CARTOGRAPHIC MONITORING OF ATMOSPHERIC AIR QUALITY ON THE TERRITORY OF POLTAVA REGION (MONTHLY TREND)

E. Bondarenko* (Taras Shevchenko National University of Kyiv, Ukraine),
M. Kyryliuk (Institute of Geography, NAS of Ukraine),
O. Yatsenko (Taras Shevchenko National University of Kyiv, Ukraine)

Atmospheric air pollution has long been a major environmental factor in the growth of morbidity and mortality. According to the sources of atmospheric impurities, it is one of the types of natural and/or anthropogenic pressure on the environment, characterized by emissions into the celestial sphere of chemicals, solid particles, and biological materials, which can cause harm to humans, other living organisms and plants.

The degree of danger to humans, which is determined by a certain indicator of air pollution and provides the possibility of safe living and living in a particular area, is determined by fixed and calculated quantitative values of indicators: emissions of certain pollutants and greenhouse gases from stationary and mobile sources; emissions of pollutants by type of economic activity; maximum permissible concentrations of pollutants; complex index of air pollution.

Recently, due to the further development of network technologies and the possibilities of their use, various sources of information on air pollution by its quality index (AQI) on the basis of such indicators recorded at observation points (at monitoring stations) or atmospheric dispersion modeling have become widely available.

The openness of monitoring data will promote citizens' understanding of the state of the environment of living, working, recreation; effective state planning of the environmental management process; better public control; possible change in people's attitudes and behavior to environmental problems at the household level.

The presentation of systematic monitoring information on the territorial distribution of air quality indicators for practical use is quite rational through the use of a **cartographic method** that will fully, accurately, identify indicators of individual factors on them, and the environment.

The effectiveness of the developed monitoring maps lies in the use of **dynamic graphical variables** in their creation, which will show the variability of the mapping indicator within a certain area over a period of time.

Continuation of the study to **create a monitoring map of air pollution** in the model area is caused, in particular, by the need to:

- expansion of the time interval of the mapping indicator (up to one month) to identify trends in the spatial development of the phenomenon in time compared to its change over the day, week, decade, crescent;
- optimization of the interval of fixation and cartographic representation of the air quality index isoline method;
- taking into account within the model area the study of transboundary air pollutants with the adjustment of its quality index as an indicator of mapping;
- identification of natural and anthropogenic factors influencing the mapping indicator.

The **objectives of this work** are fully consistent with the approved framework provisions of the State Environmental Monitoring, its structure, territorial levels, as well as the order of operation with possible types of security.

To present the initial result of mapping and create on the basis of the improved author's algorithm an animated monitoring map of the estimation type, which presents the **monthly trend of air pollution in the Poltava region according to its quality index AQI PM 2.5,** we used publicly available information from (Air Quality Index, 2021) for July 2021 year by sampling it from the database (fig. 2). Such information is an integral indicator, which takes into account fine dust particles (Particulate Matter, 2.5 nm) as the most dangerous for the human body. The data is in text format with comma separators (CSV). They are quite easy to convert into mapping indicators, correlated with **15** monitoring stations, unevenly located in the Poltava region, and **3** cross-border stations along its perimeter.

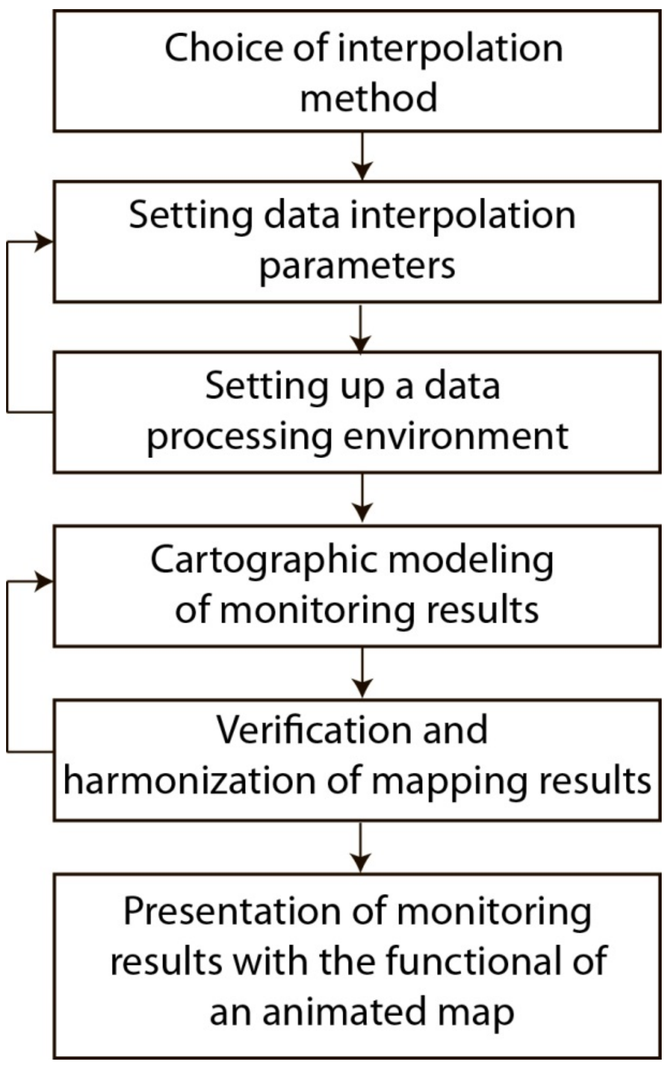

Fig. 1. Improved author's mapping algorithm for creating an animated monitoring map of air pollution.

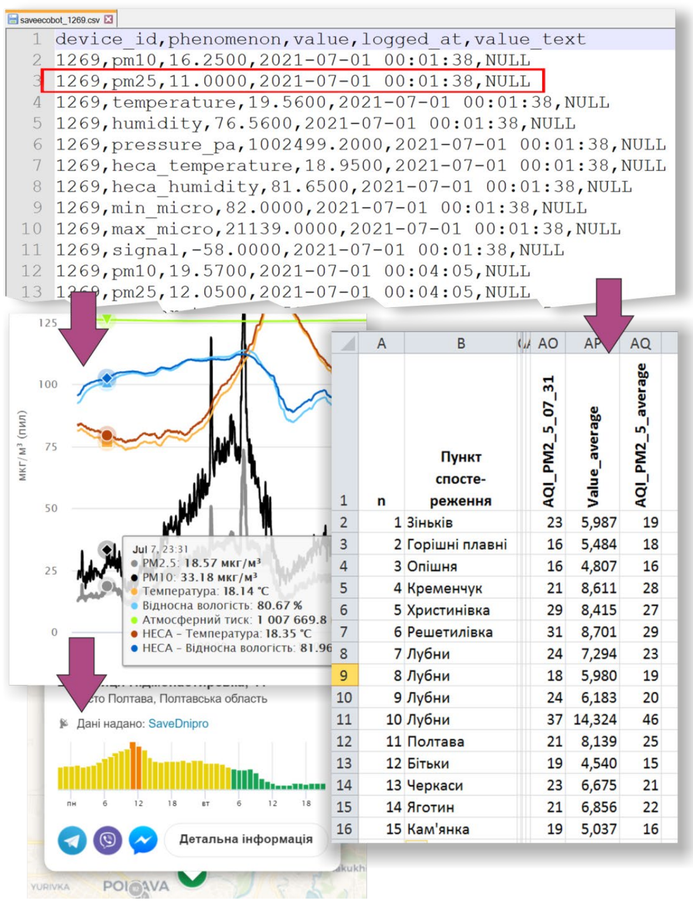

Fig. 2. Example of source data for creating air pollution monitoring maps.

The lack of monitoring stations in the model area once again justifies the need to present the result by **isolines** rather than localized diagrams, which generally provides a continuous area of the indicator. within the territory of mapping and allows further use of the created map. It, in particular, consists in the possibility of conducting geoinformation analysis to identify the impact of relief, climatic characteristics (temperature, precipitation, wind), as well as man-made air pollutants on the value of the distribution of AQI PM 2.5. When using climate maps, both the average monthly indicators (for July) of temperature distribution, precipitation, wind recurrence, and the corresponding monitoring values for July 2021 were used.

The cartographic model of air quality of the territory of the Poltava region according to the averaged data for July 2021 is presented in fig. 3.

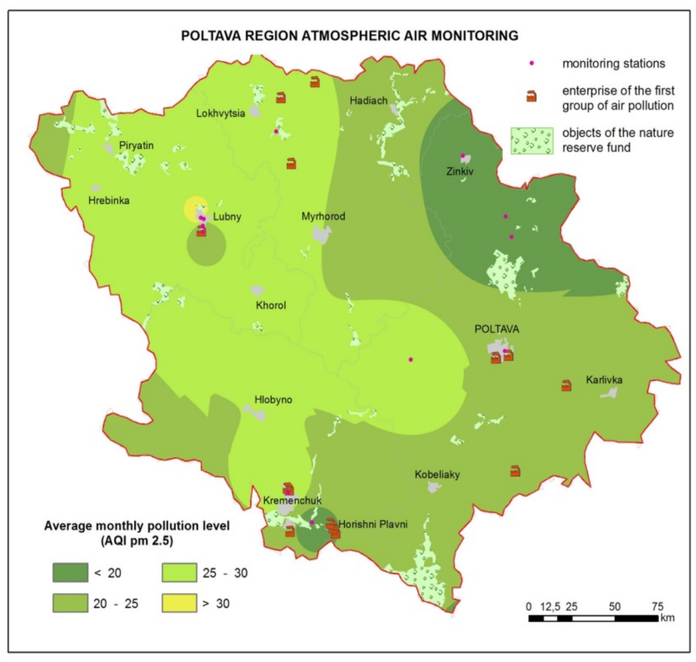

Fig. 3. Atmospheric air quality in the Poltava region (average monthly AQI PM 2.5, July 2021).

Extending the time of mapping in the Poltava region to **one month** using the optimal three-hour interval revealed a cyclical spatial development of the phenomenon in time, consistent with its change over the day: the growth of air pollution is recorded daily from 12 to 24 hours.

Taking into account the study of transboundary air pollutants in adjacent regions within the model area made it possible to adjust its quality indices as an indicator of mapping in the direction of increase.

Anthropogenic factors have the most negative impact on the air quality of the model area: emissions from stationary and mobile sources.

Wind speed reduces the distribution of mapping over the area.

The relief (with the distribution of heights from 64 to 204 m) does not significantly affect the change of the air quality of the region.

Animated map access:

https://drive.google.com/file/d/1HmhZcEpKwRUVXdzxW6LCWCrurNriQTz8/view?usp=sharing