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TECHNOLOGY OF THE NETWORK DESIGN FOR THE OBSERVATION OF ATMOSPHERIC AIR QUALITY OF THE REGION, BASED ON THE METHOD OF HIERARCHY ANALYSIS

Paper considers the developed technology, intended for the design of the observation network, of the atmospheric air quality in the region, based on the method of hierarchy analysis. New approach regarding the determination of the priority of the locations of the points for the observation of atmospheric air quality, using Saati skew symmetric matrix of the pairwise comparison is suggested. Such approach enables to take into account various criteria for the selection of the observation points location, using the available input data and taking into account the weights of each criterion. Complex of the criteria, based on the known in Europe model «DPSIR» is suggested: "Pressures" criteria take into consideration the proximity to stationary sources of emission, motorways, etc, "States" criteria take into account the data of the environment state monitoring, "Impacts" criteria take into account the proximity of the sensitive and other population, "Responses" criteria reflect the possibility of monitoring the efficiency of different measures, etc. Recommendations, regarding the application of the developed technology for the territory of zones and agglomerations are developed.

The example of the suggested technology application during the development of the Program of state monitoring in the sphere of the protection of the atmospheric air in the zone "Vinnytsia" is proposed. This example proved the efficiency of this technology. Further it is planned to developed the given technology for the automation of the stage of the input data processing.

Key words: *technology, system of decision making support, atmospheric air, GIS, analytic hierarchy process, network of the observation points, monitoring of the atmospheric air, system analysis.*

Introduction

In recent years EC Directive "On the quality of the atmospheric air and cleaner air for Europe", aimed at reduction of the pollution of the atmospheric air to the level not harmful for human health [1] is implemented in Ukraine. First, to meet the requirements of the given Directive, the system of the state monitoring of the atmospheric air is optimized. The same requirements contains the article 32 of the Law of Ukraine «On the protection of the atmospheric air» [2] and the order of realization of State monitoring in the sphere of atmospheric air protection (further – Order) approved by the Resolution of the Cabinet of the Ministers of Ukraine [3]. Order of the Ministry of the Internal affairs of Ukraine [4] approved the order of location of the observation points, performing the monitoring of the atmospheric air pollution in the zones and agglomerations of Ukraine. Point 4 of the Resolution [3] obliges the executive authorities and local administrations develop the programs of the state monitoring in the sphere of atmospheric air protection (according to the requirements, contained the Order of the Ministry of Environmental protection of Ukraine [5]), main aim of these programs is the development of the network of the observation points for the control of the atmospheric air quality. Documents, mentioned above [1 – 5] contain many directives, instructions and recommendations concerning what factors should be taken into account and what limitations must be observed in the process of the selection of the places for the location of the observation points. However, there is no clear technique or technology, how this should be done, using the available data of the region. As a rule, optimal choice has a high level of the subjectivity of the experts, who develop and approve the monitoring programs of such level. Scientific schools of different countries solve this problem in their own way [6 – 9]. Taking into account certain limitations, concerning the obtaining of the information about the region, which occur in Ukraine, it is expedient to improve these technologies.

The experience of the authors of this paper, who already developed such programs for the agglomeration «Vinnytsia» (approved and is available on the site of Vinnytsia City Council [10], which is the result of the research program of VNTU «Ecological monitoring in the sphere of atmospheric air protection by means of developing the «Programme of state monitoring in the sphere of atmospheric air protection in the agglomeration «Vinnnytsia» for the period of 2021 – 2025»» [11]) and for the zone «Vinnytsia», which is being considered (it is also the result of the research of VNTU «Development of the divisions of the program of state monitoring in the sphere of the protection of atmospheric air in Vinnytsia Region», number of state registration 0121U110737), showed than there may exist tens of places for the location of the observation points, optimal by different criteria. At the same time, criteria may be arranged in certain groups, allocating criteria themselves and integral criteria. Part of the criteria is determined quantitively and this process can be automated, part of the criteria is determined by the experts. As it is known, in such conditions, methods of system analysis, in particular, analytic hierarchy process (AHP) [12 – 15] operate most efficiently. Such methods enable to range many variants, which take into account the information, regarding large quantity of hierarchically structured criteria and give substantiated answer concerning the set minimal quantity of points according to the set groups of indices, at least, they will show which points should be designed in the first turn.

Aim of the paper is to improve the substantiation of the location of the points for observation of the atmospheric air quality by means of development the technology of their design by ranging the possible locations and determination of the priority of the location on the base of processing the information, available in Ukraine.

Analysis of the available information according to the regions of Ukraine regarding the quality of atmospheric air

Order of Ministry of Environmental Protection [5] demands to collect and process certain information. In Ukraine there exist special institutions, operating with such data and provide them according the request for public information. But not always such information is complete. Main types of the necessary information were arranged. What aspects of information are available in the answers for public requests is determined from practical experience of the authors, obtained in the process of the development of the programs for the agglomeration and zone, as well as in the process of creation of information analytical systems of natural resources and pollution of the Ukrainian regions. Table 1 presents types of the information with the indication of the possible uncertainty when the information is available but it does not completely correspond to the order of the Ministry of Environmental protection and it is impossible to eliminate this problem. The authors suggest to group and mark these criteria by types according to the components of the model «DPSIR», know in Europe, it is cause and effect model for the description of the interaction of the society and environment, accepted by the European Environment Agency (EEA): «Driving forces» – sources of the pollution, realizing impact on the environment, etc., «Pressures» (direct anthropogenic load in the form of stationary sources of emission, burning of the leaves, etc.), «States» – (data of the monitoring of the environment, etc.), «Impacts» – (consequences in the form of the disease incidence of the population, etc., «Responses» – (various control measures, penalties, decisions-making, etc.) [16].

Table 1

Formalization of the information in the answers for the requests for public information, collection of which needs the order of the Ministry of Environmental protection [5]

Code	Type of information	Source	Available information	Uncertainty and drawbacks
D1	Information about the quantity of the population.	Main department of statistics of the region.	Quantity of the population by years.	1. As a rule, information is available only for the complete years, for instance, at the end of 2021, the information is available for 2020.
D2	Information about the greatest sources of pollution.	Main department of statistics of the region.	Name, address of the enterprise.	1. As a rule, information is available only for the complete years, for instance, at the end of 2021, the information is available for 2020, 2. Information is available for the enterprises, which submit the report according to the form 2-ТП «Air».
P1	Coordinates of the location of the production capacities of the enterprises, mentioned in the list D1.	Organ of the regional administration, responsible for the management of the atmospheric air quality and Ministry of Environmental Protection of Ukraine.	Addresses or GPS-coordinates of the centroids of all the production sites with the permissions for limited permitted emissions.	1. Part of the permissions provides Ministry of Environmental Protection, another part – regional authorities and sometimes it is difficult to determine where is the needed permission. 2. Often not coordinates but the address of the building is provided, however, it is not always clear if it is address of the emissions or it is the address of the office of the enterprise, located, as a rule, in other place.
S1-01 … S1-N	Values of N indices of the atmospheric air quality.	Regional center of hydrometeorology of the State Administration of Ukraine of Emergency Situations.	Averaged values of N indices concentration at small number of points.	1. Documents [1 – 5] contain requirements, concerning indices PM2.5 and PM10 (solid particles of the dust, size of 2.5 and 10 μm, correspondingly) and State Administration of Emergency Situations and Ministry of Health Protection, as a rule, measure only un differentiated dust, which with the thresholds of PM2.5 and PM10 can not be compared. That is why, it is expedient at the initial stage take into consideration the exceeding and boundary admissible concentrations (BAC). 2. Different subjects of monitoring can measures indices, applying different techniques, this complicates their comparison. Besides regarding greater part of indices SAES provides the averaged data, observed all the time at the same site, whereas the laboratories of Ministry of Health Protection, as a rule performs episodic measurement, but in wide network(hundreds of points in one region) of observations..
S2-01-M	Values of M indices of atmospheric air quality.	Regional Laboratory Centre of the Ministry of Health Protection of Ukraine.	Value of M indices concentration in many points but during comparatively small number of days.	
I1	Quantity of sensitive population in the region.	Main Department of Statistics of the Region.	Quantity of the sensitive population in the region by years.	1. As a rule, information is available only for complete years, for instance, at the end of 2021, information is available for 2020.

Problems of uncertainty, characterized in the Table 1 lead to the impossibility to develop the technique of the sites ranking, based only on the quantitative data from the responses to the requests to the corresponding organizations – consolidated approaches are needed, when part of the information is obtained from the experts.

Selection, and structuring of the criteria for the priority selection of the location of the network points for the observation of the atmospheric air quality in the region

Analytic hierarchy process (AHP) was suggested by Saaty as far back as in 1990 [12, 13]. There exist numerous variations of this method, development and relation to different tasks and problems. The authors suggested to take as the basis the article of one of the co-authors of this paper – namely paper [14], based on the work [15], which contains step-by-step realization of the given technology.

According to the methodology of the paper [14], it is suggested to use the technology of the decision making support system synthesis, using Saaty skew symmetric matrix of pairwise comparison, this matrix for its maximum rank will have the following form [14]:

$$C = \lfloor C_{ij} \rfloor; i = 1,2,\dots,9; j = 1,2,\dots,9,$$
$$c_{ij} = \frac{1}{c_{ij}}, \quad (1)$$

where c_{ij} — are the stages of advantage factors , established by the expert in the process of the pairwise comparison of these factors between them from $c_{ij} = 1$ (advantage of the factor i over factor j is missing) to $c_{ij} = 9$ (absolute advantage).

For the determination of the expert assessments of the criteria weights and their subcriteria the assessments of the coauthors of the article and various comments of the members of the commission of «Vinnytsia» agglomeration and commission of the Ministry of Ecological Protection, which were presented at numerous meetings, devoted to the consideration of the programs of the regions (various agglomerations and zones) and in different documents, circulated among the organs of atmospheric air quality management in different regions of the country will be used .

On the base of the analysis, carried out, above 25 criteria $\Phi_{ij}; i = 1,2,\dots,5; j = 1,2,\dots,5$, grouped in 5 integrated criteria $\Phi_i; i = 1,2,\dots,5$ can be selected.

Analysis of the documents [1 – 5] showed that main criteria, which should be taken into account in the process of selection the location of the points for the observation of the atmospheric air quality of the region, are the following [11]:

– density and volume of emissions from stationary and mobile sources of emissions;

– locations and frequency of the increased values of the averaged and maximum indices of the air state, including those, determined by means of interpolation and methods of geostatistic analysis of the maps of these indices distribution;

– proximity to the places where sensitive population live;

– uniformity of the region territory coverage for the construction in future the maps of the polluting substances distribution;

– convenience of the infrastructure and conditions for maintenance of the observation points.

Besides, it should be taken into account the components of the model «DPSIR» and information of the Table 1. Thus, the following integral criteria are suggested:

Φ_1 – proximity to the most important sources of pollution of the atmospheric air (group of P-criteria – «Pressures»);

Φ_2 – frequency and surpassing level of the averaged and maximum one-time indices of the atmospheric air state and precipitation (group of S-criteria – «States»);

Φ_3 – proximity to the stakeholders (population, including sensitive population, investment objects, etc.) (group I-criteria – «Impacts», investments can be considered as indirect positive «consequences» – in more clear regions the investments are greater, as less resources will be spent for improvement of the employees health, for filters, ventilation systems, etc.);

Φ_4 – representation level of the implemented measures (installed cleaning systems, control over the emissions of the transport vehicles, etc.) (group R-criteria – «Responses»);

Φ_5 – convenience of the infrastructure, conditions for maintenance of the observation points, value for the uniform coverage of the region, that will simplify the construction of the maps of the pollution in future etc. (group of the auxiliary criteria).

Analysis of experts assessments of the comparison of these criteria, i.e. determination which one is in their pairs the most important, enabled to determine the Saaty matrix, given in Table 2.

Table 2

Matrix $C^{(0)}$

Integral criteria	Φ_1	Φ_2	Φ_3	Φ_4	Φ_5
Φ_1	1	2	5	6	6
Φ_2	$\frac{1}{2}$	1	3	4	4
Φ_3	$\frac{1}{5}$	$\frac{1}{3}$	1	4	2
Φ_4	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{4}$	1	2
Φ_5	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	1

By separate criteria we will be denote"(expertly)" the criteria, which are difficult to automate, using the data, available in Ukraine. The rest can be automated, using the data bases, geoinformation technologies, etc.

In the first integral criterion of the priority selection of the observation points for the atmospheric air quality the basic criteria are:

Φ_{11} – total volume of the stationary sources of the enterprises emissions in the last of the given years from the list of the greatest pollutants of the air in certain surrounding (for instance in the circle, area of which is 1/100 or 1/1000 from the area of the region);

Φ_{12} – total volume of maximum permissible emissions of the enterprises in the last of the listed years from the list of the greatest pollutants of the air in the region in certain circle;

Φ_{13} – number of the centroids of the production sites in certain circle;

Φ_{14} – proximity to the international or regional autoroutes or to the autoroutes with intensive traffic in the «rush-hours», mainly transport vehicles (experts);

Φ_{15} – degree of the proximity from the point to the geometrical centre of the neighboring settlement or the territory with the greatest number of stationary sources of emission.

Analysis of the expert assessments of the pairwise comparisons of these criteria enabled to determine the Saaty $C^{(0)}$ matrix, presented in the Table 3.

Table 3

Matrix $C^{(1)}$

Criterion	Φ_{11}	Φ_{12}	Φ_{13}	Φ_{14}	Φ_{15}
Φ_{11}	1	4	7	8	9
Φ_{12}	$\frac{1}{4}$	1	4	7	9
Φ_{13}	$\frac{1}{7}$	$\frac{1}{4}$	1	2	9
Φ_{14}	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{2}$	1	9
Φ_{15}	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	1

In the 2-nd integral criterion of the priority selection of the observation points for atmospheric air quality in the region basic criteria are the following:

Φ_{21} – percentage of the mean daily permissible concentration level exceeding in the points in a certain circle (for instance, in the circle area of which is 1/100 or 1/1000 of the area of the region);

Φ_{22} – percentage of exceeding maximum one-time permissible concentration index in the points in a certain circle;

Φ_{23} – percentage of exceeding the low threshold of the index assessment in the points in a certain circle;

Φ_{24} – percentage of exceeding the upper threshold of the index in a certain circle;

Φ_{25} – percentage of exceeding permissible concentration level according to the satellite data and/or data of the public monitoring of the atmospheric air in a certain circle.

Analysis of the expert assessments of the pairwise comparison of these criteria enabled to determine Saati $C^{(2)}$ matrix, presented in the Table 4.

Table 4

Matrix $C^{(2)}$

Criteria	Φ_{21}	Φ_{22}	Φ_{23}	Φ_{24}	Φ_{25}
Φ_{21}	1	2	3	7	9
Φ_{22}	$\frac{1}{2}$	1	3	3	9
Φ_{23}	$\frac{1}{3}$	$\frac{1}{3}$	1	4	9
Φ_{24}	$\frac{1}{7}$	$\frac{1}{3}$	$\frac{1}{4}$	1	9
Φ_{25}	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	1

In the 3-rd integral criterion of the priority selection of the observation points location for atmospheric air quality in the region basic criteria are the following:

Φ_{31} – proximity to the intensive housing development with multistorey residential buildings, km;

Φ_{32} – proximity to the location of the most sensitive population: health centers, hospitals, schools, childcare centers, etc. (expert assessment);

Φ_{33} – proximity to the available investment objects, km;

Φ_{34} – proximity to the potential investment objects (expert assessment);

Φ_{35} – proximity to the bodies of local self government (City Councils, Village Councils) and other places where different delegations, including foreign , are met, km.

Analysis of the expert assessments of the pairwise comparison of these criteria enabled to determine matrix Saati $C^{(3)}$ matrix, presented in the Table 5.

Table 5

Matrix $C^{(3)}$

Criteria	Φ_{31}	Φ_{32}	Φ_{33}	Φ_{34}	Φ_{35}
Φ_{31}	1	2	7	8	9
Φ_{32}	$\frac{1}{2}$	1	5	8	9
Φ_{33}	$\frac{1}{7}$	$\frac{1}{5}$	1	7	9
Φ_{34}	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{7}$	1	9
Φ_{35}	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	1

In the fourth integral criterion of the priority selection of the observation points location for atmospheric air quality basic criteria are the following:

$Ф_{41}$ – proximity to the objects, where disposal facilities were recently installed and other measures, aimed at reduction of atmospheric air pollution were carried out, including covering with asphalt and other road-transport work, measures for optimization the road traffic, etc. (expert assessment);

$Ф_{42}$ – proximity to the objects, where disposal facilities are to be installed or other measures, aimed at the reduction of the atmospheric air pollution, including roads covering with asphalt and other road-transport works, measures for the optimization of the road traffic etc., will be carried out (expert assessment);

$Ф_{43}$ – proximity to the locations, where the control over the emissions of the moving sources, over the weight of the transport vehicles, etc. is carried out, km;

$Ф_{44}$ – proximity to the objects of the natural-conservation fund or rural area (for zones);

$Ф_{45}$ – proximity to the parking zones or zones with limited traffic of the transport vehicles.

Analysis of the expert assessments of the pairwise comparison of these criteria enabled to determine Saati matrix $C^{(4)}$, presented in the Table 6.

Table 6

Matrix $C^{(4)}$

Criteria	$Ф_{41}$	$Ф_{42}$	$Ф_{43}$	$Ф_{44}$	$Ф_{45}$
$Ф_{41}$	1	2	3	3	4
$Ф_{42}$	$\frac{1}{2}$	1	2	3	4
$Ф_{43}$	$\frac{1}{3}$	$\frac{1}{2}$	1	4	4
$Ф_{44}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{4}$	1	3
$Ф_{45}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{3}$	1

In the fifth integral criterion of the priority selection of the observation points location for the atmospheric air quality basic criteria are the following:

$Ф_{51}$ – convenience for the maintenance of the measuring equipment of the point (expert assessment);

$Ф_{52}$ – convenience of the infrastructure for the installation of the measuring equipment of the point (expert assessment);

$Ф_{53}$ – value for the uniform coverage of the region, this will simplify the development of the maps of pollution in future (expert assessment);

$Ф_{54}$ – value for the monitoring of the atmospheric air quality of the region in the opinion of the organ, responsible for the monitoring of the atmospheric air quality (expert assessment);

$Ф_{55}$ – value for the control over the regular violations of the conditions, indicated in the permissions of the enterprises in this region, in the opinion of the organ, responsible for ecological control of the atmospheric air quality (expert assessment).

Analysis of the expert assessment of the pairwise comparison of these criteria enabled to determine the Saati matrix $C^{(5)}$, presented in the Table 7.

Table 7

Matrix $C^{(5)}$

Criteria	$Ф_{51}$	$Ф_{52}$	$Ф_{53}$	$Ф_{54}$	$Ф_{55}$
$Ф_{51}$	1	1	2	2	7
$Ф_{52}$	$\frac{1}{1}$	1	2	2	6
$Ф_{53}$	$\frac{1}{2}$	$\frac{1}{2}$	1	2	6
$Ф_{54}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	5
$Ф_{55}$	$\frac{1}{7}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{5}$	1

Application algorithm of analytic hierarchy process to the suggested criteria

Standard algorithm of the analytic hierarchy process is applied to the criteria and expert assessments, determined in the previous section. There exist several algorithms of this process application. The algorithm from the paper [14] is suggested for the application. As it is known, maximum real positive number λ_{max} of each C-matrix and proper vectors w^j for it ($j = 0 \dots n$) is found, using this method and system of matrix equations of the kind [14] is solved.

$$\left[C^{(j)} - \lambda_{max}^{(j)} I\right]\left[w^{(j)}\right] = 0,\ where\ j = 1 \dots n.$$

It is necessary to replay one of the equations by [14]:

$$w_1^j + w_2^j + \dots + w_n^j = 1.$$

Having solved the system of equations, we obtain the weights of the criteria $w_i^{(j)}, where\ j = 1 \dots n$ and may use them for the calculation of the values of the integral factors and each basic factor by means of the following formulas [14]:

$$K_j = w_j^{(0)} K_{nn}^*,\ where\ j = 1 \dots n,$$

$$K_{ji} = w_j^{(0)} w_i^{(j)} K_{nn}^*,\ where\ j = 1 \dots n, i = 1 \dots n.$$

Block-diagram of the algorithm of the suggested technology is presented in Fig. 2.

The technology is used for each index of the atmospheric air quality and atmospheric precipitation separately. First, data are collected, then 3 – 5 optimal locations are determined by each criterion (for instance, by $Ф_{11}$– location with the largest amount of the stationary emission sources, by $Ф_{32}$ – where is the largest quantity of hospitals, sanatoria, schools and nursery schools, by $Ф_{51}$ and $Ф_{52}$ – in the points where there are stationary posts, for instance, of SAES of Ukraine or locations where the Ministry of Health regularly performs measurements, etc.,) form a single list of all these locations, perform calculations, rank all the locations according to this index, select the most important for installation. Then the ranks of these locations can be added by all these indices and the most priority locations can be selected simultaneously according to all these indices. Sometimes it is better to measure in one location the dust, in other location – heavy metals, in the third – ozone (ozone sensor is comparatively cheap, it can be measured in all priority locations), in the fourth location – quality of the atmospheric precipitations. This must be decided by the designers and commission of the zone or agglomeration.

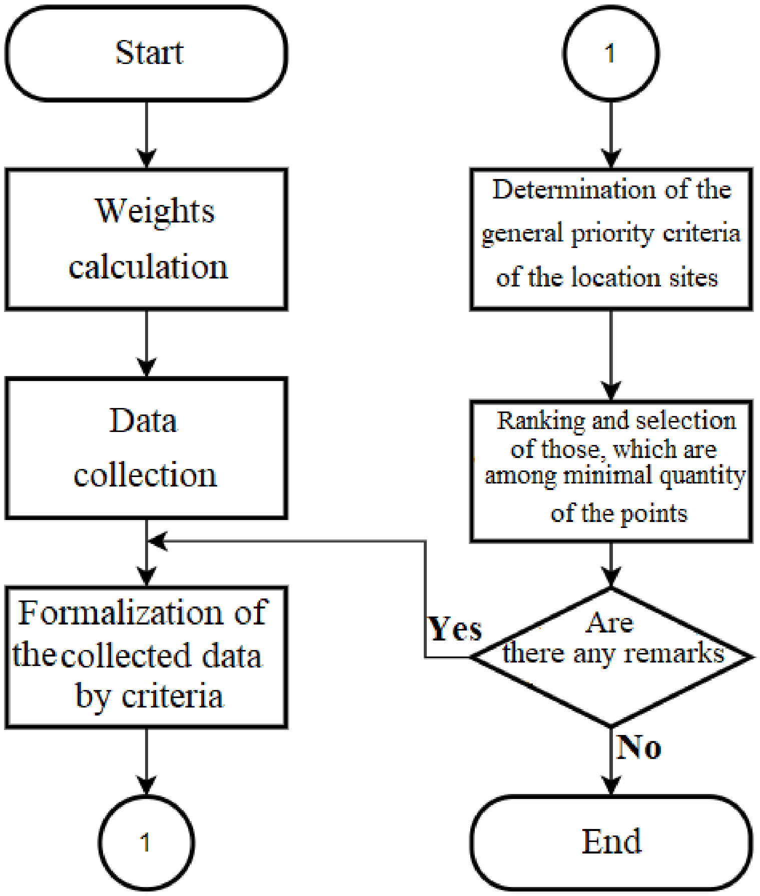

Fig. 2. Block- diagram of the algorithm of the suggested technology, used for the design of the network for the observation of the atmospheric air quality in the region, based on analytic hierarchy process (AHP)

Example of the application of the developed information technology

The application of the suggested technology will be considered on the example of the design of the network of the observation points for the control of the atmospheric air quality of the zone «Vinnytsia», boundaries of which coincide, according to the Resolution [3], with the boundaries of Vinnytsia Region.

Using the suggested algorithm (see block-diagram in Fig. 2) collected public data and expert assessments, three optimal for each of 25 criteria observation points were selected (they were often repeated), values of all criteria were calculated for all the points. The results of their aggregation in the integral criteria are presented in Table 8.

Table 8

Results of the assessment of the observation points

№	Criteria and points	Φ_1	Φ_2	Φ_3	Φ_4	Φ_5	J
	Criteria weights	0.5	0.3	0.14	0.07	0.058	1.0
1	Centre of Ladyzhyn	4.43	2.70	1.29	0.5	0.45	9.365
2	At the entrance in Gaisyn, near the route	4.24	2.70	0.75	0.6	0.55	8.821
3	Settlement Ilintsi	3.55	2.69	0.56	0.4	0.24	7.402
4	Centre of Khmilnyk	0.95	0.27	1.15	0.4	0.42	3.152
5	Kalynivka, near the route	0.78	1.36	0.25	0.4	0.37	3.131
6	Village Nemia near Mohyliv-Podilskyi	1.06	0.81	0.54	0.5	0.21	3.110
7	Mohyliv-Podilskyi	1.04	1.07	0.43	0.3	0.24	3.082
8	In the centre of Nemirov	0.96	0.53	0.69	0.3	0.30	2.728
9	Zhmerynka, near the railway station	0.92	0.53	0.26	0.3	0.42	2.395
10	Village Ivaniv	0.91	0.32	0.16	0.2	0.22	1.790

Fig. 4 presents 6 best observation points where the color of the circle is proportional to the priority level of the corresponding point.

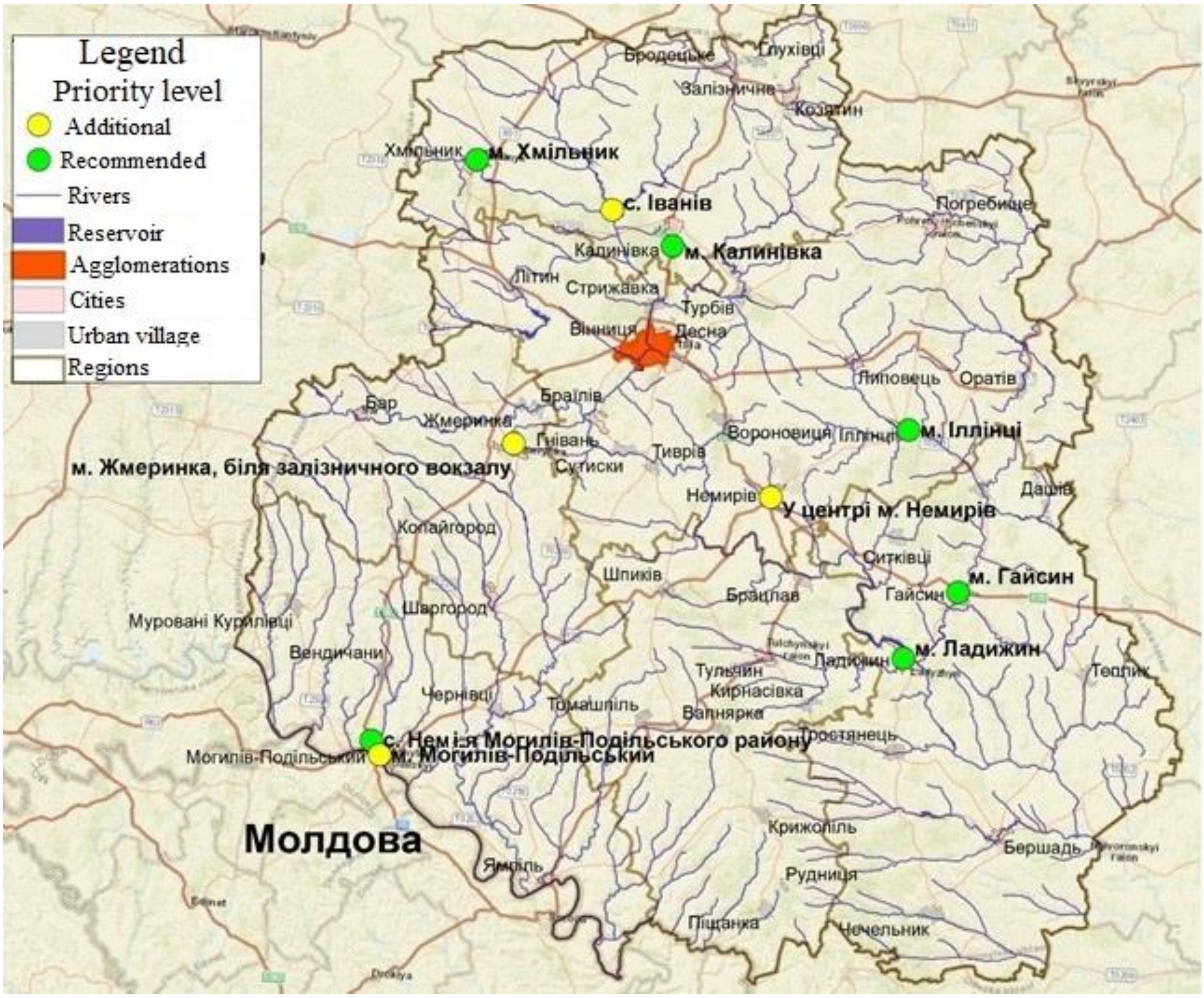

Fig. 4. Map of the priority visualization of the projected observation points of the zone «Vinnytsia»

Conclusions

The paper describes in details the technology of the design of the observation network for the control of the quality of atmospheric air in the region on the base of the analytic hierarchy process. New approach to the determination of priority of the location of the points of the atmospheric air quality observation, using skew symmetric is suggested.

Such approach enables to take into account various criteria of the observation points locations selection, using available input data and, taking into consideration the weights of each criterion and integral criteria, which are selected according to the requirements of the European and Ukrainian legislation and known in Europe model «DPSIR».

Recommendations, concerning the application of this technology for the territory of zones and agglomerations are elaborated.

The example of the application of such technology in the process of the development of the Program of the state monitoring in the sphere of the atmospheric air protection in the zone "Vinnytsia" is considered, this example showed the operation ability of the technology.

Further it is planned to develop this technology this technology for further automation of the stage of the input data processing.

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