

IV.9.3 Monitoring concentrations of elemental, organic and black carbon

The first regular measurements of elemental and organic carbon (EC, OC) in the CR were launched in February 2009 at the Košetice Observatory (OBK). The average concentration of total carbon (TC) in 2009–2021 in the sampled PM_{2.5} fraction was 3.2 µg·m⁻³, of which EC was 0.4 µg·m⁻³ and OC 2.8 µg·m⁻³. In 2021, the highest average concentration of TC (5.7 µg·m⁻³) was measured in February. In February, the average air temperature was 0.0 °C, which was the second lowest average temperature recorded in 2021 (the lowest average temperature of -1.4 °C was recorded in January). In 2021, the average TC concentration was 2.9 µg·m⁻³, only 0.1 µg·m⁻³ higher than in 2020. The average annual EC con-

centration in 2021 was 0.3 µg·m⁻³ and the OC concentration reached 2.6 µg·m⁻³. Overall, considering the trend in concentrations during the period of measurements, a slightly decreasing trend can be identified despite the increase in average annual concentrations in some years. While EC concentrations have been gradually decreasing since the beginning of measurements (2009 – 0.6 µg·m⁻³), in 2012, 2013, and 2018, concentrations again increased. After the renewal of measurements in 2016, the annual average concentrations were slightly above 0.3 µg·m⁻³. A significant increase was recorded in 2018. A similar but more noticeable trend was also observed for OC. The highest average value was observed in 2013 (3.7 µg·m⁻³), while the lowest OC concentration was characteristic for 2016 (2.0 µg·m⁻³) (Fig. IV.9.3.1).

Black carbon (BC) concentrations are measured at stations within the network of ultrafine particles – Hradec Králové-Brněnská, Lom, Mladá Boleslav, Plzeň-Slovany and Ústí nad La-

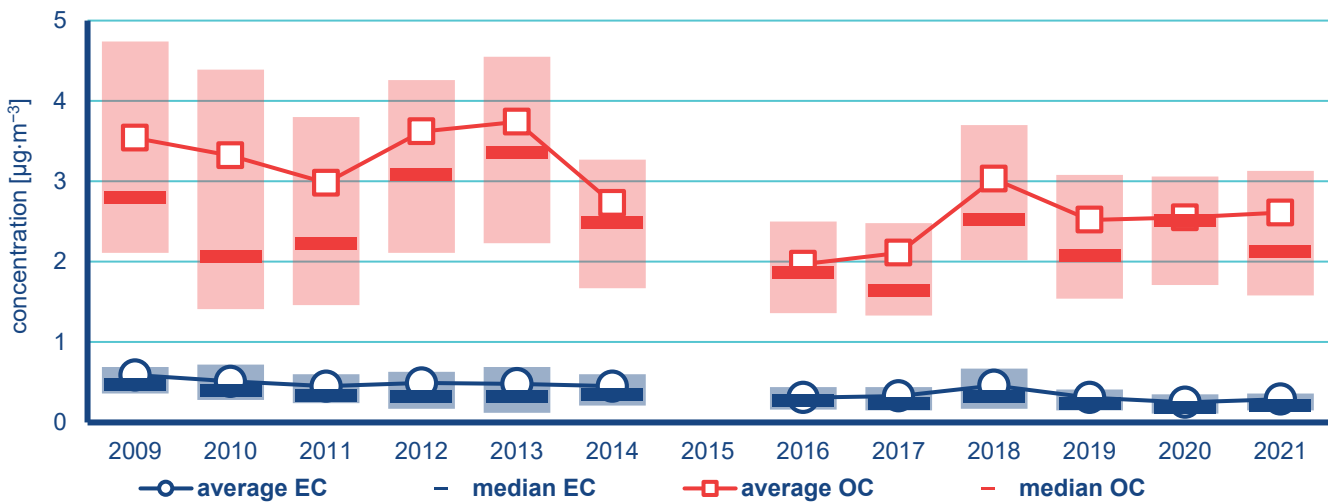


Fig. IV.9.3.1 Annual average concentrations of EC and OC, Košetice Observatory, 2009–2021

Note: The range of daily values is indicated by the top/bottom border of the boxes representing the value of 75th and 25th percentile respectively; the horizontal line indicates the median.

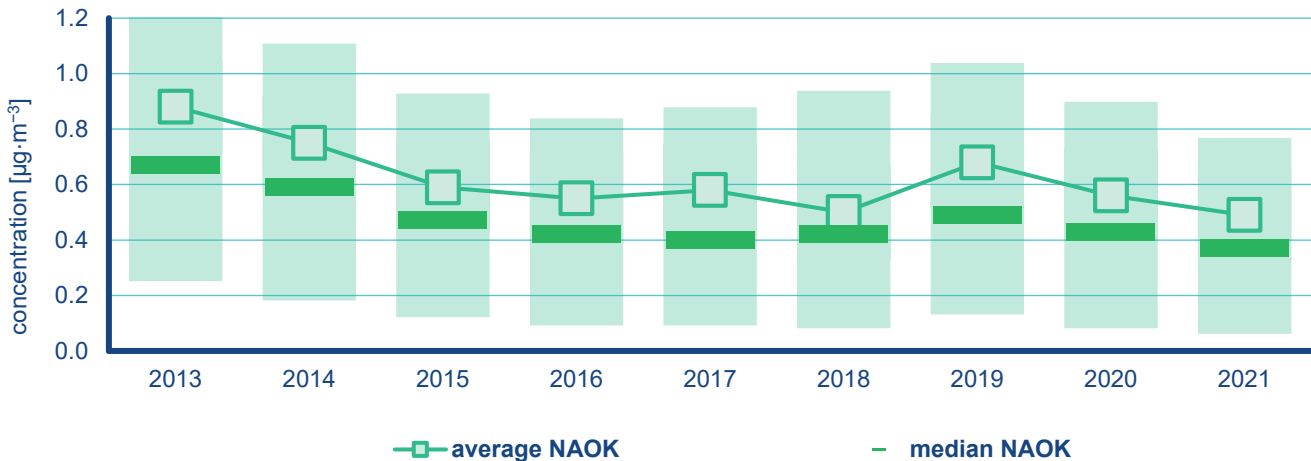


Fig. IV.9.3.2 Annual average concentrations of BC, NAO košetice, Lom, Ústí nad Labem-město, 2013–2021

Note: The range of daily values is indicated by the top/bottom border of the boxes representing the value of 75th and 25th percentile respectively; the horizontal line indicates the median.

bem-město, and further at the National Atmospheric Observatory Košetice (NAOK)¹, where the Košetice Observatory represents the core station. Instrumentation was replaced in 2021 at some stations of the ultrafine particle network. Due to the need to test and set new coefficients required for data validation and verification, data from these stations are currently not available. Only data from the NAOK station, which is not part of the ultrafine particle network, and data from the Lom station are available. The other stations will be verified after the software for data pro-

cessing from the new devices is completed, and relevant data will be added to the AQIS database. The annual variability of BC concentrations reflects higher amounts of emissions produced during the heating season, as increased values are recorded during the cold part of the year. Apart from the heating season, weekly maxima can be identified namely due to traffic. Another source of BC in the summer months are barbecues. The average annual concentration of BC at NAOK decreased from $0.9 \mu\text{g}\cdot\text{m}^{-3}$ in 2013 to $0.5 \mu\text{g}\cdot\text{m}^{-3}$ in 2021. The variability of the measured values was the lowest in 2021 (1st and 3rd quartiles reached $0.2 \mu\text{g}\cdot\text{m}^{-3}$ and $0.6 \mu\text{g}\cdot\text{m}^{-3}$, respectively); in the previous year the variability was slightly higher, as was the average concentration in 2019 ($0.6 \mu\text{g}\cdot\text{m}^{-3}$) (Fig. IV.9.3.2).

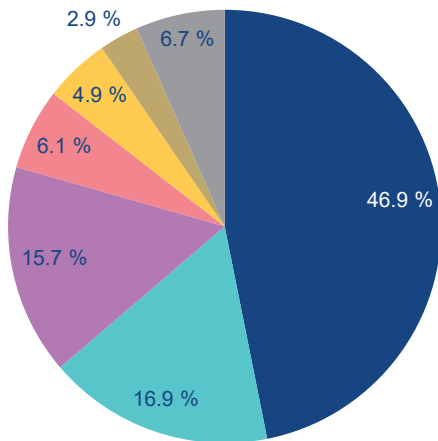


Fig. IV.9.3.3 Share of NFR sectors in total emissions of BC, 2020

Based on the results of emission inventories in the CR in 2020, up to 45 % of BC emissions originated from mobile sources (CHMI 2022d), particularly from the combustion of fuel in diesel engines. Of this, the following sectors contributed the most to the total BC emissions: Agriculture, forestry, fishing: Off-road vehicles and other machinery (1A4cii) by 16.9 %, and Road transport: Passenger cars (1A3bi) by 15.7 %. Of stationary sources, the highest BC emissions were produced in the sector Residential: Heating, water heating, cooking (1A4bi) with a proportion of 46.9 % to total emissions (Fig. IV.9.3.3). Developments in total BC emissions in the 2010–2020 period can be characterized by a decreasing trend, particularly due to measures in the transport sector (Fig. IV.9.3.4)².

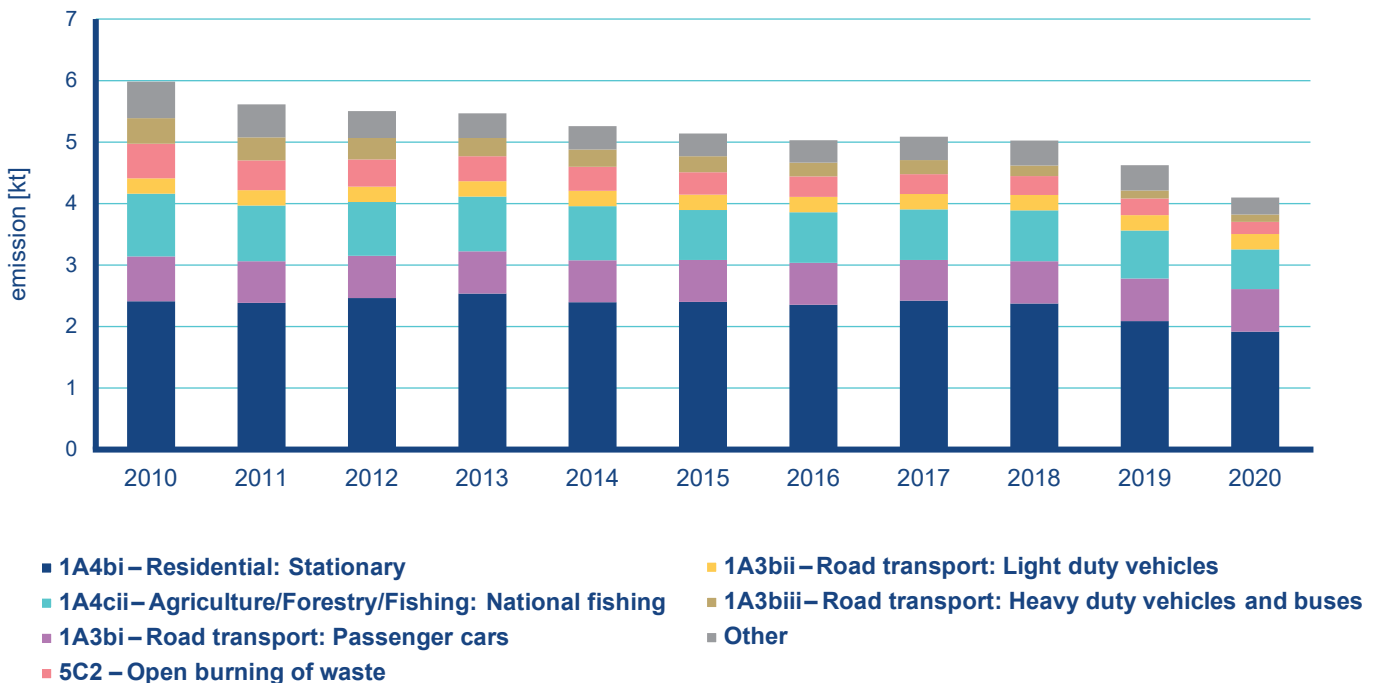


Fig. IV.9.3.4 Total emissions of BC, 2010–2020

- 1 The indication of the NAOK locality is used for measurements taken within the ACTRIS-CZ project. It is a part of research activities carried out by four partner organizations – the Czech Hydrometeorological Institute, the Institute of Chemical Process Fundamentals of the Czech Academy of Sciences, the Global Change Research Institute of the Czech Academy of Sciences, and the Masaryk University. The NAOK includes the Košetice Observatory and the facilities of the Atmospheric Mast.
- 2 The proportion of BC emissions by sectors has recently been recalculated and the results given in previous years may therefore differ.