11.3 CIVIC AIR QUALITY MONITORING AS AN ALTERNATIVE AND SUPPLEMENT TO THE STATE AIR QUALITY MONITORING NETWORK

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Background and Aims: Poor air quality causes an estimated 400 000 premature deaths in Europe every year because of the fact that a significant number of Europe's population lives in areas where air pollution is pure and poses a risk to health (Schaefer et al, 2020). The European initiatives for citizens' inclusion in the air quality monitoring process, impacted the participants' knowledge, self-efficacy, and attitudes towards air pollution; they resulted in changed or adjusted behaviour of the involved citizens towards measures to exposure and contribution to air pollution, led to a higher sense of community, stimulated discussions with policy makers, and influenced political decisions in the involved regions (Schaefer et al, 2020). Such experiments in the Republic of Serbia, with self-made sensor kits "Klimerko - Air to the Citizens" started in 2018 (Klimerko, 2018). Since then, it has been continuously improved in terms of its hardware and software. Klimerko measures: a) air humidity; b) air temperature; c) concentration of PM_1, $PM_{2.5}$, and PM_{10}. It has not been calibrated, since it was established that PMS7003 sensors are precise enough for civil measurement. This has been once confirmed with the installation of 4 PMS7003 sensors on a vehicle of the Institute of Public Health "Dr. Milan Jovanović Batut" and comparing the data with their professional sensors, as well as by comparing official values obtained by the Serbian Environmental Protection Agency (SEPA) with the values obtained by the Klimerko devices that are located in the close vicinity of the SEPA monitoring stations (Klimerko, 2018). As there are no processes yet to guarantee data quality adequate for regulatory actions regarding PM, the main aim of the mentioned project "Klimerko - Air to the Citizens" is to inform, raise awareness, and educate. At the moment, about 140 Klimerko devices are deployed on the entire territory of the Republic of Serbia: a good part of them is located on the territory of the city of Belgrade. Our intention was to compare the PM readings from Klimerko devices to the readings of the calibrated PM device in the town of Bor in order to confirm once again their usability for indicative measurements of suspended particles in the ambient air.

Methods: The results obtained by the Klimerko devices (PM_{10} and $PM_{2.5}$ (PMS7003), temperature and relative air humidity (BMPE80)) were compared to the results obtained by the reference instruments located at the SEPA air quality monitoring stations as well as with the calibrated PAQMON2020 monitors (SDS011 PM sensor, DHT22 temperature, and relative air humidity sensor) that were located next to the Klimerko devices. The comparison of the results was carried out during a one month period, from 27th of July to 6th of September 2021.

Key results: Determination coefficients obtained by the comparison of mean hourly levels of PM (R^2 = 0.59 and 0.72 for PM_{10} , and R^2 = 0.64 and 0.73 for $PM_{2.5}$) from the Klimerko devices deployed in the Bor town and reference instruments (from SEPA station in Bor) indicate a very strong linear relationship between the measurement results of the reference instruments and the PMS7003 sensors which were placed in Klimerko devices.

Conclusions: The Klimerko devices that we have tested were showed very good stability and reliability during the comparison period with the reference instruments. So, the conclusion is that Klimerko devices could be applied for indicative measurements of PM mass concentrations in ambient air.

Acknowledgements: This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, Grant No. 451-03-9/2021-14/ 200052.

REFERENCES

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Klimerko, https://github.com/DesconBelgrade/Klimerko [Accessed on 20th October 2021]