Представлено метод оцінювання рівня екологічної безпеки житлового приміщення. Метод відрізняється від відомих вузькою спрямованістю саме на оцінку якості житлового середовища за екологічними чинниками, серед яких: фізичні, хімічні, мікрокліматичні та естетичні, а також дозволяє приймати управлінські рішення на основі результатів оцінки. При цьому фактичний вплив факторів екологічної небезпеки порівнюється з діючими нормативами якості житлового середовища. Метод апробовано для умов реальної житлової забудови у м. Дніпро, Україна

Ключові слова: екологічна безпека, чинник небезпеки, житлове приміщення, інтегральний показник, бальна оцінка, кваліметрична таблиця

Представлен метод оценки уровня экологической безопасности жилого помещения. Метод отличается от известных узкой направленностью именно на оценку качества жилой среды по экологическим факторам: физическим, химическим, микроклиматическим и эстетическим, а также позволяет принимать управленческие решения на основе результатов оценки. При этом фактическое влияние факторов экологической опасности сравнивается с действующими нормативами качества жилой среды. Метод апробирован для условий реальной жилой застройки в г. Днепр, Украина

Ключевые слова: экологическая безопасность, фактор опасности, жилое помещение, интегральный показатель, балльная оценка, квалиметрическая таблица

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DEVELOPMENT OF THE METHOD OF EVALUATION OF THE LEVEL OF ENVIRONMENTAL SAFETY OF HOUSING ACCOMMODATION AND ITS APPROBATION

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1. Introduction

Effective management of environmental safety, including that of residential premises, is possible only on the basis of a detailed and comprehensive assessment of the factors of the environmental hazards formation. Taking into account the fact that the process of ecological danger formation is multifactorial, it is expedient to use integral indicators in determining the environmental safety level, reflecting the possible negative impact of danger factors groups. As it is known, a person in the process of life is exposed to adverse environmental factors, not only in the conditions of production, stay in an open or urbanized space, but also in residential buildings. Under such conditions, person's comfortable existence and state of health depend on the level of environmental safety of the internal housing environment. Thus, the quality control of residential premises in environmental performance terms is appropriate in determining

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the overall level of environmental safety of the population in an urbanized environment. The necessity to estimate the level of environmental safety of residential premises can also be justified. For instance, the necessity to perform tasks in the system of environmental monitoring of atmospheric air, which consists in determining the contribution of various (external, internal) sources of pollution to the value of the total indicator of environmental pollution.

Thus, the analysis of the aggregate of external and internal factors of the ecological danger formation of residential premises and the definition on this basis of certain integral indicators that characterize the level of ecological safety of the environment, are relevant scientific and practical tasks.

2. Literature review and problem statement

In general, many works of scientists from different countries of the world are devoted to solving the task of assessing the state of living environments safety. Thus, the World Health Organization in 1983, taking into account the growing concern about the development of the human ecological safety problem in the living environment, has developed the concept of "sick building syndrome" and "syndrome of the usage of harmful building materials" [1]. At the same time, the notion of "harmfulness" or "environmental cleanliness" of building materials and the choice of relevant methods for assessing this indicator requires serious refinements, as indicated by the authors of [2, 3], which direct the results of their studies to a partial solution of these issues.

Also, the significant number of published studies about living environments air quality is known. The study [4] evaluates the efficiency of air conditioning and ventilation systems in residential buildings. The influence of the decorative materials quality on the quality of indoor air is considered in [5]. The authors of [6] made a general assessment of the city apartment comfort. The results of the influence evaluation of the electromagnetic field on the objects of social infrastructure and residential buildings are presented in [7]. In [8], the influence of the electromagnetic field of mobile communication stations on the residential areas is considered. Separately, the negative influence of the electromagnetic field on the health of the population is considered in [9]. The authors of [10] consider the pollution of the premises only by radon. The authors of [11] specifically consider only the negative effects of dampness and mold. The influence of noise on humans, according to many authors, has a purely medical aspect. So, in [12], an estimation of the noise effect on the reduction of life expectancy, adjusted for disability from myocardial infarction, was made. The influence of noise elevated levels on health is combined by the authors with the subsequent monetization [13]. In [14], quality of life is estimated by indicators of the number of population living in the noise pollution zone. The analysis of the research results presented in the above-mentioned studies [2–14] serves as an additional confirmation of the relevance of the issues of assessing the environmental safety level of residential premises by a hazards combination. However, at the same time, such results do not provide comprehensive consideration of the factors of the environmental hazards formation and, most importantly, do not answer the question of choosing the actual method of evaluation.

Thus, for solving the above-mentioned tasks, it is necessary:

– to establish the initial (basic) theoretical concept that determines the relevance of assessing the quality of life of the population in an urbanized environment;

– to reveal the connection of this basic concept with the tasks of the environmental safety system in Ukraine;

– to analyze the methods that are mainly used in assessing the level of environmental safety of residential premises;

– to determine the list of tasks that remain unresolved in the application of the above methods.

The study [15] reasonably states that ecological sustainability has been one of the important planning concepts since its introduction in the field of economics and ecological thinking for the assessment of urban development. The need for a comparative analysis based on the indicator approach in a specific urban environment and inclusion of various local problems in the assessment, thereby increasing the long-term sustainability of cities is also noted. The authors of [16], when substantiating the system of indicators of sustainable development of urban systems, concluded that in the general set of indicators, the determining role belongs to those which can characterize the quality of life of the population in urbanized territories. In conducting a generalized analysis of quality of life in large cities [17], it is clearly stated that the indicators characterizing the impact of the state of the living environment and environmental factors of the internal and external environments are equivalent on a par with others – economic and social. Thus, the basic concept of the research is the concept of sustainable development of urban areas within which the factors of the living environment are considered indissolubly with the notion "quality of the population life". In favor of this conclusion, the approach of the authors of [18] to assessing the housing quality shows that the factors influencing the quality of life are considered with an emphasis on the social and economic components of the implementation of the concept of sustainable development: the criminal situation, the inability to pay utility bills, etc.

In general, when assessing the quality of life of the population of urban systems, it should be borne in mind that the ecological component is taken as the basis of the gradual and comprehensive sustainable development of mankind [19]. Such a choice can be substantiated by the UN's conclusion that a person is a part of nature. At the same time, in the context of the necessity of carrying out a multi-factor assessment, the authors of [19] prove the approach to the implementation of the provisions of the sustainable development concept with the emphasis on environmental safety, the level of which should be determined on the basis of integral assessment.

The authors of [20] in the search for optimal methods for determining the quality of life – the level of environmental safety in an urbanized environment determine that the complexity and multivariateness of the evaluation process requires the usage of a wide range of methods: both quantitative – the direct determination of the factor quantitative characteristics, the calculation of integral indicators, and qualitative – expert assessments, interviews with respondents, etc.

The analysis of [21–23] showed that the vast majority of researchers use the survey method when assessing the quality of dwellings. This approach is justified in terms of the ease of processing the results. However, when using this approach, it is difficult to avoid subjectivity in respondents' answers. In addition, this method only gives the results of an assessment of the actual state of the problem. Instead, in [24] there is a more precise approach to the evaluation of quality that lies in a direct measurement of quantitative values of danger factors, comparison with standard parameters and formation of recommendations to improve the environment on this basis. Meanwhile, such an approach is not completed in terms of integral assessment. The authors of [25] apply the evaluation approach according to the "measurement – poll survey – recommendations" scheme by conducting a comparative analysis of the reliability of the survey results with respect to the results of direct measurements. However, these studies are reduced to the intentions of creating a specific universal assessment protocol to predict the improvement of the environment. The indicated disadvantages are partially offset in [26], where a method of assessing the quality of an urban environment is proposed, which also includes a group of risk factors for the impact of environmental factors on the quality of population life. The author of this study uses a system of integral indicators, the weight of which is determined by the method of pair comparison. The indicators are rated on a 100 point scale. However, the usage of such a methodology is relevant to assessing a wide range of environmental performance indicators, and the 100 point system does not allow for the formation of recommendations – managerial decisions. Meanwhile, for narrow groups of factors, such as "environmental safety of a dwelling house", it is more appropriate to apply scores, but on the basis of comparison of quantitative and qualitative values of actual indicators with their norms.

3. The aim and objectives of the study

The aim of the study is to develop a method for the integrated assessment of the level of environmental safety of a residential environment and its testing in conditions of real residential development of a large city.

To achieve this aim, the following tasks were set:

– the main factors of formation of ecological danger, which will have a decisive influence on the level of environmental safety of the living space, are determined;

– groups of danger factors in the structure of such a category of life quality as "environmental safety of a dwelling house" are formed;

– on the basis of actual data, the weight of each factor, the group of factors of danger was determined and on this basis qualimetric estimation tables were formed;

– an assessment of the environmental safety of residential premises in the primary and secondary sales markets was carried out with the help of the developed method for assessing the state of ecological safety.

4. Definition and calculation of the integral indicator of environmental safety of the living environment

4. 1. Stages of determining the quality of the environment and the limits of the assessment of the risk factor

In developing this method, existing Ukrainian regulatory documents were used [27–30]. Theoretical studies on the assessment of the environmental safety level of the population in a residential building were based on the usage of partial pair comparison and expert assessment methods [31].

The sequence of actions to determine the numerical value of the environmental safety index consists of the following steps:

1) selection and determination of the hazards number;

2) scoring factor assessment;

3) hierarchy of factors within groups;

4) definition of integral environmental safety indicator (category of quality of life "environmental safety of a dwelling house").

Thus, the basis of the method is the exploration of weighting and quantification of each danger factor and its groups. Therefore, at the first stage, factors are selected depending on the object of research (evaluation) and compiled into certain groups of danger factors that have a determining influence on the category "environmental safety of a dwelling house". At the second stage, a scoring assessment of factors is conducted, the basis of which are both quantitative and qualitative indicators that characterize the selected factors. Scoring factor assessment consists in comparing the values of the danger factors with the normative (optimal) values. For this purpose, a four-point system of evaluation is proposed and possible limits for assessing the significance of the hazard factor are presented in Table 1 [2].

Table 1

Boundaries for assessing the value of a hazard factor

Category of security area	Points	Value of factor in % of norm	
		ascertaining (existing)	stimulant (promising)
fully suitable (FS)	4	more than 90 %	more than 100 %
suitable (S)	3	70–90 %	90–100 %
partially suitable (PS)	2	50–70 %	70–90 %
unsuitable (Uns)	1	less than 50 %	less than 70 %

In some cases, the factor may be assigned a score of 0 – the category is completely unusable (Uns), in the case where its impact on the environment is very negative (natural or man-made disasters).

4. 2. Establishing the weight of the hazards and determining the environmental safety indicator

In the third stage, the significance (importance, weight) of the danger factors is established, taking into account the level of their influence on the estimated environment [2]. The exclusion of subjectivity in this case is an important condition that is achieved through the application of expert evaluation. The method of partial pair comparison is chosen to rank the hazards. The total pair number of comparable factors can be written in a special table – the Fuller triangle [2].

From the pair of factors considered, the prevailing factor is indicated (in the Fuler table) with an estimate of 1, and equivalent, with an assessment of each factor of danger, is marked with an estimate of 0.5. The significance (weight) of a factor in the overall integral assessment will characterize the sum of these estimates.

In the fourth stage, the integral indicator of the environmental safety level K, the score for each group of factors within the category "environmental safety of a dwelling house" are defined by the formula (1):

$$K = \frac{2 \times \sum_{i=1}^{n} \delta_i \times \omega_i}{n \times (n-1)}, \quad (1)$$

where δ_i is the score of the i-th factor; ω_i is the weight of the i-th factor; n is the number of factors in the group (category).

5. Preparation of qualimetric tables for assessment and determination of the weight of the hazards for residential premises

Life activity of a person in the living environment is influenced by both natural and man-made factors, including noise, chemical, temperature, electromagnetic, radioactive, aesthetic and other influences. Therefore, the ecological security of housing depends on the activity of a human on creating a favorable living environment.

According to the Building code V.1.2-8-2008 [27], construction objects should provide a healthy environment in premises for residents and consumers. The distribution of factors that have a detrimental effect on human health is proposed. The distribution of factors is presented in Table 2–7.

Table 2

Category of quality of life "environmental safety of a dwelling house"

Groups of factors				
Micro-climate (1)*	Air environ-ment (2)*	Lighting (3)*	Physical environmental factors (4)*	Aesthetic factors ** (5)*

*Note: * – Number of the group; ** – Aesthetic factors are visual comfort in premises*

Table 3

Group of factors "Microclimate" (1)

Factor number	Factors of danger	Unit	Standard
1.1	Air temperature	°C	Cold period – (+18+24) Warm period – (+20+28)
1.2	Temperature of fences	°C	Cold period – (+17+21) Warm period – (+26+30)
1.3	Infrared radiation intensity	W/m^2	Up to 140
1.4	Relative humidity	%	60
1.5	Air speed	m/s	Cold period – 0.2 Warm period – 0.3

Table 4

Group of factors "Air environment" (2)

Factor number	Factors of danger	Unit	Standard
2.1	Chemical composition of air	ppm	1 air quality class (on CO_2 – 350 ppm)
2.2	Stubbornness	mg/m^3	0.15 (daily average concentration)
2.3	Ionic composition	ions/sm^3	Lightweight (+) 1500–3000 Lightweight (–) 3000–5000
2.4	Air change rate	l/s, pers	10
2.5	Ozone concentration	mg/m^3	0.1
2.6	Microbiological air condition *	CSO in 1 m^3	up to 2000

*Note: * – the content of colony-forming units (CFU) of bacteria and fungi spores in premises*

Table 5

Group of factors "Lighting" (3)

Factor number	Factors of danger	Unit	Standard
3.1	Natural lighting	*CNL** %	2 (min 0.5)
3.2	Orientation of windows	Horizon-rhumbs	all accommodations should be oriented to the southern rhumbs, and auxiliary – to the north
3.3	Insolation	hours/day	2.5–3
3.4	Sun protection	Yes, no	No
3.5	Artificial lighting	Type of light source	electricity
3.6	Luminosity	Lk	150
3.7	Brightness	cd/m^2	0.8

*Note: * – CNL – coefficient of natural light*

Table 6

Group of factors "Physical environmental factors" (4)

Factor number	Factors of danger	Unit	Standard
4.1	Noise mode	dBA	30
4.2	Vibration mode	m/s (dB)	$2*10^{-2}$ (112)
4.3	Geomagnetic field (Tension)	A/m	0.3
4.4	Electric field	B/m	0.5
4.5	Radiation background of natural materials	Bq/kg	370
4.6	Indoor radon level	Bq/m^3	100–200
4.7	Electromagnetic field (Tension)	kV/m	5

Table 7

Group of factors "Aesthetic factors" (5)

Factor number	Factors of danger	Unit	Standard
5.1	View from the window*	Conditional score	4
5.2	Color gamut indoors	Conditional score	4
5.3	Spatial and planning solutions of the premises (height, area)	m, m^2	height – 2.8 area – 30–98**

*Note: * – the surrounding landscape has a significant impact on the psychological health of the inhabitants of the-house, depresses it if the windows overlook a dilapidated building, a landfill, or a garbage-littered roadway (bio negativity of buildings and structures) and improves it if your home is surrounded by a flowering garden, and the walls of a neighbor's mansion are covered with green ivy (bio positivity of buildings and structures); ** – depending on the number of rooms*

Based on the normative values of the hazards, qualimetric (estimation) Table 8, 9 are developed.

Table 8

Example of compilation of the qualimetric table by the factor "Noise mode"

Factor	Indicator	Score			
		FS, 4 points	S, 3 points	PS, 2 points	Uns, 1 points
Noise mode	Internal to 30 dBA	less than 33.3	33.3–42.9	42.9–60.0	More than 60.0

Table 9

Example of compilation of the qualimetric table by the factor "Chemical composition of air"

Factor	Indicator	Balance score			
		FS, 4 points	S, 3 points	PS, 2 points	Uns, 1 points
Chemical composition of air	Composition of CO_2 in the room over the composition in air, ppm	350	500	800	More than 800

Based on the actual results of the quantitative assessment of the above-mentioned factors on the example of multi-storey residential development in the city of Dnipro, Ukraine, the expert estimation method was used to calculate the weight of each hazard factor in all five groups of the category "Environmental safety of residential premises". The results of determining the weight of factors are given in Table 10, 11 respectively.

Table 11

Hierarchy of danger factors by groups of the category "Environmental safety of a dwelling house" [2]

Category name	Factor risk number	Name of a group of factors	Weight factor, ω
Environmental safety of a dwelling house	01	Microclimate	1.0
	02	Air environment	3.5
	03	Lighting	1.0
	04	Physical environmental factors	3.5
	05	Aesthetic factors	1.0

Therefore, according to the results of the evaluation, it is possible to make a clear conclusion that the factors "Air Environment" and "Physical Environmental Factors" are more important.

6. Discussion of the results. Practical application of assessments of environmental safety of the living environment

Approbation of the method is carried out for the purpose of comparative assessment of the ecological condition of housing in the primary and secondary sales markets by determining the values of the integral indicator of environmental safety for dwellings in real buildings in Dnipro.

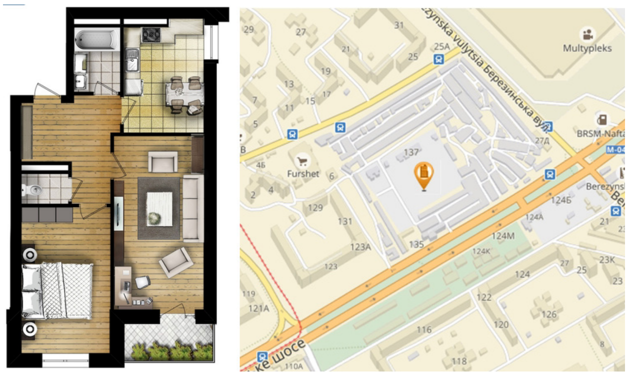
Table 10

Hierarchy of danger factors by groups of the category "Environmental safety of living quarters" [2]

Name of a group of factors	Factor risk number	Name of factor of ecological danger	Weight factor, ω
Microclimate	01	Air temperature	3.0
	02	Temperature of fences	0.5
	03	Infrared radiation intensity	0.5
	04	Relative humidity	3.0
	05	Air speed	3.0
Air environment	01	Chemical composition of air	3.5
	02	Stubbornness	3.5
	03	Ionic composition	0.5
	04	Air change rate	0.5
	05	Ozone concentration	2.5
	06	Microbiological air condition*	4.5
Lighting	01	Natural lighting	4.0
	02	Orientation of windows	1.0
	03	Insolation	6.0
	04	Sun protection	4.0
	05	Artificial lighting	4.0
	06	Luminosity	1.0
	07	Brightness	1.0
Physical environmental factors	01	Noise mode	5.0
	02	Vibration mode	1.5
	03	Geomagnetic field (Tension)	1.5
	04	Electric field	0.5
	05	Radiation background of natural materials	5.0
	06	Indoor radon level	5.0
	07	Electromagnetic field (Tension)	2.5
Aesthetic factors	01	View from the window	0.5
	02	Color gamut indoors	0.5
	03	Spatial and planning solutions of premises (height, area)	2.0

6. 1. Estimation of ecological security of housing in the primary sales market

As an example for assessing the level of ecological security of housing in the category "Environmental safety of residential premises" in the primary sales market, a two-room apartment in the new building in the city of Dnipro is presented (Fig. 1). The residential building is located in the residential area of the city. Territorially, the location has indicators of a place with a well-developed infrastructure.



a *b*

Fig. 1. The location of a two-room apartment in the new building on the Hetmanska St., 7: *a* – the layout of the apartment; *b* – the situational plan of the house

Estimates of the level of environmental safety for residential premises in the new building in the city of Dnipro on the Hetmanska St., 7 are shown in Table 12–17.

Table 12

Assessment of the level of environmental safety by the group "Microclimate" (Hetmanska St., 7)

Name of factor of ecological danger	Weight of factor	Actual value	Rating, score	
			factor, δ	group of factors, K, formula (1)
Air temperature	3.0	Norm*	4	4.00
Temperature of fences	0.5	Norm*	4	
Infrared radiation intensity	0.5	Norm*	4	
Relative humidity	3.0	Norm*	4	
Air speed	3.0	Norm*	4	

*Note: * – for the new building, indicators are planned within the limits of normative values*

Table 13

Assessment of the level of environmental safety by the group "Air Environment" (Hetmanska St., 7)

Name of factor of ecological danger	Weight of factor	Actual value	Rating, score	
			factor, δ	group of factors, K, formula (1)
Chemical composition of air	3.5	class II, (500 ppm)	3	2.93
Stubbornness	3.5	0.2	3	
Ionic composition	0.5	Norm*	4	
Air change rate	0.5	Norm*	4	
Ozone concentration	2.5	0.1	4	
Microbiological air condition*	4.5	3000	2	

*Note: * – for the new building, indicators are planned within the limits of normative values*

Table 14

Assessment of the level of environmental safety by the group "Lighting" (Hetmanska St., 7)

Name of factor of ecological danger	Weight of factor	Actual value	Rating, score	
			factor, δ	group of factors, K, formula (1)
Natural lighting	4.0	1.0	3	3.43
Orientation of windows	1.0	north rhumbs	3	
Insolation	6.0	2.0	3	
Sun protection	4.0	No	4	
Artificial lighting	4.0	electricity	4	
Luminosity	1.0	150	4	
Brightness	1.0	0.9	3	

Table 15

Assessment of the level of environmental safety by the group "Physical environmental factors" (Hetmanska St., 7)

Name of factor of ecological danger	Weight of factor	Actual value	Rating, score	
			factor, δ	group of factors, K, formula (1)
Noise mode	5.0	Inside – 38 dBA Outside – 50 dBA	3	3.73
Vibration mode	1.5	120 dB	4	
Geomagnetic field (Tension)	1.5	0.25	4	
Electric field	0.5	0.6	3	
Radiation background of natural materials	5.0	370	4	
Indoor radon level	5.0	100	4	
Electromagnetic field (Tension)	2.5	5	4	

Table 16

Assessment of the level of environmental safety by the group "Aesthetic Factors" (Hetmanska St., 7)

Name of factor of ecological danger	Weight of factor	Actual value	Rating, score	
			factor, δ	group of factors, K, formula (1)
View from the window	0.5	Norm	4	4.00
Color gamut indoors	0.5	Norm	4	
Spatial and planning solutions of premises (height, area)	2.0	Norm	4	

The results of the quality assessment of the living environment for two-room apartments of type 4 and type 5 of section 1 of the residential complex "Salut" are presented in the conclusions.

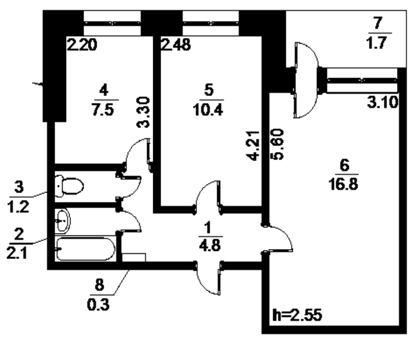
Table 17

Assessment of the environmental safety level by the category "Environmental safety of a dwelling house" (Hetmanska St., 7)

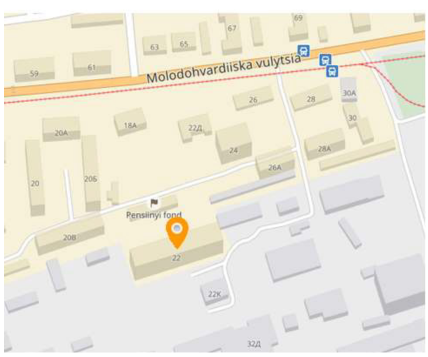
Groups of danger factors		Weight of factor, ω	Score of the group, δ	The value of K, formula (1)
Code	Name			
01	Microclimate	1.0	4.00	3.48
02	Air environment	3.5	2.93	
03	Lighting	1.0	3.43	
04	Physical environmental factors	3.5	3.73	
05	Aesthetic factors	1.0	4.00	

6. 2. Estimation of ecological security of housing in the secondary sales market

To evaluate the ecological security of housing on the secondary sales market, we have chosen an apartment: on the Molodohvardiyska St., 22 (Fig. 2), the residential building is located in the industrial and residential area of the city. The assessment of the quality of the living environment for residential premises was carried out according to the methodology discussed above.



a



b

Fig. 2. The location of a two-room apartment on the Molodohvardiyska St., 22 near the Interkorn plant (secondary sales market): *a* — the layout of the apartment; *b* — the situational plan of the house

The result for the apartment on the Molodogvardiyska St., 22 is presented in-Table 18. In general, a comparative assessment of the values of the environmental safety index by the category "Environmental safety of a dwelling house" is presented in the conclusions for two apartments in new buildings, and two apartments in the secondary sales market.

Table 18

Assessment of the environmental safety level by the category "Environmental safety of a dwelling house" (Molodogvardiyska St., 22)

Groups of danger factors		Weight of factor, ω	Score of the group, δ	The value of K, formula (1)
Code	Name			
01	Microclimate	1.0	3.65	2.85
02	Air environment	3.5	1.77	
03	Lighting	1.0	3.81	
04	Physical environmental factors	3.5	3.24	
05	Aesthetic factors	1.0	3.50	

7. Conclusions

1. The method of estimation of the ecological safety level of a dwelling is developed, which allows determining the integral index of the environmental safety level based on a four-point assessment in the conditions of the factors combination of the environmental hazards formation.

2. The choice of the ecological danger formation factors according to the category of life quality of the population "Environmental safety of a dwelling house" is made. The proposed groups of danger factors of this category are: microclimate, air environment, lighting, physical environmental factors, aesthetic factors. Using the partial pair comparison method, the weight of each danger factor is determined and its hierarchy is carried out, according to the results of which it is established that the groups of factors "Air Environment" and "Physical Environmental Factors" are the most important.

3. Qualimetric tables have been compiled for the scoring assessment of the selected environmental hazards factors. Based on the values of the hazard factors scoring assessment and their weight determination, a formula is proposed for determining the numerical value of the integral indicator of the environmental safety of the dwelling.

4. As an approbation of the method, a comparative assessment was made for choosing more environmentally friendly housing in the primary and secondary sales markets. According to the results of the evaluation, the following results were obtained: in new buildings: 3.48 and 3.36 points, respectively; on the secondary sales market – 3.32 and 2.85 points. The obtained results are generally predictable and allow, by the value of a single integral indicator, justifying, for example, the purchase of a house.

5. In general, the application of the developed method allows:

– assessing the existing environmental safety level of residential premises to manage its quality, in terms of both new construction and reconstruction;

– justifying the choice of new architectural regarding the level of environmental safety in the room;

– estimating the cost of a premise when it is purchased on the primary or secondary market in the conditions of equivalence of all other parameters such as location, the state of the infrastructure of the district, etc.

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