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Evaluation of low-cost air quality measuring devices - Klimerko

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The problem of pollution in Serbia is severe. In winter, concentrations of PM2.5 and PM10 often exceed the permitted values. In addition to official automatic stations for measuring air quality, it is useful to have low-cost sensors that are available to everyone. The benefit of this type of measurement lies in the fact that in addition to understanding the overall problem of pollution, low-cost sensors allow citizens to know at any time how polluted the air in their environment is. Klimerko is a low-cost sensor that measures air quality data, such as the concentration of PM1, PM2.5, and PM10 every 15 minutes. It also measures meteorological parameters like Temperature, Humidity, and Pressure. PMS7003 Sensor is used for air quality measurements whereas BME280 Sensor is used for meteorological measurements. In this research, the goal was to detect how well Klimerko devices measure the concentration of pollutants compared to official automatic stations. Klimerko devices installed in Bor and Nis were observed. Klimerko data in the period from February 1 to February 28, 2022, were analyzed. Measurements from Klimerko stations were compared with measurements from the nearest official station. The data from official stations were provided by the Serbian Environmental Protection Agency (SEPA). The initial step in data analysis was to prepare the data. That includes filtering the data - making decisions on how to treat missing or invalid values. The next step was determining data completeness for every device and its distance to the official station. Devices that had over 90% of valid data for the observed period and were at a distance of up to 1 km in relation to the SEPA station were taken into consideration. Then, the daily mean, maximum, and minimum values of PM2.5 and PM10 between Klimerko devices and official stations were compared. It was concluded that there is a qualitative agreement in the measured data with Klimerko and the nearest SEPA station. Also, it was found that Klimerko devices measure a slightly higher daily concentration of PM2.5 and PM10 compared to the SEPA station.We also calculated the correlation coefficients for PM2.5 and PM10 particles between Klimerko and SEPA stations. It was found that there is a significant correlation between Klimerko and SEPA stations in Bor and Nis for both pollutants. The coefficient values ranged from 0.62-0.95 for PM2.5 and 0.48-0.91 for PM10.

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