Original scientific paper
UDK 629.33.03-83:[504.6:534.322.3
DOI: 10.7251/afts.2022.1426.079S
COBISS.RS-ID 136085249

ADMINISTRATION OF SUSTAINABLE DEVELOPMENT OF TERRITORIES AS ONE OF THE APPROACHES FOR CREATING A BIOSPHERE-COMPATIBLE AND COMFORTABLE URBAN ENVIRONMENT

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ABSTRACT

Topical issues of formation of sustainable urban environment were analyzed. In this work, the modern urban environment was considered in the form of an open dynamic system, where its state is determined by other specific laws based on the mutual influence of the components of the system taking into account external influences. The safe city environment acts as natural social and technical structure. This concept assumes unity and interaction/interference of three main bases (natural aspect of X, social aspect of Y and technological aspect of Z) subject to external influences. The analysis of data of monitoring gives a qualitative and quantitative picture of current state of the urban environment. The approach to city management based on GIS-systems is also considered, which make it possible to collect, process, analyze and display spatially coordinated data and allow the most efficient interpretation of information and knowledge about territories for further assessment of the state of the habitat.

Key words: *sustainable development, urban territories, geo-information systems, mapping, menagement vector layers, city planning*

INTRODUCTION

At present, the concept of sustainable development is becoming increasingly used, the purpose of which is to create a high-quality habitat that meets all the demands of society.

Any urbanized area, whether it be a large agglomeration or a rural settlement, is a complex system in which many spheres of life of a large number of its inhabitants repent. That is why the issue of harmonious and rational use of urban areas is one of the priority areas of research of each of the sciences, in one way or another related to the process of their functioning [1].

Qualitative and effective development of territories is not possible without understanding their real state, which makes the role of monitoring in this process decisive. Formulation of a new development strategy cities caused by the development of global ecolo-geopolitical problems and means permanent co-integration into a single self-organizing system the main areas of human activity: economic, environmental, social, etc [2].

At the same time, the transformation of the city can grow be viewed through biosphere compatibility, cost-effectiveness with overall reduction the burning of anthropogenic pressure on the biosphere.

In modern works of a number of scientists [3,4,5,6,7,8] the urban environment is presented in the form of open dynamic system which condition is caused by external influences, internal interactions between clusters of system and the intra making processes. Here the safe city environment acts as natural social and technical structure. This concept assumes unity and interaction/interference of three main bases (natural aspect of X, social aspect of Y and technological aspect of Z) subject to external influences. The specified structure is extremely difficult owing to variety of communications, versatility of entities of interaction and features of nature of interference.

In the solution of such capacious task it is difficult to overestimate a role of monitoring. The analysis of data of monitoring gives a qualitative and quantitative picture of current state of the urban environment. It will allow, in particular: to carry out preventive influences (or correction) by establishment of a deviation of values of the current parameters from set (the territories providing sustainable development); to define a common ground of one sphere of life of the city with another; to estimate correlation of dynamics of change of one parameters of function of the city from others and so forth.

Modern views on monitoring of social and economic development are various. However, despite their variety, a main goal of sustainable development of territories is providing governing institutions of full, reliable and relevant information.

By means of monitoring quality of life, pressing needs of the population, development of real and financial sectors of economy; ecological situation; tendencies and prospects of development of territories can be traced; a number of the negative phenomena which can take place.

Submission of such information is the user-friendliest if geoinformation technologies are applied, such, for example, as GIS-mapping of the city. In this case the electronic card – the city basis consisting of n-vector layers of separate (independent) layers of social and economic life of the city is formed. The number of n-vector layers is generally not limited. As a layer, for example: housing estate; industrial building; underground construction; utilities; transport systems; power systems; grounds of household waste; recreational recreation areas, etc. can be taken.

raster form of her representation the grid - "lattice" which conditional area can be accepted, for example, equal to one square kilometer is imposed. In knots of this grid databases on all vector layers of information of any realized function of the city are concentrated. At the same time numerical values of parameters of each vector layer in knots of a grid can be or are initially received directly as natural and experimental, or indirectly as numerical and experimental (for example, with use of methods of automatic interpolation of natural experimental data) [9].

The purpose of this article is to consider approaches to monitoring the state of the urban environment for the development of a sustainable urban natural, socio-technical structure.

THE MODERN URBAN ENVIRONMENT AS A DYNAMIC SYSTEM

The modern urban environment is the dynamic system which open for external managing directors of influences, that is the influences transferring system to a new state as it is possible to tell that its state is caused by:

External influences (for example, climatic factors, change of requirements of standard and legal base, social standards and qualities of life, change of education level and culture of society and others, defining a possibility of cooperation with the biosphere);

Internal interactions between components (for example, rendering services, social tasks, environmental protection, etc.);

The intra making processes (for example, the intra production and economic relations).

On the basis of the transformation principles of the city in Biosphere compatible and developing the person [10,11,12] the conceptual model of the safe urban environment as natural-social-technical structure is offered.

As a part of this structure the components making it are allocated:

the natural component as the part of the external environment containing resources for the person, interacting with objects of city infrastructure and which is exposed to negative technogenic impact;

the social component as the part of the external environment which is also interacting with objects of city infrastructure and expecting satisfaction of the requirements at certain risks. (besides, the person as the representative of society, being a part of the environment, indirectly is influenced by negative technogenic impact);

the technological component making power impact on natural and social environments, and defining first of all, a possibility of formation of an adverse ecological situation in a certain territory.

At the same time the conceptual model of ecologically safety organizational and technical system of the city looks as follows (Figure 1).

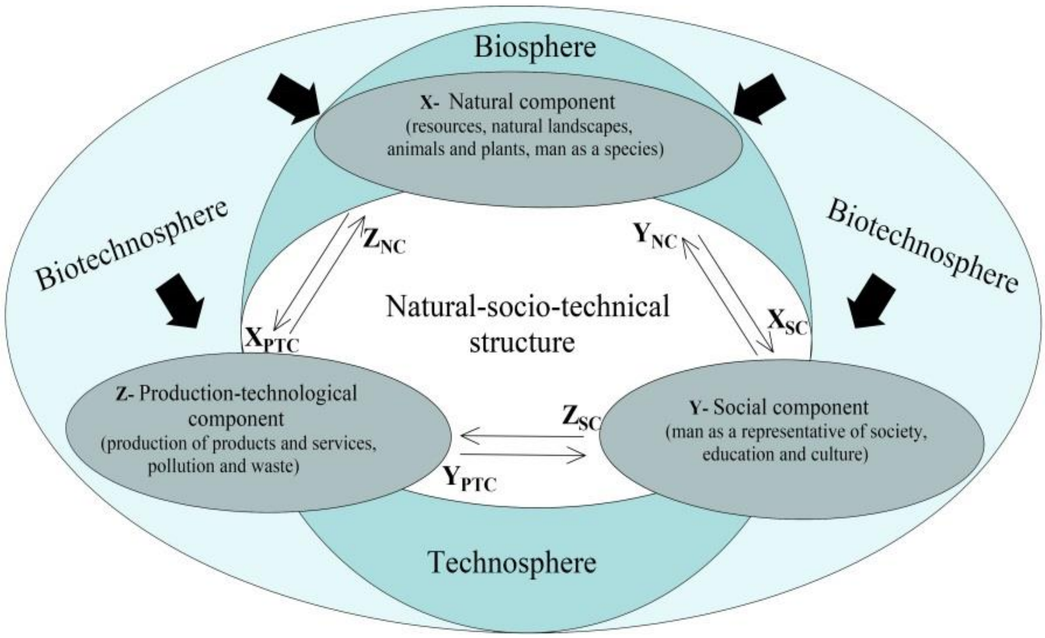

Figure 1. The scheme of conceptual natural-social-technical structure of the urban environment

The principal novelty in creation of the safety urban environment conceptual model in the form of open dynamic system in this case is that its state is defined by other specific laws which are based on mutual influence of system's components taking into account external influences.

For formalization of a system considered by the authors [10] the set-theoretic approach was used [11], which determining parameters entered in Figure 1.

X - a set of fortune natural component, characterized as the capacity (resource) of the biosphere, and depending on impact on it: technological objects, person as parts of the nature, and external environment;

Z - a set of fortune technological component (production, services, pollution and waste);
Y - a set of fortune social component, characterized as "the human potential" as a part of the considered system, and depending on influence of two other components.

Interactions as a part of analyzed natural-social-technical system of the urban environment according to [10] are described by sets:

XPTC, XSC – sets of impacts of a natural component on technological and social components: (XPTC, XSC $\subset$ X);
ZNC, ZSC – sets of impacts of a technological component on natural and social environments (ZNC, ZSC $\subset$ Z);
YPTC, YNC – sets of impacts of a social component on technological and natural components: (YPTC, YNC$\subset$ Y).

The mathematical model natural-social-technical structure of the urban environment as difficult dynamic system is presented in a general view by the nonlinear equation of a look:

$$\frac{dx_i}{dt} = f_i(x_1, x_2, \dots, x_n),\ \ i = \overrightarrow{\overline{1, n}}, \tag{1}$$

where f_i- continuous or piecewise and continuous functions; x_n - the system coordinates reflecting the provision of some point in the phase plane or in space of coordinates, and characterizing fortune making systems at any moment.

For the description of a condition of system and definition of components of humanitarian balance on the basis of representation (1) various processes, situations caused by interactions of various factors have to be formalized. Separate processes in the itself and functional dependences describing them are known, also many of them are normed.

Nevertheless, statistically most of them are not recorded neither on the different cities, nor on the historical periods of any one city in the ratio with the level of development of human potential. It is one of the most important problems of the forthcoming researches in this direction to define optimum indicators and purposefully to make corresponding changes to mechanisms of management of the city.

In order to develop an implementation algorithm of such task the balanced state natural-social-technical system of the urban environment is formalized and presented by set of three nonlinear equations:

$$\begin{cases} \frac{dX}{dt} = F_1(X, Y, Z)X, \\ \frac{dY}{dt} = F_2(Y, X, Z)Y, \\ \frac{dZ}{dt} = F_3(Z, X, Y)Z, \end{cases} \tag{2}$$

where $F_1(X, Y, Z), F_2(Y, X, Z), F_3(Z, X, Y)$ - the nonlinear functions reflecting influence of parameters of internal interactions between components of X,Y and Z and external impacts on dynamics of system.

Taking into account interactions in the considered system the model of the balanced state is offered in the form of the following system of the differential equations:

$$\begin{cases} \frac{dX}{dt} = F_1(X, Z_{NC}, Y_{NC})X, \\ \frac{dY}{dt} = F_2(X_{SC}, Y, Z_{SC})Y, \\ \frac{dZ}{dt} = F_3(X_{PTC}, Y_{PTC}, Z)Z, \end{cases} \tag{3}$$

where $\frac{dX}{dt}$ - the pace of change a condition of a natural component;
$\frac{dY}{dt}$ - the pace of change a condition of a social component;

$\frac{dZ}{dt}$ - the pace of change a condition of a technological component; $F_1(X, Z_{NC}, Y_{NC})$, $F_2(X_{SC}, Y, Z_{SC})$, $F_3(X_{PTC}, Y_{PTC}, Z)$ - nonlinear functions; X - a set of fortune natural making, characterized as the capacity (resource) of the biosphere, and depending on influence of objects of technological infrastructure and the person and also the external revolting influences; Z_{NC} - impacts of a technological component on the environment; Y – set of fortune of social component; X_{SC} – impacts of a natural component on the social environment; Z_{SC} – impacts of a technological component on the social environment; Z – set of fortune of technological component; Y_{PTC} – impacts of a social component on a motor transportation part; X_{PTC} – impacts of a natural component on a motor transportation part.

The system of the differential equations (3) is synthesis of the known exponential law on types developing of V. Volterra:

$$\frac{dx_i}{dt} = \varepsilon_i x_i, \tag{4}$$

where $x_i = x_i(t)$ - a condition of i-component in natural-social-technical structure, i =1,2,3; ε_i - gain coefficient; t – time.

Coefficients of a gain of each component x_i can be presented in the form of some functions from all interacting factors. For example, we will present an absolute increment of a natural component for a period Δt as:

$$\Delta X = (a + bY_{NC} + cZ_{NC})X\Delta t, \tag{5}$$

where a - the coefficient reflecting change of a condition of a natural component for the accepted unit of time (for example, one year);

b- the coefficient reflecting change of a condition of a natural component for the accepted unit of time taking into account influence of a social component;

c - the coefficient reflecting change of a condition of a natural component taken for a unit of time taking into account influence of a technological component.

Coefficients in the differential equations can be also presented in the form of some functions or the sum of the coefficients reflecting, for example, realization of the operating influences in relation to components natural-social-technical of the urban environment:

$$a = (a_1 + a_2 + \cdots + a_n = \sum_{j=1}^{n} a_j \tag{6}$$

The same way to form increments of other components of natural-social-technical structure are register.

Then the system of the equations takes a form:

$$\begin{cases} \frac{dX}{dt} = (a + bZ_{NC} + cY_{NC})X, \\ \frac{dY}{dt} = (eX_{SC} + d + hZ_{SC})Y, \\ \frac{dZ}{dt} = (kX_{PTC} + lY_{PTC} + m)Z, \end{cases} \tag{7}$$

where $\varepsilon = (a + bY + cZ_{NC})$ - coefficient of change in the state of the natural component; $\varepsilon = (eX_{SC} + d + hZ_{SC})$ - coefficient of change in the state of the social component; $\varepsilon = (kX_{PTC} + lY_{PTC} + m)$ - coefficient of change in the state of the production and technical component.

Thus, authors [10] received the system of three nonlinear differential equations accepted to the description natural-social-technical structure of the urban environment which has to be complemented with entry conditions at $t = 0$: $x(0) = x_0$, $y(0) = y_0$, $z(0) = z_0$.

The mathematical model in a general view gives an idea of a possibility of the description a condition of the urban environment system and quantitative assessment the components of humanitarian balance Biotechnosphere of the urban territory, characteristics of the general properties models and allows to conduct numerical researches of transformation processes of separate components and components in the concrete region on the basis of data of monitoring, collecting and processing corresponding statistical information and appointment on these basics of parameters to the covered model.

THE URBANIZED TERRITORIES AND ASSESSMENT OF VALUE Z_{NC}

Under the urbanization of the territory is understood as the relation of the area of city lands to the total area of the region (edges, region, district). In Russia there are a number of territories with high degree of an urbanization - Moscow (17,4%), St. Petersburg (6,0%), Tula (14,8%), Yaroslavl (9,9%), Central-Chernozem (7,3%). A number of industrial centers forms large agglomerations. The index of an agglomeration is defined as the relation of number of the city settlements located in an external zone of agglomeration to the total number of its urban population. Among the largest agglomerations - Moscow, St. Petersburg, Novosibirsk, Kemerovo, Chelyabinsk.

For the urban territories also calculate such parameters as: population density on urban areas, security of citizens with green plantings and a greening of urban areas, development of transport infrastructure, security with water and recreational resources. In addition, for the urban territories integrated ecological assessment which is defined by a total score of influence extent of technogenic factors and stability of natural complexes and components (a land cover, water and air basins) is removed.

Many cities on intensity of pollution and the distribution area of toxic anomalies elements in various environments represent technogenic geochemical provinces already now. Pollutants of the atmosphere, waters and soils of the urbanized territories in the form of various toxic gases, aerosols, particles of solid or liquid substances adversely influence the environment. Being in the urban environment, these products of production economic activity of the person form technogenic geochemical anomalies of pollutants in various components of a landscape [4,5,6].

For city landscapes, under the influence of technogenic processes and an urbanization not only considerable transformations, but also essential (including irreversible) geochemical changes of the main physical and chemical properties of a landscape which do not correspond to the natural analogs any more are characteristic, and develop on the new technogenic-provoked cycles.

Certainly, degree of negative impact of the cities on natural systems in each concrete city is very specific and depends on the size of the city, its specialization in territorial division of labor, types of building, extent of improvement and gardening. The urbanization involves the increased concentration of negative anthropogenic toxicants the result of which is almost universally disturbed natural environment, air pollution, soil, water bodies, drying up of vegetation, loss of biodiversity, increased morbidity of the urban population.

GEO-INFORMATION TECHNOLOGIES AS EFFECTIVE TOOL OF COMPLEX ASSESSMENT OF URBAN ECOSYSTEMS CONDITION Z_{SC}

Currently, under the geo-information systems (GIS) understand hardware and software systems that enable to collecting, processing, analysis and display of spatially coordinated data and allow the most effective interpretation of information and knowledge about the territories [7,8]. A cartographical method in combination with geo-information technologies - an integral part of a modern geo-ecological research therefore use of computer technologies in geoecology passes from the field of theoretical and methodical developments into the field of broad practical application.

Intensive development of GIS-technologies began with emergence of cartographical software packages, such, for example, as «Mapinfo», which allowed not only to create, but also on the basis of the arriving new information quickly to update ecological cards, to form cartographic and ecological models in relation to the solution of various problems of ecological assessment and monitoring.

Iformation filling of GIS comprises an electronic card file, documents with opportunities of thematic search and a set of basic cards. Communication of documents of an electronic card file with objects on basic cards gives to the user of system new opportunities of cartographical information search. The GIS's main functions are:

- creation of electronic card files of documents;
- linking of the documents which are stored in card files with electronic maps of the considered territory;
- carrying out thematic and cartographical search of documents;
- creation of thematic maps.

Modern computer technologies allow to process and interpret quickly big arrays of the cartographical data accumulated in maps of different function, contents and scale. But it's more effective to use maps and information which is contained in them, it is necessary to choose and put into practice such methods of the analysis, synthesis and the forecast which combine application of computerized programs of mathematic-cartographical modeling and traditional methods of geographical cartography.

In recent years there has been a new, higher stage of the automated geo-information mapping providing creation and the purposeful analysis of cartographical images on the basis of geographic information systems was outlined. The electronic cards received by means of computers offer broad prospects for expeditious creation of the models reflecting not only a statics, but also dynamics of the phenomena by comparison of various objects in existential aspect that is especially important for conducting environmental assessments. Working in the interactive mode with electronic cards by means of manipulators, it is possible to highlight, increase certain sites of the image for the detailed analysis and also to combine them for obtaining the synthesized information, to scale images and by that to reflect development or regression of the studied phenomenon. The organization of access to the separate, chosen as necessary by the operator card elements, allows to analyze ratios between components for more exact analysis of events. Existence of the editorial mode gives an opportunity to quickly make changes and to model the existing or predicted situation.

For information support of the solution of various ecological tasks, including ecological safety and environmental protection, it is necessary to collect, to keep, process and interpret various geo-ecological data. As a natural stage on the way of further systematization of the saved-up data and to their effective use creation of regional geo-ecological atlases has to serve. The projected satin cartographical work has to meet to a number of the traditional and specific requirements caused by its functional features: thematic completeness and versatility of contents; internal unity in the relation of contents and data representation forms; geographical concreteness and detail; optimum combination of interpretation and synthesis of data with their help and factual reproduction; semantic orientation; present; availability, ease of perception of information; possibility of fast obtaining reference; convenience of use; high esthetic qualities.

The geographic information systems including parameters of health of the population and the environment - the main tool for decision-making on formation and improvement of policy of decrease in an adverse effect of factors of the environment on health of the population.

Especially promising are regional GIS, which allow systemically organize regional geo--ecological information, analyze it quickly and map it, which is important for the purposes of regional environmental management and optimization of environmental management.

For example, a regional GIS was created, which is a geo-information geo-ecological Atlas of one of the regions of Russia. The Atlas includes a number of models of the following geo-ecological maps:

1. Maps of sustainability of natural complexes-reflect information assessment of the ability of landscapes or their components to maintain the structure and mode of operation in the conditions of technogenesis.
2. The overall landscape-ecological (geo--ecological) maps reveal the geo-ecological context, natural X, Y, social, technical and production Z subsystems, in the process of economic development of landscapes.
3. Maps of landscape-ecological (geo-ecological) potential reveal the possibility of landscape to meet the needs of society.
4. Maps of technogenic complexes and objects that have influence on the natural territorial complexes.
5. Maps of man-made changes in landscapes-reflect the acquisition of new landscape or the loss of previous properties under the influence of external factors or self-development.
6. Landscape-ecological (geo-ecological) maps of regulation of economic activity - reflect the existing and proposed restrictions in order to form cultural landscapes.
7. Maps forecasting anomalous (catastrophic) phenomena in landscapes, that is, those that do not fit into the normal mode of landscapes functioning, accompanied by a radical restructuring of their condition, the destruction of geotechnical systems, the deterioration of welfare, health and living conditions of the population of the region.

Other example of effective use of GIS as tool of assessment of a condition of the habitat: GIS of control of technogenic impact on the environment of the inhabited territory where the ecological situation is close to critical. The areas of 12 stations located in various areas are a part of system (10 - PC platform and 2 - Unix platform).

To work as a base layer a digital model of the topographic base scale 1:500000 as given. The main content of the system is information on annual emissions of pollutants into the atmosphere and water bodies, the location and content of waste storage facilities, the state of forests and the activity of pollution sources. Regular updating of information is carried out at the expense of monitoring data - tests and water intake, atmospheric air, etc.

Introduction of GIS offers broad prospects for the analysis and forecasting of an ecological situation. So, for example, combination of vector layers of model of an arrangement of storages of waste and basins of the rivers gives complete idea of potential danger of hit of pollutants in waterways. And by consideration of the project of construction of any object by means of GIS the section "Conservation" allows to demonstrate influence of an object on the environment and to pick up optimum parameters for construction of nature protection constructions.

Other example of use of GIS at assessment of a condition of the habitat are pollution researches heavy metals of the environment in one of the mining provinces, most known in Russia. GIS basis is made here by the following vector layers in scale 1:10000: geological map of the area, tectonic map, hydrogeological map; map of a hydraulic network and lakes, quarters of settlements and technogenic objects and also relief; map of points of geochemical approbation of soils and surface water.

With the help of the Spatial Analyst module, maps of soil contamination by elements (Zn, Si, Cr, Mn, Cd, Pb, As, Ni) were built on this basis. Further maps of soil contamination by the specified elements in relative shares of maximum permissible concentrations were constructed.

The result of the work was 12 vector layers of the territory assessment map for each of the analyzed factors. For the general expert assessment of the area, these layers were summarized and a final map of the integrated assessment of the area by 13 factors was obtained [12].

Thus, complex satin mapping on the basis of GIS-technologies is one of the most effective and perspective methods of the spatial analysis allowing to estimate quickly state of environment and to make effective administrative decisions on optimization of environmental management and regional planning of development the urban territories on this basis.

For assessment of the quality of the environment of the city territory created GIS "Eco-geochemistry and Technological Hazards", which was formed with help of the electronic geo-ecological atlas of the city. The automated City Eco-geochemistry database and also program and cartographical tools of creation of city geo-ecological maps forms a basis of GIS.

"Ecogeochemistry of the city" databases are the cornerstone ten years observations of geochemical state of environment of the city air pollution and soils on priority pollutants B various points of the city (annually - not less than 200 samplings for assessment of air pollution and the soil).

CREATION IN THE ENVIRONMENT OF «MAPINFO» THE ELECTRONIC TOPOGRAPHIC BASE MAP OF THE CITY

For systematization of data on state of environment and studying of formation of zones of environmental risk for the population of the city the Mapinfo Professional program, version 7.8 which is most convenient for realization of a goal is used. By means of this program the city GIS electronic basis-map was created which structure is shown in the Figure. 2.

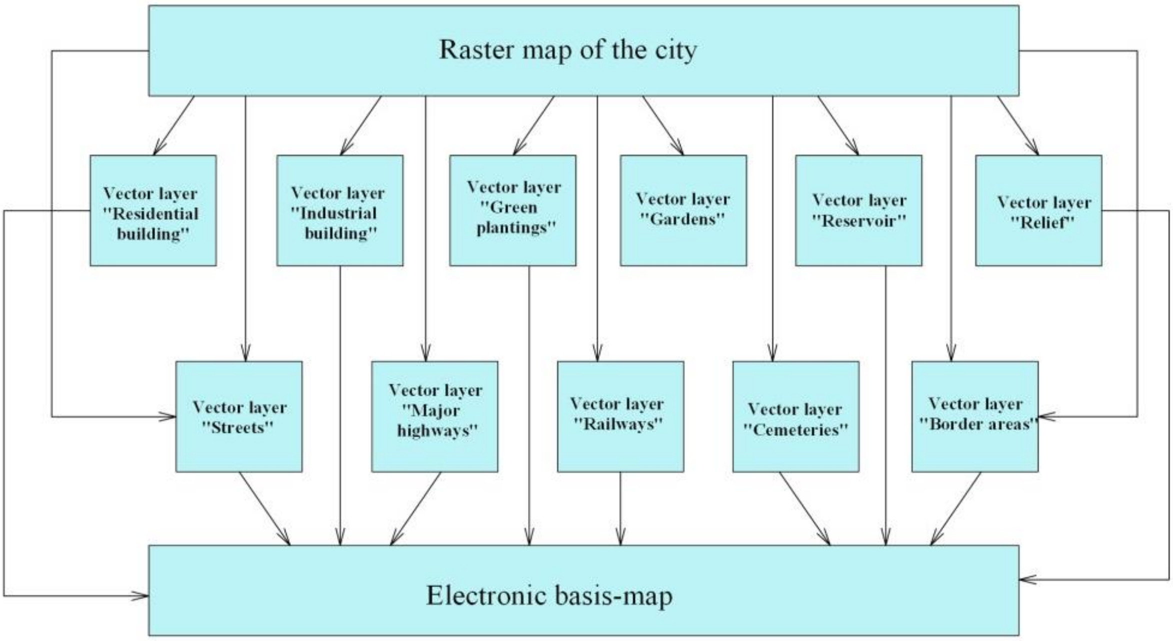

Figure 2. Type of the GIS electronic basis-map

At the first stage of creation of the topographic base map, a raster image of the city was registered in the Mapinfo system the raster image of the city was registered. In the projection "NonEarth (kilometers)". A 1:20 000 scale city map was used as the basis for the raster image.
On the basis of this raster layer 11 vector layers were created: housing estate; industrial building; green plantings; streets; large highways; railroads; relief; cemeteries; gardens; reservoir; borders of areas.

The layer "Housing estate" (Figure 2) is created by means of "grounds" which were imposed on the main residential quarters of the city.

The layer "industrial building" (Figure 2) is created by analogy with the housing estate by means of grounds which are imposed on contours of the industrial enterprises of the city - the main sources of environmental pollution.

B the table of this layer are brought names of the enterprises, their postal address, a specific contribution of emissions of pollutants B the atmosphere from city and a class of harm of the enterprise. On the basis of this layer it is provided possible to estimate areas of alleged local influence of industrial zones taking into account a wind rose and also placement of fragments of the housing estate within sanitary protection zones of the industrial enterprises that is observed B city where several thousands of people live in sanitary protection zones of the enterprises 1 and 2 of classes of harm.

The layer "green plantings" (Figure 2) is created by means of grounds. This layer allows to estimate possible "retardation" of distribution of toxic substances from the industrial enterprises and highways.

Layers "large highways" (Figure 2) and "railroads" are created by means of lines and polylines. The layer "large highways" displays the main transport arteries of the city. As motor transport is the main source of lead, formaldehyde, oil products and other pollutants, comparing this layer with a layer "housing estate", it is possible to estimate zones of possible excess of maximum allowable concentration of these pollutants in the environment. Railway transport is less toxic from the ecological point of view, however, comparing a layer "railroads" with "housing estate", it is possible to reveal residential quarters in which the noise discomfort and local chemical pollution of the environment is observed.

The layer "relief" (Figure 2) is created by means of smoothed polylines. This layer allows to estimate distribution of pollutants of the environment taking into account the relative height of this or that territory. So, for example, in hollows concentration of pollutants of the environment is usually higher, than on heights. Also this layer allows to predict aeration of this or that site of the urban area. Layers "gardens" and "cemeteries" are created by means of grounds. The layer "gardens" displays the main landings of fruit-trees in the territory of the city, and the layer of "cemetery" displays an arrangement of the main cemeteries of the city.

The layer "reservoir" (Figure 2) includes all reservoirs located in the territory of the city - a city reservoir, the rivers, lakes, ponds and other reservoirs. The city reservoir, ponds and lakes and also the large rivers were created by means of grounds, and smaller rivers - by means of smoothed polylines.

The layer of "border of areas" (Figure 2) created by means of lines and polylines shows an arrangement of the borders dividing the city into 6 certain territorial areas.

The received electronic card basis formed a basis for spatial display and the analysis of eco-geochemical and medical-statistical data. Creation of GIS was carried out by the block (modular) principle that gives the chance to expand system due to addition of new blocks (programs) or to work only with a certain part (module) of GIS.

RESULTS AND DISCUSSION

The proposed conceptual model of a safe urban environment as a natural, socio-technical structure is based on the transformation of the city into a biosphere-compatible and developing human being according to the concept of sustainable development. In general, it gives an idea of the possibility of describing the state of the urban environment system and quantifying the components of the humanitarian balance of an urbanized territory, the characteristics of the general properties of this type of models and allows numerical studies of the transformation processes of individual components and components in a particular region based on monitoring data, collecting and processing relevant statistical information and assigning parameters of the model under consideration on this basis.

For visual display and subsequent processing of information about the urban environment, it is advisable to use GIS systems. Regional GIS are particularly promising, allowing to systematically organize regional geoecological information, analyze it promptly and display it cartographically, which is relevant for the purposes of regional environmental management and optimization of environmental management. But in order to effectively use maps and the information contained in them, it is necessary to choose and put into practice such methods of analysis, synthesis and forecasting that combine the use of computerized mathematical cartographic modeling programs and traditional methods of geographical cartography.

All this will help in solving the task of monitoring indicators of sustainable development of the city as a whole. It is the analysis of monitoring data that gives a qualitative and quantitative picture of the current state of the urban environment. This will allow, in particular: to carry out preventive actions (or correction) by determining the deviation of the values of the current parameters from the set ones (ensuring the sustainable development of territories); to determine the points of contact of one sphere of city life with another; to assess the correlation of the dynamics of changes in some parameters of the city function from others, etc.

CONCLUSIONS

Management of development of building of territories means activities of state institutions and/or municipality for formation and the approval of the concept of such development, localization of important objects, etc. This type of management is guided by laws and the principles of development of residential territories, is a component of town-planning activity and is usually calculated not less, than on 10 expected years.

Thus, management of development of territories has strategic planning character. Contradictory tendencies of process of a modern urbanization and the developed adverse ecological situation in megalopolises demands association of narrowly professional approaches to the solution of the numerous problems connected with the theory and practice of management of the city and safety of the urban environment. In particular, it can be caused by development of the market relations, difficult proceeding administrative reforms and deterioration of demographic situation. High-quality and effective development of territories isn't possible without understanding of their real state that does a monitoring role defining in this process. Besides, a necessary condition of planning of development of urban areas is respect for the principles of formation of the compatible with the biosphere safe and comfortable urban environment.

The created GIS can be used as help system about geochemical state of environment and health of the population in various parts of the city as the tool of the mathematical analysis of data of imitating modeling and forecasting of emergence of zones of environmental risks under the influence of eco-geochemical factors of the environment, so and as the tool for management of urban areas.

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The use of GIS electronic maps offers broad prospects for the rapid construction of models of the state of the urban environment, reflecting not only the static, but also the dynamics of phenomena by comparing different objects in the space-time aspect, which is especially important for environmental assessments.

In addressing the sustainable development of the city, the role of monitoring is difficult to overestimate. It is the analysis of monitoring data that gives a qualitative and quantitative picture of the current state of the urban environment. This will allow, in particular: to carry out preventive effects (or correction) by establishing deviations of current parameters from specified ones (ensuring sustainable development of territories); to determine the points of contact of one sphere of life of the city with another; assess the correlation of the dynamics of changes in some parameters of the function of the city from others, etc.

Current views on monitoring socio-economic development are different. However, despite their diversity, the main goal of the sustainable development of the territories is to provide the governing bodies with complete, reliable and relevant information.

(Received January 2022, accepted February 2022)

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