within Belgium.

Company cars in Belgium drive considerably more than the average car. A recent survey[2] found that company cars drive on average 27,860 km per year. This data is quite close to data published by the Service public fédéral Mobilité et Transports, which puts this value at 28,937 km per year. For this exercise, we will go for the lower value, given that we will use the higher value for the actual number of cars. 96% of current company cars are diesel.

Once the company cars are discarded, the average non-company car drives an average of 13,100 km per year. Company cars drive on average more than double the distance, and even if they only represent 11% of the fleet, they are responsible for almost 21% of all the vkm.

Historic emissions and targets

Belgium	2000	2005	2010	2015	2016
1.A.3.b - Road Transportation	24.0	25.7	25.6	26.0	25.8
1.A.3.b.i - Cars	14.9	14.7	15.0	15.2	15.0
1.A.3.b.ii - Light duty trucks	2.2	2.9	3.0	3.0	3.1
1.A.3.b.iii - Heavy duty trucks and buses	6.9	7.9	7.5	7.6	7.5

[1] new book, chapter 2
[2] H9 of the new book

	2030
35% ESR target on 2005 Emissions for cars	9.6
35% ESR target on 2005 Emissions for vans	1.9
35% ESR target on 2005 Emissions for Cars & Vans	11.4
35% ESR target on 2005 Emissions for trucks & buses	4.5
35% ESR target on 2005 Emissions for road transport	15.9

Methodology

We use the passenger car full stock model version of the EUTRM. The manual can be found here [link]. Bottom up model that calculates emissions based on exogenous per capita wealth driven demand, and the existing fleets. Policy levers such as vehicle driven train, efficiency, can be selected.

Assumptions, ZEVs, new sales

These results focus only on passenger cars, and in particular, the impact that differing targets for the whole fleet versus sub targets for company cars. Three scenarios, each broken into two sub scenarios, are listed below, while the sales curves, based on a logistic function (or S-curve) are shown in Figure 1 and described in Table 1.

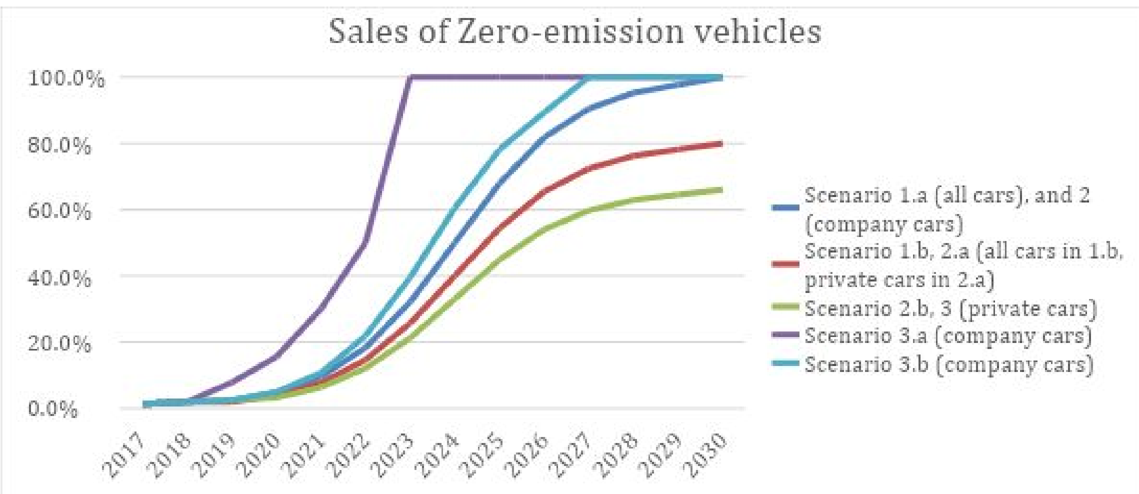
Scenarios 1 considers setting 2030 ZEV sales targets for the whole Belgian car fleet. Scenario 1.a considers a 100% sales target and 1.b an 80% target. Scenarios 2 break the Belgian fleet into company and private cars, and assumes that company cars will have a 100% ZEV sales target for 2030 while the sub scenarios 2.a and 2.b for private cars are 80% and 66%, respectively. Finally, Scenarios 3 considers a fixed 2030 sales target for private cars of 66% in 2030, while moving the 100% sales target forward for company cars, where scenario 3.a and 3.b have 100% ZEV sales targets in 2023 and 2027 respectively.

Although this paper largely focuses on 2030 targets, for long term projections we consider that sales linearly increase from **whatever value they take in 2030 to 100% in 2050**.

Table 1

ZEV sales target	Private cars	Company cars
Scenario 1.a	100% in 2030	
Scenario 1.b	80% in 2030	
Scenario 2.a	80% in 2030	100% in 2030
Scenario 2.b	66% in 2030	100% in 2030
Scenario 3.a	66% in 2030	100% in **2023**
Scenario 3.b	66% in 2030	100% in **2027**

Figure 1



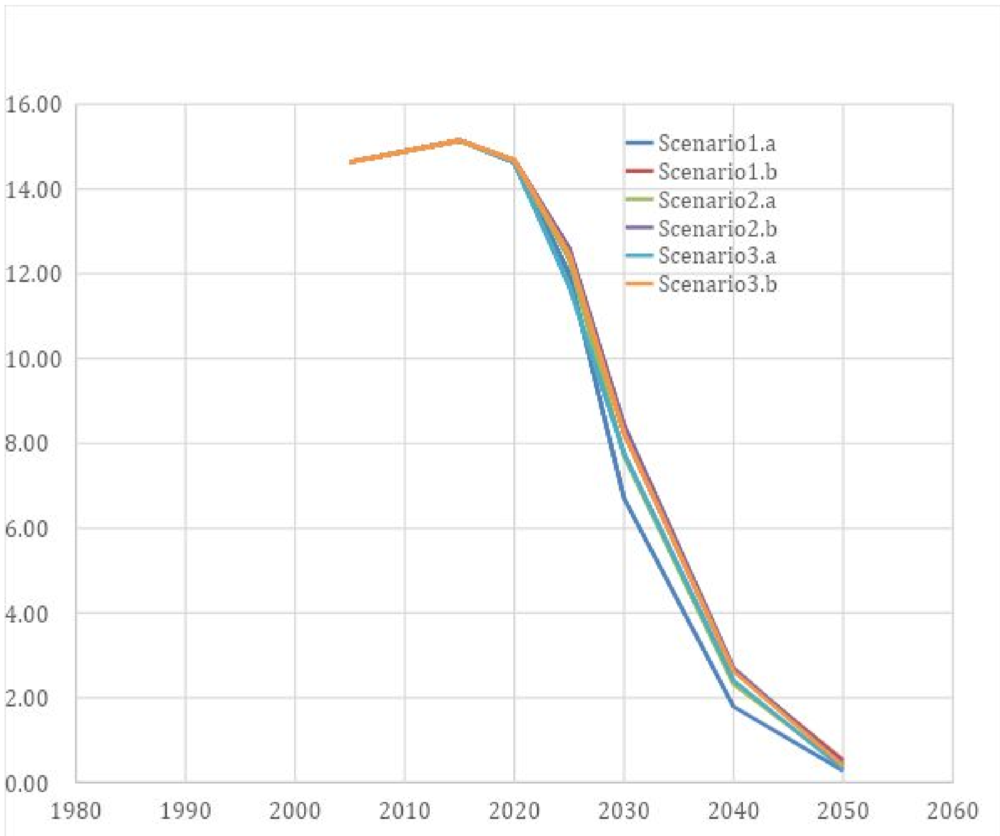
Results

The results are summarised in Table 2 and shown in Figure 2. All scenarios achieve the ESR target of 9.6 Mt CO_2e by 2030 for cars only.

A universal target of 100% ZEV sales by 2030 shows the lowest results in 2030 (Scenario 1.a) with a reduction in yearly emissions from 2005 equivalent to -54% while the least ambitious scenario for private cars and 100% sales of company cars in 2030 (scenario 2.b), gives the highest, equivalent to -42.4%. Grouping together the last three scenarios, we can see the influence of moving the sales target forward for company cars to 2027 (Scenario 3.b) and 2023 (Scenario 3.a), saving an additional 180 kt CO_2e and 660 kt CO_2e respectively.

Table 2

TTW EMISSIONS (million metric tons)	2005	2015	2020	2025	2030	2040	2050
Scenario1.a	14.63	15.14	14.62	12.01	6.71	1.79	0.28
Scenario1.b	14.63	15.14	14.66	12.51	8.25	2.64	0.52
Scenario2.a	14.63	15.14	14.65	12.35	7.71	2.33	0.37
Scenario2.b	14.63	15.14	14.67	12.60	8.43	2.70	0.43
Scenario3.a	14.63	15.14	14.62	11.72	7.77	2.41	0.32
Scenario3.b	14.63	15.14	14.67	12.46	8.25	2.63	0.40



It is interesting to point out that scenarios 2.a (private cars 80% ZEV by 2030, company cars 100% by 2030) and 3.a (private cars 66% ZEV by 2030, company cars 100% by 2023) deliver very same results. This shows that, as long as early pressured is applied to company cars, it can compensate for lower pressure on non-company cars.

Additionally, rather than yearly totals, the cumulative emissions can give clearer idea of the amount of CO2e emitted (or mitigated) over the course of the decade. These results are shown in Table 3. In this case, the difference between the most ambitious to least ambitious scenario is 7.7 Mt CO2e

Table 3: Comparison from a car perspective only

TTW EMISSIONS (Mt CO2eq)	2005	2030	% diff	cumulative
Scenario1.a	14.63	6.71	-54.2%	201.1
Scenario1.b	14.63	8.25	-43.6%	207.8
Scenario2.a	14.63	7.71	-47.3%	205.6
Scenario2.b	14.63	8.43	-42.4%	208.8
Scenario3.a	14.63	7.77	-46.9%	201.9
Scenario3.b	14.63	8.25	-43.6%	207.5

If results are analysed from a broader road perspective, scenario 1.a delivered -36% vs 2005 for all road transport. This means that, in absence of new policies for Heavy Duty Vehicles (HDVs) or other policies for cars and vans (modal shift, demand management), this policy alone would do basically all the effort needed to achieve 2030 targets. Additionally, it would put Belgium on track to meet 2050 targets, at least regarding car decarbonisation.

Scenario 1.b delivered -30% vs 2005 for all road transport. This means that, in absence of new policies for Heavy Duty Vehicles (HDVs) or other policies for cars and vans (modal shift, demand management), this policy alone would not do most of effort needed to achieve 2030 targets. Additional measures would be required. That would be the case basically for all scenarios: scenario 2.a would deliver 32%, 2.b 29%, 3.a 32% and 3.b 30%.

Discussion

Many policies are available to stimulate ZEVs, and some of the burden can be placed on companies rather than citizens. Tax breaks for company cars are currently generous; important consideration about continuing them unless they become ZEVs. Fast uptake and turnover of ZEVs for company cars creates an expanding second hand market, which eventually allows uptake of these vehicles by private citizens. This policy is more affordable and equitable for the average citizen.

Appendix

From here, p17:

Belgique	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015*	2016
nombre de voitures	5 042 095	5 123 972	5 191 714	5 275 610	5 406 362	5 440 754	5 504 809	5 572 573	5 661 742	5 645 698	5 730 974
km/an par voiture	15 741	15 690	15 867	15 649	15 489	15 311	15 286	15 096	15 151	15 149	14 999
km total voitures (milliards)	**79,368**	**80,395**	**82,377**	**82,559**	**83,737**	**83,301**	**83,089**	**82,928**	**84,225**	**83,972**	**84,306**

Some key assumptions/considerations for company cars:

- Load factors for company cars as per national average
- National fleet adjusted so that diesel-petrol share nationally is equivalent when adding company car fleet
- Company cars have modified survival rate, with an *average retirement age* of 4.1 years. These cars are then assumed to go to the national Belgian fleet but then drive significantly fewer kms per year, as per observed data today.
- Activity versus wealth curve is identical for company cars and national fleet (future activity demand growth)
- 2016 share of fleet and activity used as a proxy split for historical and future shares
- Adjustment to payload to calibrate:
- Calibrated emissions in BAU
- Vkm distribution as:

AVERAGE ANNUAL DISTANCE AT AGE X							
Function	**Average Retirement**	**0**	**1**	**2**	**3**	**4**	**5**
Belgium LDV	10.4	13 100	13 100	13 100	13 100	13 100	12 527
Belgium_cc LDV	4.1	27 860	27 860	27 860	27 860	27 860	12 527