

Mobile monitoring of spatio-temporal variations of the level of respirable particles in the urban area of Novi Sad, Serbia

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Министарство просвете, науке и технолошког развоја

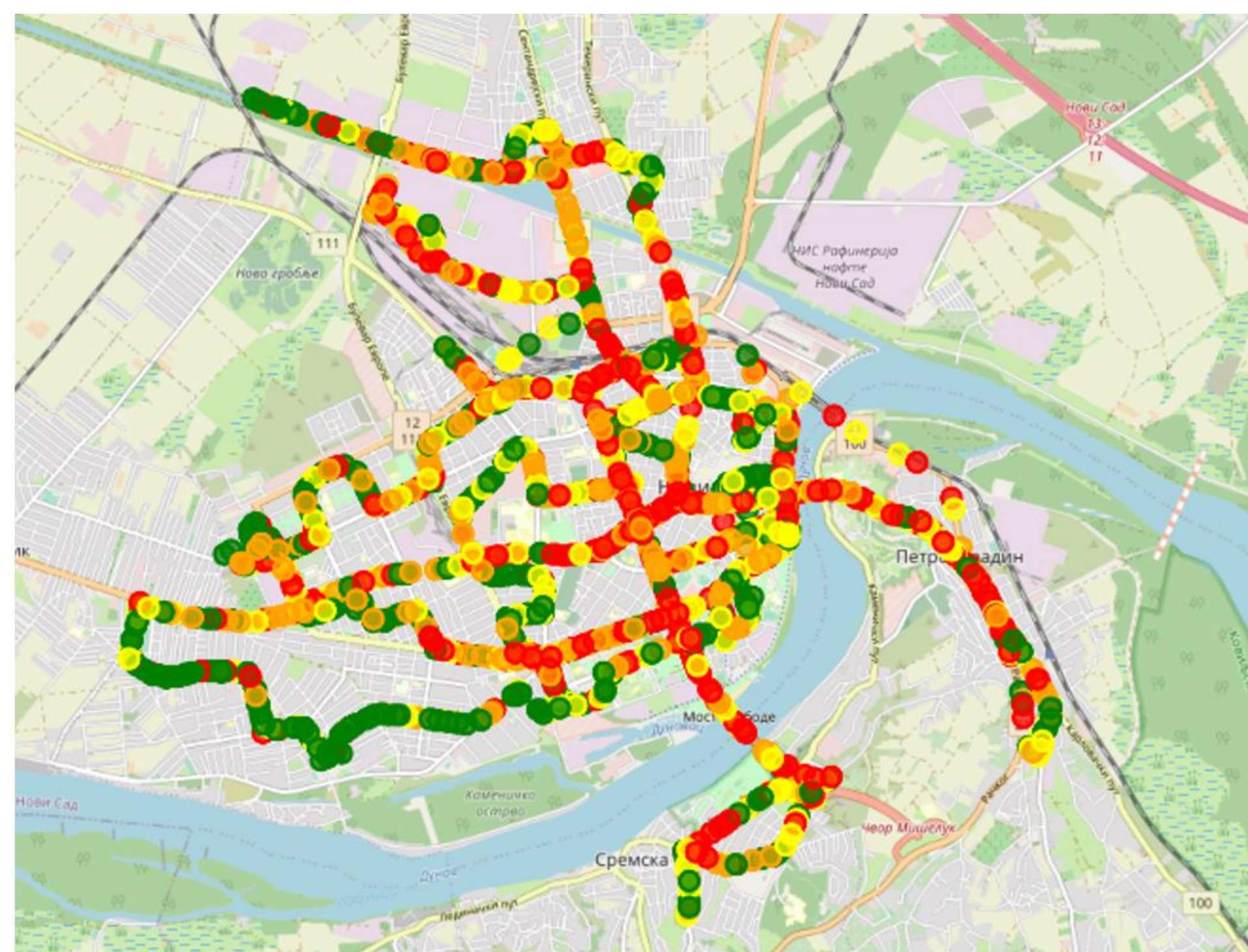


ГРАДСКА УПРАВА ЗА ЗАШТИТУ ЖИВОТНЕ СРЕДИНЕ

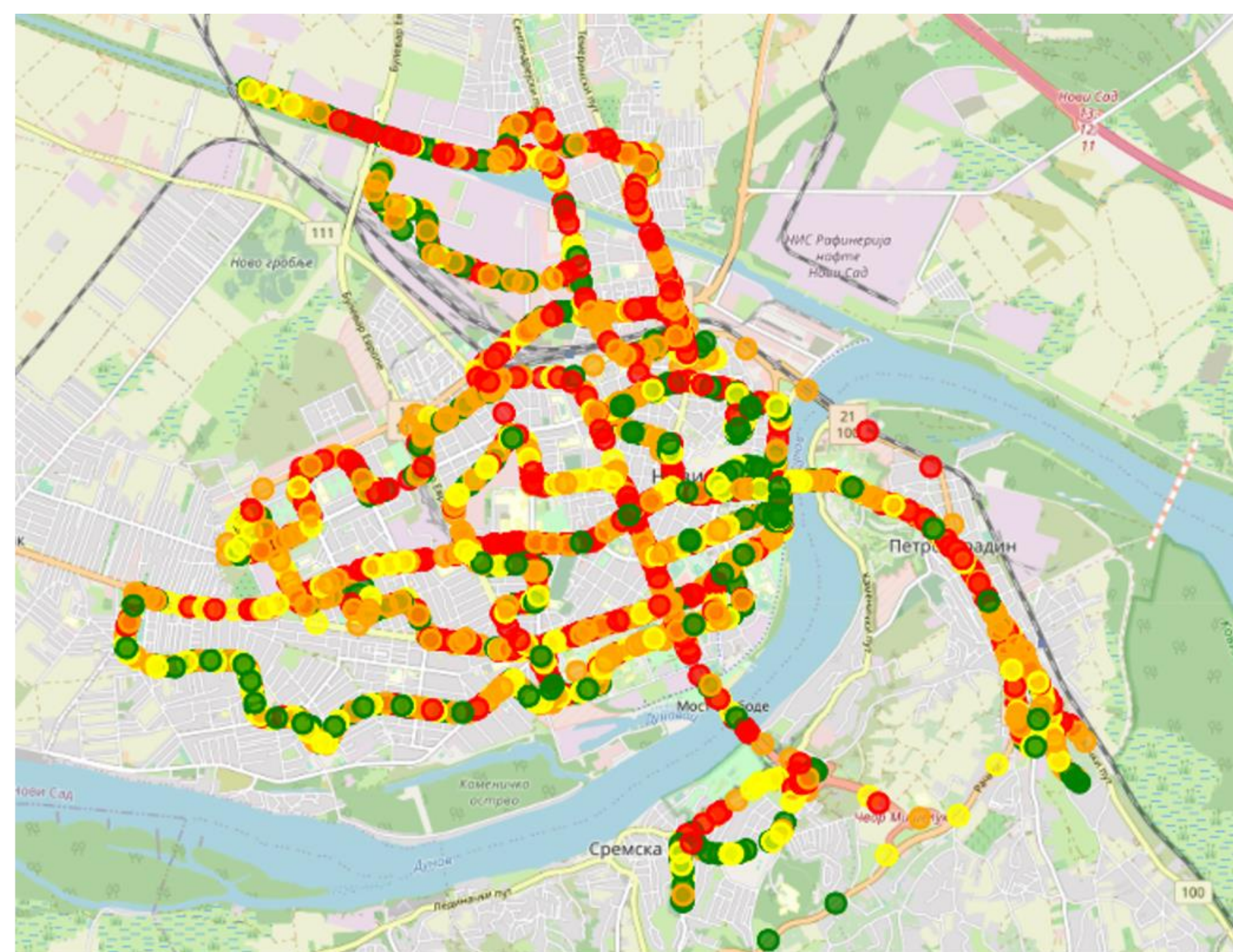


Virtual centre for Distributed atmospheric Sensing for reduction of pollution pressures

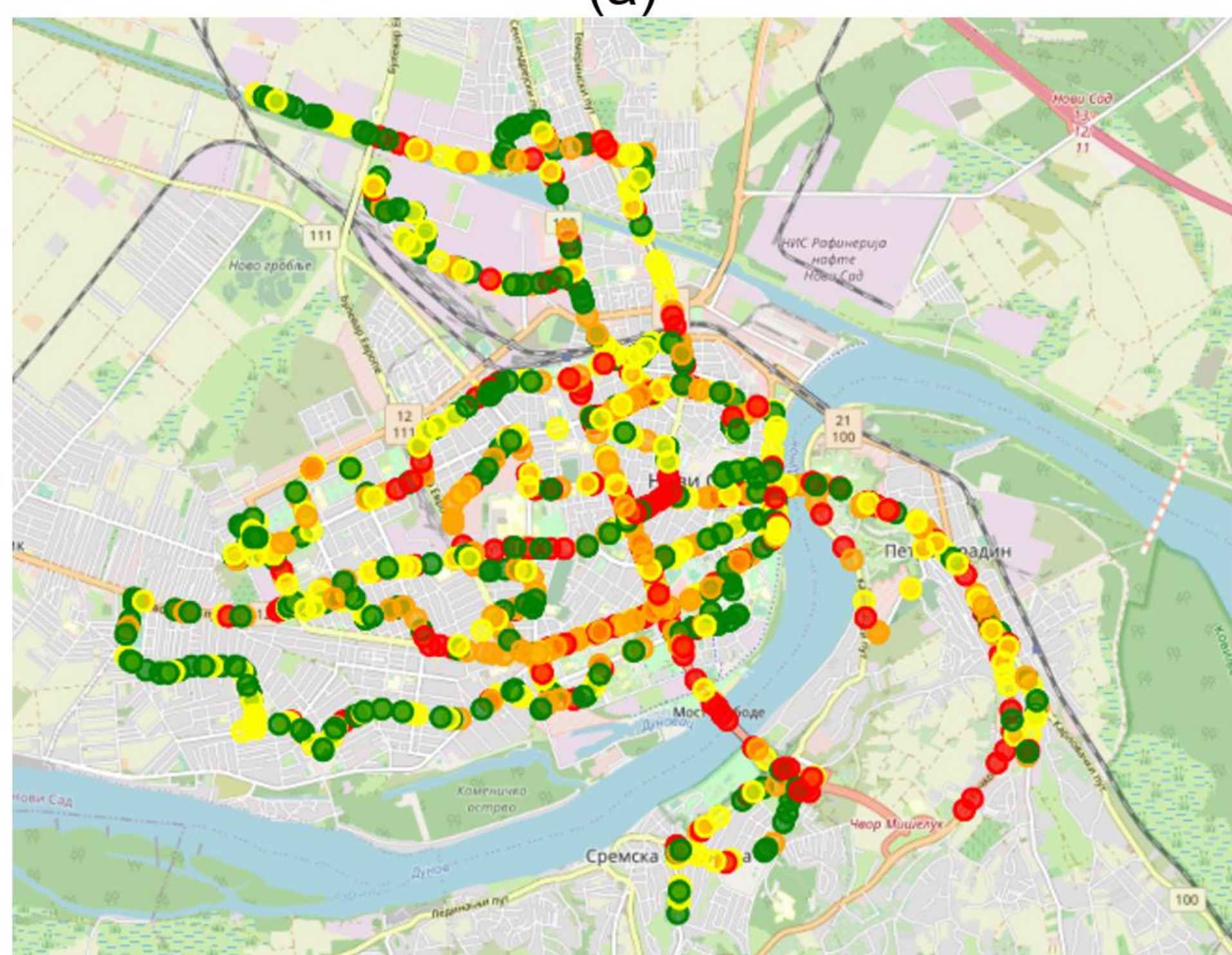
The goal of this project is to significantly contribute to solving the problem of low spatial resolution of data on particulate matter pollution in the territory of the city of Novi Sad. Existing monitoring networks (state, regional, local) cannot provide a complete picture of pollution, primarily due to the small number of (stationary) measuring points on a large area of interest. Traditional monitoring stations cannot be exclusively used to obtain more complete and reliable knowledge about air quality with a high spatial and temporal resolution, because citizens are most often exposed to air of very different quality during the day, i.e. they stay in places with drastically different air quality compared to the air quality measured by automatic stations. The low resolution of data on polluting substances in the air, either spatially or temporally, significantly complicates, or makes impossible, real insight into the level of exposure of the population, as well as the assessment of the long-term risk associated with staying in a certain environment.



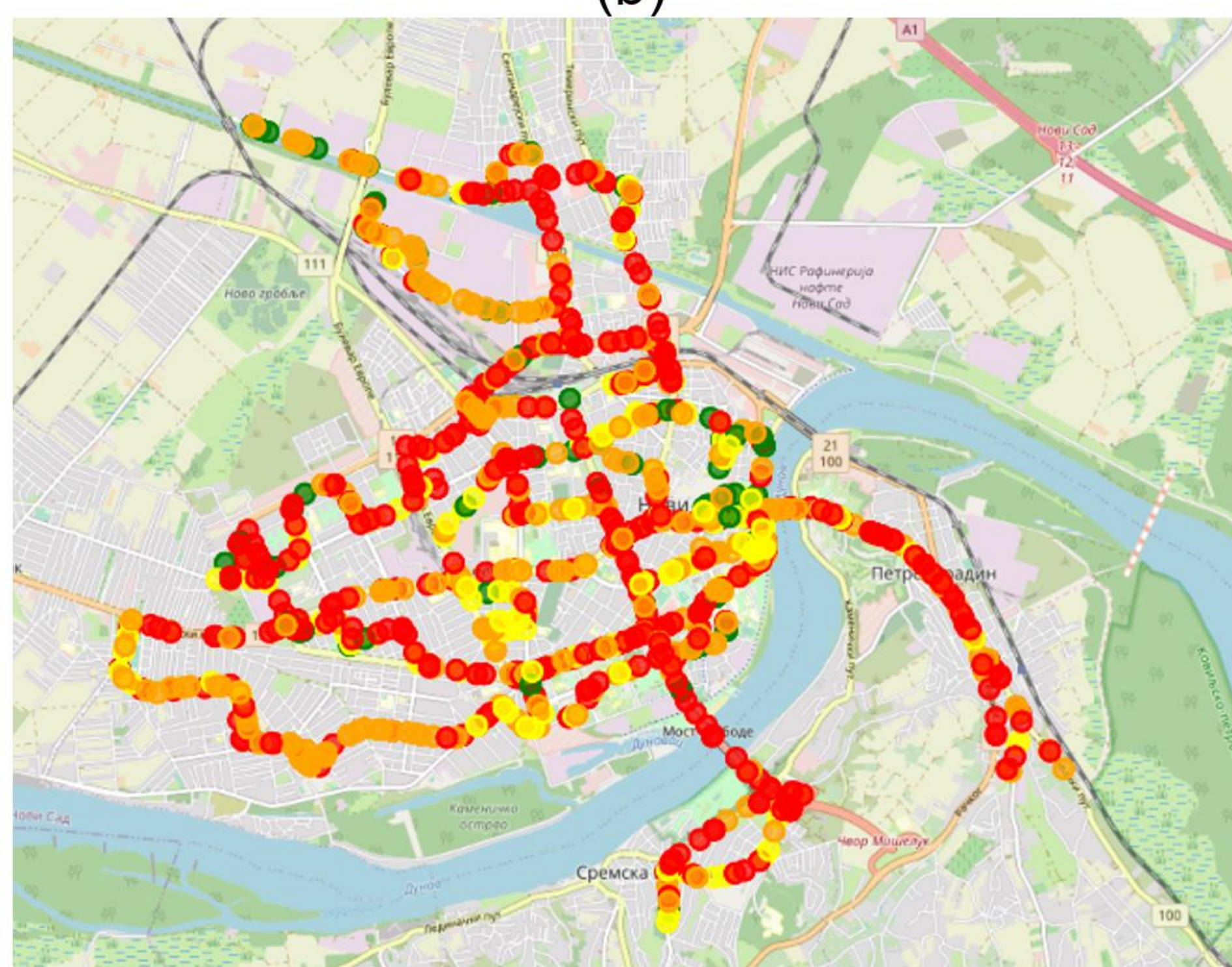
(a)



(b)



(c)



(d)

	Percentile of complete set of measurements during both seasons	Range of values of number concentration (#/cm ³)
green	0-25%	0 - 5617
yellow	25-50%	5617 - 10972
orange	50-75%	10972 - 21025
red	75-100%	21025 - 5303867

During the summer campaign, measurements in the lowest percentile (green marking) are more pronounced, especially in regions near the river and larger green areas, even in the industrial zone. During the winter campaign, on working days, a significantly higher number of measurements in the last percentile (red marking) is observed, especially in the industrial zone in the north of the city, as well as along major roads on the outskirts of the urban zone of the city where there are more households with individual heating.

Results

As part of this study, for the first time in the urban area of Novi Sad, during the heating (March 2022) and non-heating season (August 2022), data on the spatio-temporal variation of respirable particles, including those of ultrafine dimensions were collected, with a high spatial resolution. As a result, zones, periods and scenarios were identified when particles of the highest concentrations are present, as well as areas of the city with the lowest concentrations of respirable particles, which all represent a contribution to better quality of the environment, health and well-being for the citizens of Novi Sad. In addition to the extensive measurement campaign, preparations were also made for statistical modeling based on the land-use technique, which makes it possible to further increase the spatial resolution of pollution data. [For more details please visit https://vidis-project.org](https://vidis-project.org) VIDIS synergistic projects subpage.

Acknowledgements

This work was supported by H2020 VIDIS project funded by the European Commission in the H2020 Work Programme 2018-2020, GA No. 952433. "Spreading Excellence and Widening Participation", H2020-WIDESPREAD-2018-2020 (H2020 VIDIS), project 'Spatio-temporal variations of the level of respirable particles in the urban area of Novi Sad - mobile monitoring, modeling and creation of high-resolution maps' partially financed by the city administration of the city of Novi Sad, as well as the Ministry of Education, Science and Technological Development of the Republic of Serbia, no. 1002201.

Distribution of number concentration of ultrafine particles measured on: a) weekdays during the summer campaign, b) weekdays during the winter campaign, c) weekends during the summer campaign, g) weekends during the winter campaign.

Mobile monitoring campaigns were carried out in the periods 04.-16. March 2022 (heating season) and 18-30 August 2022 (non-heating season). Mobile monitoring vehicle was equipped with lab grade portable instruments with a special intake that conducted air to the devices that were on the passenger seat. The instruments used were the optical particle sizer, **TSI Optical Particle Sizer OPS 3330**, which is a portable and precise device for measuring the number of aerosol particles with a diameter of 0.3 to 10 micrometers. The result of the measurement is particle concentration and particle size distribution, which can be obtained with a time resolution of one second (1 Hz). Another type of instrument that was used simultaneously with the TSI OPS 3330 for mobile monitoring campaigns is the **TSI NanoScan SMPS 3910**. This device is a nanoparticle size meter (10-420 nm) and contains a compact spectrometer based on the principle of electrical mobility.

