

Monitoring of the rate of drivers using lights during daytime in Germany

(Survey 2021/2022)

FE 83.0041/2020
on behalf of the
Federal Highway Research Institute (BASt)

Abridged Report

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30 November 2022

1 Introduction

In order to assess the extent to which the recommendation of the Federal Ministry of Transport and Digital Infrastructure (BMVI) on driving with lights on during the day, which has been in place since October 2005, was followed, a survey of light activation rates (LEQ) during the day in Germany was carried out for the first time in 2007. The survey concept developed at that time (SIEGENER ET AL., 2008) and the revised evaluation methodology (KATHMANN ET AL., 2020) were designed in such a way that a continuous and systematic update of the results is possible at regular intervals.

As a consequence of the European Directive 2008/89/EG, all new vehicle types of the classes M1 and N1 have to be equipped with daytime running lights (TFL) since February 2011 and since August 2012 also the new vehicle types of all other EG vehicle classes. In view of this development, it is assumed that driving with lights on during the day will become more and more widespread. In order to be able to evaluate the resulting safety gains, continuous monitoring of the light activation rates is necessary.

In this context, the proportion of daytime running lights was recorded for the first time in the 2013/2014 survey (KATHMANN ET AL., 2015). The experience gained from this was used in the 2015/2016 survey to develop a concept for the continuous recording and evaluation of the proportion of daytime running lights, which also forms the basis for the 2021/2022 surveys.

The aim of the present research project is to provide up-to-date information on the behaviour of road users with regard to driving with lights on during the day and to update the results available so far for the survey period 2021/2022. In addition, since the 2013/2014 survey, the proportion of daytime running lights has been recorded and integrated into the update by means of a systematic evaluation concept. This information is of interest, among other things, in order to record the development of the degree to which vehicles in Germany are equipped with daytime running lights.

2 Methodology and Procedure

The surveys are carried out in each survey period according to the specifications of the current survey concept (2021/2022: KATHMANN ET AL., 2020) within the same six regions at almost unchanged locations of the three localities freeway, country road and inner city with continuous updating of the resulting results:

- Erfurt
- Essen
- Potsdam
- Karlsruhe
- Straubing
- Emden/Oldenburg

Characteristics for driving with lights on in flowing traffic are collected. The observations are made in three different survey periods according to the seasons on 6 consecutive days (Monday to Saturday):

- Summertime (May, June, July, August) from 8:00 am – 4:00 pm (48 h),
- Interim time (September, October, March, April) from 9:00 am – 5:00 pm (48 h),
- Wintertime (November, December, January, February) from 10:00 am – 3:00 pm (30 h).

Each survey hour is again divided into intervals of 15 minutes on average, which are used to observe the traffic, to assess the weather situation or as a break. The data is recorded using tablet PCs and an online tool installed on them, in which the following characteristics are recorded via a mask with regard to driving with light (KATHMANN ET AL., 2020):

- Cars / Trucks with daytime running lights
- Cars / Trucks with dimmed headlights
- Cars / Trucks without lights

In addition, the following characteristics are recorded at the end of each time interval as part of the weather assessment:

- 1 = sunny (mostly sunshine, no / hardly any clouds),
- 2 = partly cloudy (clouds with blue sky parts),
- 3 = cloudy (sky is completely covered with clouds),

- 4 = occasional rain (it rains occasionally) and
- 5 = Rain (it rains without interruption)

In addition to the weather assessment of the surveyors, the relevant information is retrieved from the German Weather Service (DWD) and prepared according to the specifications in the compendium (KATHMANN ET AL., 2020).

The summarizing evaluation of the survey and weather data is basically carried out according to the guidelines of the compendium (KATHMANN ET AL., 2020).

In this way, the survey data was initially evaluated by hour, independent of weather conditions. In order to take into account the influence of the weather at the time of the survey, the count data were then processed in conjunction with the weather data from the DWD. Thus, daytime light activation rates were determined for the three weather classes

- „rain“,
- „sunshine less than 10 minutes per hour and no rain“ and
- „sunshine more than or equal to 10 minutes per hour and no rain“

for each region and location. As a small change to the previous evaluations, the shares of the daytime running lights (DRL) were no longer divided into weather classes since the 2015/2016 survey period, as these are independent of the weather conditions due to the construction. In addition, evaluations were carried out for all hours with sunshine duration = 60 min/hour in order to determine the proportion of drivers who always drive with their lights on.

In the next processing step, the daytime light activation rates per weather class were weighted with the mileage. Subsequently, the daytime light activation rates were evaluated by region, survey interval and location.

In order to be able to make a direct comparison of the daytime light activation rates of the current survey 2021 / 2022 with the previous results, the current results were standardized taking into account the weather data of the base year (2007 / 2008). By comparing the results of the different survey periods, it was possible to describe the development of the daytime light activation rates.

In addition to the evaluation of the daytime light activation rates, an analysis of the distribution of the light types separated by region, survey interval and location was carried out. For this purpose, the proportions of the defined categories "dimmed headlights" and "DRL" in relation to all vehicles recorded were determined and compared.

Using the results from the summer months, the following rates were also calculated for two weather classes (cars only):

- Rates in sunny weather (sunshine duration = 60 min/hour),
- rates for weather with no or very little sunshine (sunshine duration < 10 min/hour but no rain).

From the development of these rates, in comparison with the development of the overall rates, it can be assessed whether the behaviour for driving with lights has changed in all weather conditions or, for example, only during periods without sun. It should be noted that the data for these two weather classes were not extrapolated from the mileage, as the mileage for each weather class is not known.

3 Research results 2021/2022 – Development of light activation rates

In the current survey interval, the mileage-weighted daytime light activation rates were determined by extrapolating the results based on the mileage survey (BÄUMER ET AL., 2017).

The comparison of the current survey with the results of previous surveys shows that the standardised daytime light activation rates for trucks have continued to rise across all survey intervals and locations, as in previous years, while the trend of a steady increase for passenger cars at the motorway and inner-city locations has flattened out. In the average, there is still a slight increase from 79.5 % to 81.0 % for cars and an increase from 80.3 % to 82.9 % for trucks compared to the last survey (cf. Table 3-1 / Table 3-2 and Fig. 3-1 / Fig. 3-2).

With weather conditions in the survey-period					With weather conditions in the base year				
Period	Motorway	Rural road	Inner city	Average	Period	Motorway	Rural road	Inner city	Average
2007/2008	56.2	35.0	26.7	37.9	2007/2008	56.2	35.0	26.7	37.9
2009/2010	61.3	39.8	33.8	43.7	2009/2010	60.8	38.8	33.3	43.0
2011/2012	61.2	45.1	41.9	48.5	2011/2012	61.3	45.3	42.2	48.7
2013/2014	69.2	51.6	47.8	55.2	2013/2014	69.0	51.7	48.1	55.3
2015/2016	74.2	64.6	59.9	66.1	2015/2016	74.3	64.9	59.9	66.3
2017/2018	80.3	73.4	67.0	73.7	2017/2018	80.5	73.6	67.3	73.9
2019/2020	83.1	76.8	76.9	78.7	2019/2020	83.7	77.4	78.2	79.5
2021/2022	83.1	80.7	77.2	80.4	2021/2022	83.9	81.3	77.5	81.0

Table 3-1: Development of daytime light activation rates LAR by location, cars (in %)

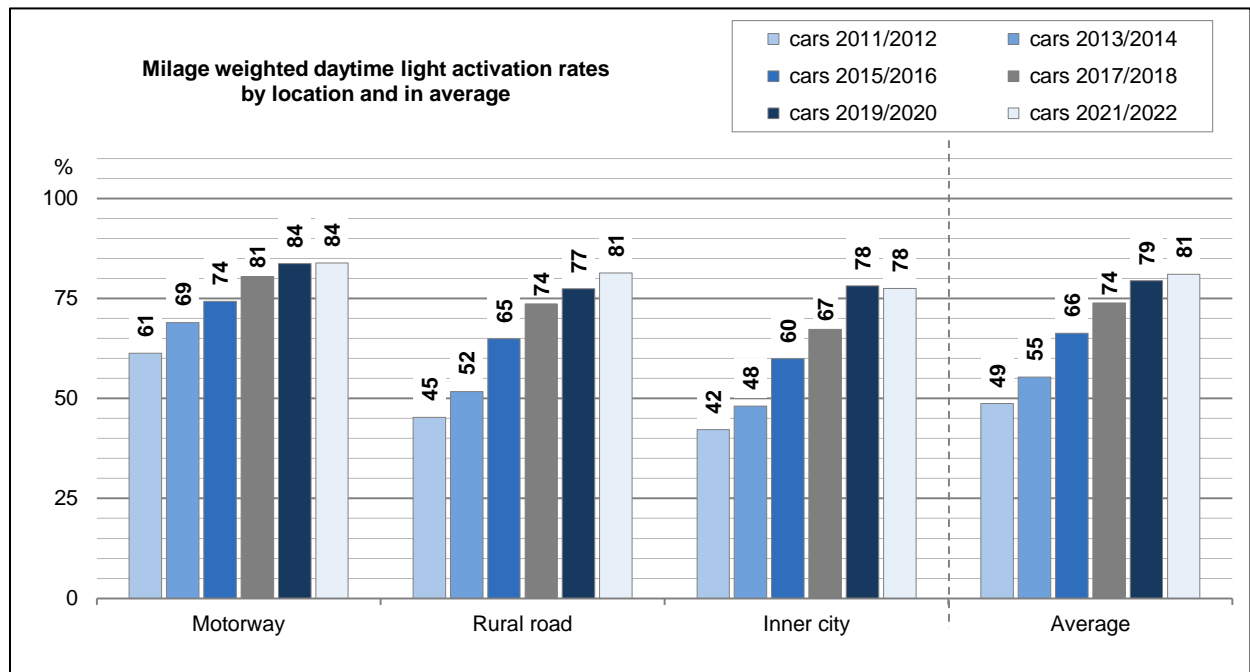


Fig. 3-1: Development of daytime light activation rates LAR (with weather conditions in the base year), cars

With weather conditions in the survey-period					With weather conditions in the base year				
Period	Motorway	Rural road	Inner city	Average	Period	Motorway	Rural road	Inner city	Average
2007/2008	49.5	34.9	27.4	39.6	2007/2008	49.5	34.9	27.4	39.6
2009/2010	52.8	39.5	36.2	44.6	2009/2010	52.2	38.5	35.7	43.9
2011/2012	55.6	41.1	43.4	48.1	2011/2012	55.4	41.3	43.9	48.2
2013/2014	59.6	49.2	47.8	53.5	2013/2014	59.3	49.5	48.0	53.5
2015/2016	69.6	62.5	58.2	64.4	2015/2016	69.8	62.7	58.3	64.6
2017/2018	78.8	70.3	65.4	72.6	2017/2018	79.0	70.7	65.6	72.9
2019/2020	84.3	76.7	76.4	79.7	2019/2020	85.0	77.2	77.0	80.3
2021/2022	85.3	80.2	79.8	82.2	2021/2022	86.1	81.0	80.2	82.9

Table 3-2: Development of daytime light activation rates LAR by location, trucks (in %)

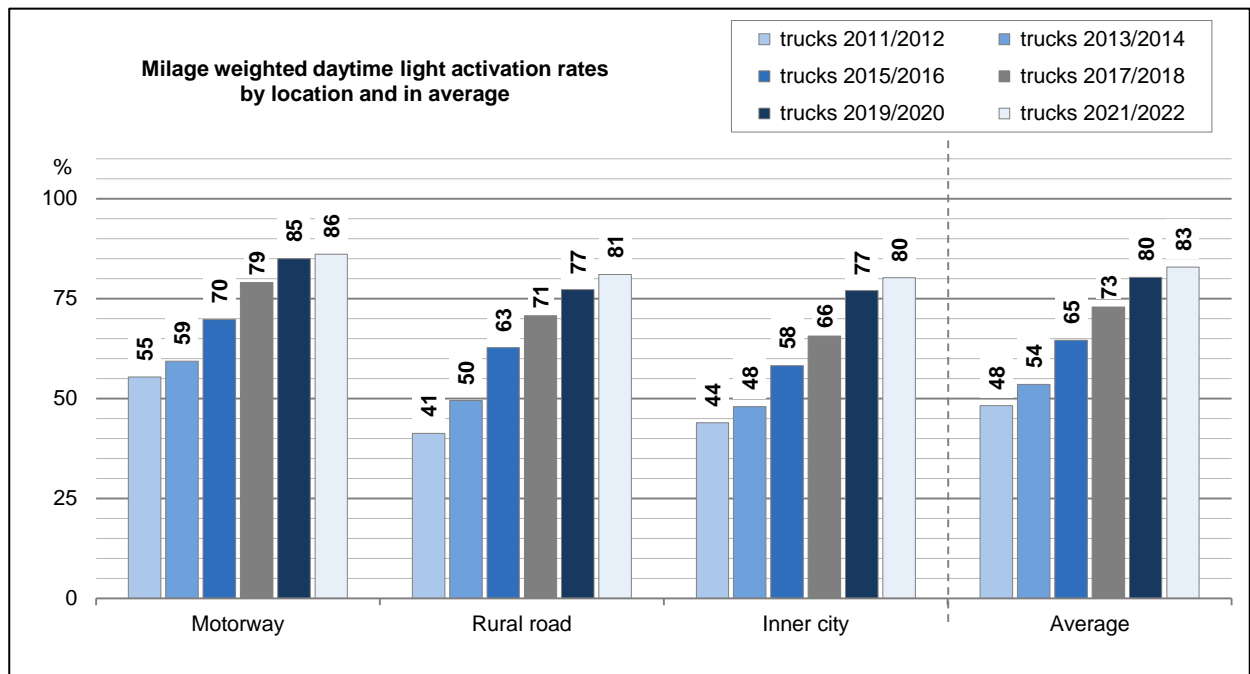


Fig. 3-2: Development of daytime light activation rates LAR (with weather conditions in the base year), trucks

In addition, the ratings in summer were evaluated in sunny weather (sun = 60 min/hour) and in weather without sun (sun < 10 min/hour). The calculation of the average was carried out without weighting, as the driving performance depending on the weather is not known. The corresponding values are shown in Table 3-3 and graphically in Fig. 3-3 and Fig. 3-4.

Cars, sun = 60 minutes					Cars, sun < 10 minutes				
Period	Motorway	Rural road	Inner city	Average	Period	Motorway	Rural road	Inner city	Average
2007/2008	36.9	14.3	12.3	21.2	2007/2008	60.4	36.6	28.9	42.0
2009/2010	40.8	18.9	20.1	26.6	2009/2010	58.9	41.1	29.8	43.3
2011/2012	46.7	27.0	25.8	33.2	2011/2012	63.5	49.5	46.8	53.3
2013/2014	54.4	37.3	37.6	43.1	2013/2014	70.8	53.2	42.0	55.3
2015/2016	67.6	53.6	48.4	56.5	2015/2016	72.1	67.8	55.8	65.2
2017/2018	75.0	64.1	60.1	66.4	2017/2018	76.2	69.4	69.3	71.6
2019/2020	75.5	73.0	73.7	74.1	2019/2020	83.1	75.8	77.1	78.7
2021/2022	75.5	75.9	73.1	74.8	2021/2022	80.6	85.5	77.9	81.3

Table 3-3: Development of daytime light activation rates LAR in summer in sunny weather and in weather without sun, cars (in %)

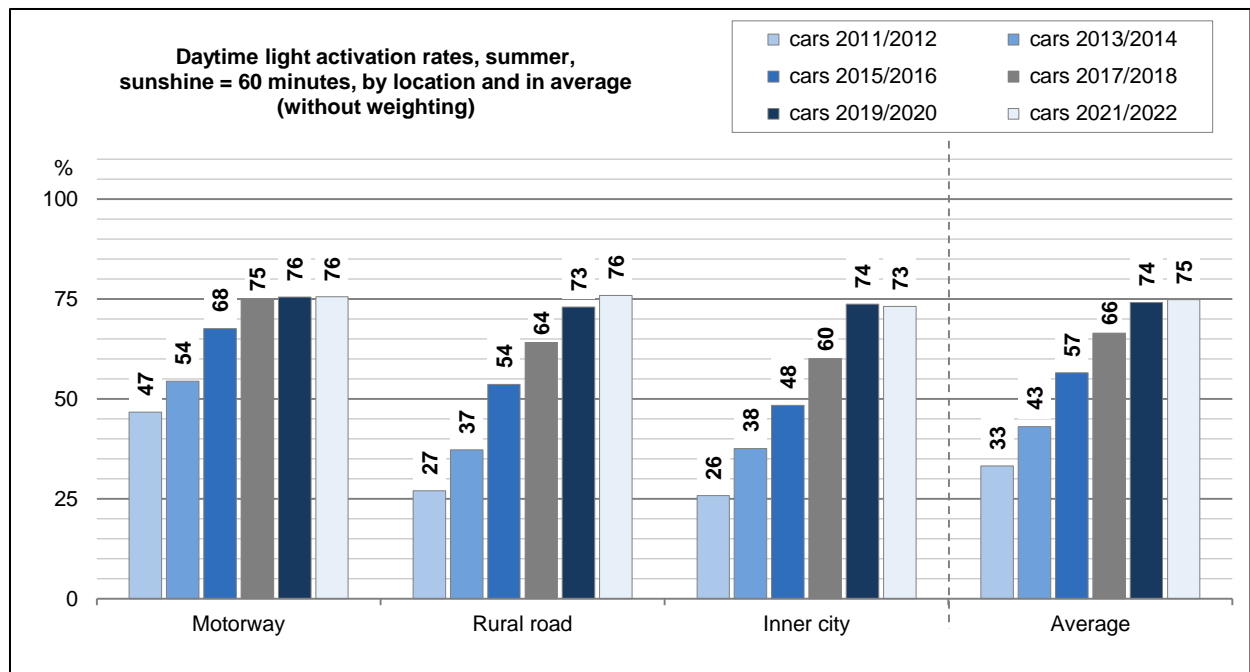


Fig. 3-3: Development of daytime light activation rates LAR in summer with sunshine duration = 60 min/h, cars

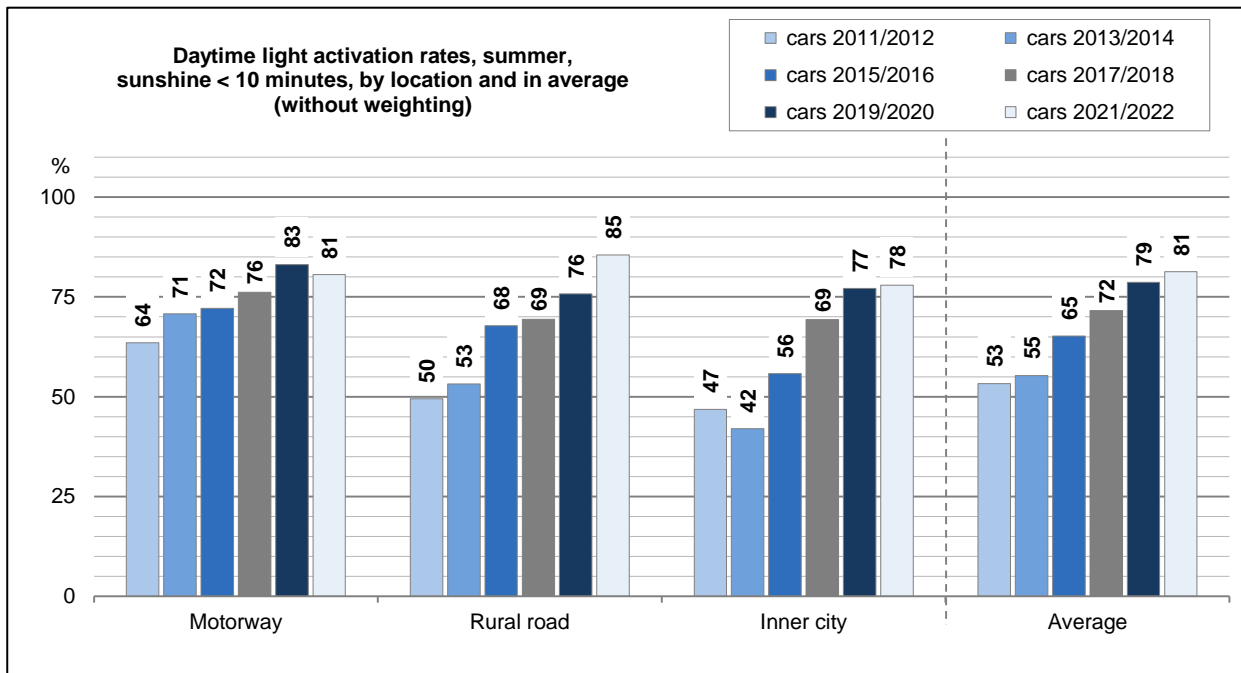


Fig. 3-4: Development of daytime light activation rates LAR in summer with sunshine duration < 10 min/h, cars

Table 3-3 and Fig. 3-3 / Fig. 3-4 show that even in the special analysis for sunny weather in summer (sunshine duration = 60 min. per hour) a clear levelling off for passenger cars compared to the last survey can be seen, so that on average across all survey regions and locations there is still a slight increase from 74.1 % to 74.8 %. The special analysis for summer weather conditions with a sunshine duration of less than 10 minutes per hour shows an average increase from 78.7 % to 81.3 %.

The additional analysis of the types of light carried out since the 2013/2014 survey period showed that the shares of the types of light differ in part between the survey regions. While the shares of daytime running lights for passenger cars increased significantly from 2013/2014 to 2017/2018 for all locations, there were only minor changes in the daytime running light shares over the last survey periods 2019/2020 and 2021/2022. As an average value in relation to all passenger cars across all locations in Germany, the daytime running light share is currently 58.0 % (in 2015/2016 this daytime running light share was still 35.3 %). This means that over half of all passenger cars in Germany are still equipped with daytime running lights (see Table 3-4 / Figure 3-5). If we only consider all observed passenger cars with their lights on, the distribution is 70.0 % passenger cars with daytime running lights to 30.0 % passenger cars with dipped headlights.

Cars, sun = 60 minutes					Cars, sun < 10 minutes				
Period	Motorway	Rural road	Inner city	Average	Period	Motorway	Rural road	Inner city	Average
2013/2014	27.9	26.2	26.5	26.9	2013/2014	13.8	11.4	14.1	13.1
2015/2016	40.0	33.3	32.7	35.3	2015/2016	21.7	19.7	14.8	18.7
2017/2018	63.4	56.2	54.0	57.8	2017/2018	47.5	45.0	40.2	44.3
2019/2020	64.6	56.4	59.6	60.2	2019/2020	55.1	48.1	51.3	51.5
2021/2022	61.4	57.0	55.6	58.0	2021/2022	53.3	45.5	48.8	49.2

Table 3-4: Development of daytime running light rates by location, cars (in %)

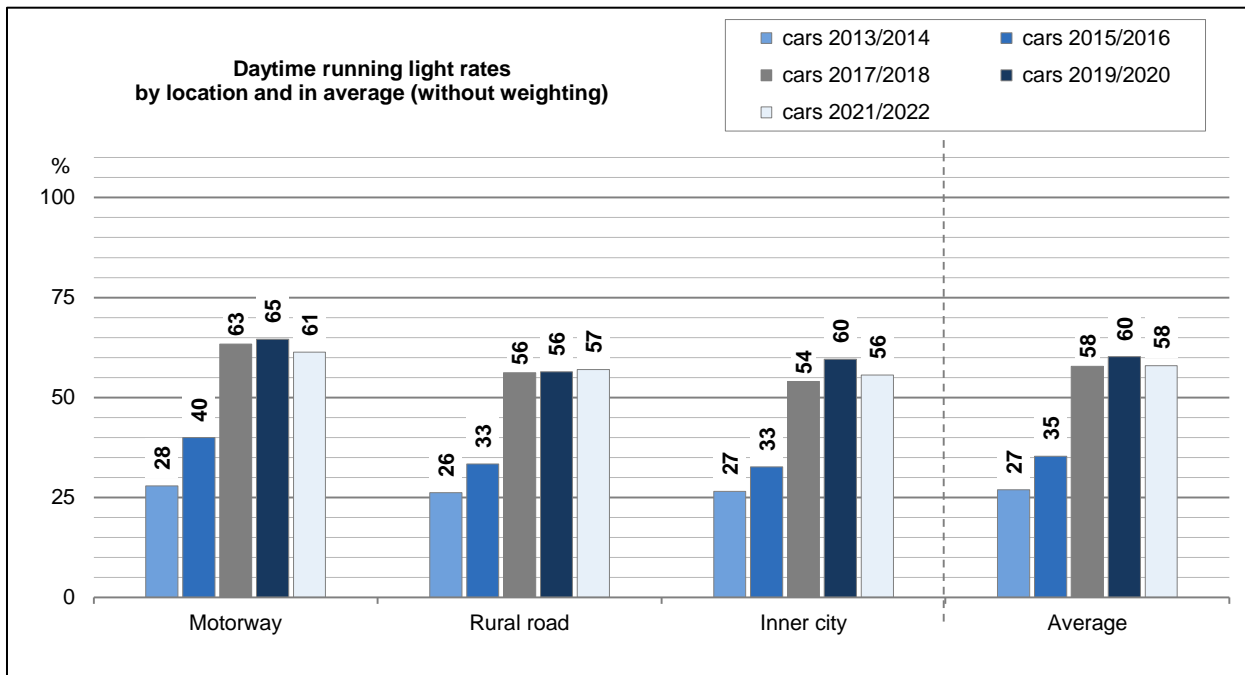


Fig. 3-5: Daytime running light rates for the last five surveys by location, cars

4 Conclusion

Within the scope of the project, the daytime light activation rates in Germany and the associated daytime running light shares were updated according to the existing specifications. The results must be regarded as slightly influenced by the restrictions and measures against the pandemic spread of the coronavirus SARS-CoV-II with changes in the traffic composition, which have been intensified in phases since 2020, both nationwide and state-specific. The result largely shows the expected rates of increase in daytime light switching rates, while little change was observed in daytime running light proportions.

In view of the mandatory fitting of daytime running lights to new vehicles and the return to normal traffic composition (also due to an expected decline in the high home-office rate of recent years), a further increase in daytime light switch-on rates is expected in Germany in the future.

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