Monitoring of Objects Urban Gardening. Information System «Quality Management of Urban Sites Greening»

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Abstract. Monitoring of landscaping objects is a system of operational control over the violation of their stability, damage by pests, damage to diseases and other natural and anthropogenic factors of the environment, as well as a system for tracking the dynamics of these processes, which provides early detection of the unfavorable state of plantings, assessment and forecast of the development of ecologically unfavorable situations, obtaining reliable information about undesirable changes in nature under the influence of anthropogenic impact and materials for substantiating and making timely decisions. The article presents an algorithm for the formation of the information and analytical system "Quality management of urban landscaping objects". At the first stage in the monitoring process, the tasks of observation and data acquisition are solved, such as: substantiation of the number and location of permanent observation sites in the city plan, which should be maximally represented in all zones of the city and in all categories of green areas; thematic mapping; creation of an information model. Approbation of the formation of a passport for the planting object of these techniques is presented on the example of a park in Krasnoyarsk.

1. Introduction
The main direction of modern urban planning activities is to ensure favorable living conditions for citizens, taking into account the ecological and natural characteristics of urban areas [1]. The process of urban development in general and the creation of urban landscaping facilities requires long-term and operational decisions of an administrative, managerial, investment, architectural, planning, design, construction, technological, operational nature [2]. All this dictates the need for the obligatory development of ecological sections and the preparation of an information base, including cartographic materials, as the basis for managing the city's greening system. The developed materials should determine the parameters and criteria for assessing the implementation of environmental impact assessments of projects and environmental audits of territories. The relevance of creating an information and analytical system "Quality management of urban greeniing objects" is determined by: a decrease in the comfort of the urban environment, the lack of regional scientifically based concepts in the field of landscape gardening; fragmentation of existing information.
The purpose of creating an information and analytical system is to accumulate, analyze and present information on the state of the city's green fund for making decisions aimed at optimizing the urban environment, reducing the consequences of negative environmental impacts, planning environmental, urban planning, medical and other activities. IAS "Quality management of urban greening objects" consists of two sequential processes: I - Monitoring the state of urban greening objects; II - Quality management of urban greening system. At the first stage in the monitoring process, the tasks of observation and data acquisition are solved, such as: substantiation of the number and location of permanent observation sites in the city plan, which should be maximally represented in all zones of the city and in all categories of green areas; formation of a passport for each landscaping object; thematic mapping; creation of an information model.

Monitoring of the environment is a regular observation of natural and anthropogenic environments carried out according to a given program, which makes it possible to identify the level of their changes occurring under the influence of anthropogenic activity. Environmental monitoring is an information system for observing, assessing and forecasting changes in the state of the environment, created with the aim of highlighting the anthropogenic component of these changes against the background of natural processes. The main goal of environmental monitoring is to provide a management system for environmental protection and environmental safety, based on timely and reliable information. Monitoring results are: assessment of the state and functional integrity of ecosystems and human habitat; the reasons for the change in these indicators and the assessment of the consequences of these changes, as well as the determination of corrective measures in cases where the target indicators of environmental conditions are not achieved; preconditions for determining measures to correct emerging negative situations before damage is caused. The monitoring system is made up of the main procedures: selection (definition) of the object of observation; inspection of the object of observation; drawing up an information model of the object of observation; measurement planning; assessment of the state of the object of observation and identification of its information model; predicting changes in the state of the object of observation; presentation of information in a user-friendly form and bringing it to the consumer.

2. Objects and methods of research
Monitoring of landscaping objects is a system of operational control over the violation of their stability, damage by pests, damage to diseases and other natural and anthropogenic factors of the environment, as well as a system for tracking the dynamics of these processes, which provides early detection of the unfavorable state of plantings, assessment and forecast of the development of ecologically unfavorable situations, obtaining reliable information about undesirable changes in nature under the influence of anthropogenic impact and materials for justifying and adopting timely legislative, managerial, economic, technological, and other decisions, choosing the optimal options for the strategy and tactics of protective and environmental protection measures and ensuring rational and ecologically based activities of the urban economy system with the use of ecological and economic criteria and taking into account the environment-forming functions and the purpose of the plantings [3].

To carry out field surveys on the basis of generally accepted and author's methods in order to form a passport of a landscaping object and build an interactive layout, survey sheets and reference documentation have been developed. The passport of the object includes such sections as: situational plan, balance of the object territory, quantitative data on greenery and qualitative characteristics of the state of vegetation and the road network, data on recreational load, calculations of the level of gas pollution and noise load from traffic flows on adjacent highways.

Each plant at the facility has a unique identification number, the abbreviation of which is encrypted: the name of the research object, the type of woody plant, the serial number at the facility, the type of plant grouping. Biometric parameters of woody plants: the height of the tree, the trunk, up to the maximum diameter of the crown, the diameters of the trunk and the crown of the trunk are determined using a specially designed scale bar based on photographs that are processed in the Compass 3D v 10c program. The scale device and method for measuring the biometric parameters of woody plants are
protected by patents [4, 5]. The sanitary-hygienic and aesthetic condition of woody plants (trees and shrubs) is determined according to the methods developed during the work on the inventory of green spaces. Phytosaturation of plant crowns is determined using photographic materials in the program "Fractal analysis of phytosaturation of tree crowns" [6]. Soil and spatial conditions make it possible to determine the reasons for the change in the state of woody plants, the conditions for the placement of plants are entered in the list: on the lawn, black fallow, holes, strip and their width. To establish the degree of biodiversity, the type of plant groupings is determined: single-row uncut hedge, single-row hedge, alley, bouquet planting, group of trees or shrubs, massif, row planting of trees or shrubs, row planting of vines, specimen.

The type of lawn is determined (decorative: parterre, ordinary, meadow, Moorish; sports, special purpose), the sanitary-hygienic and aesthetic state is determined according to the methods developed during the work on the inventory of green spaces. The type of flower beds is determined (flower beds, ridges, borders, flower-decorative devices, vertical gardening). The aesthetic state of flower beds is determined according to the methodology developed during the inventory of green spaces, is ranked in accordance with the scale of decorativeness and the occupied area, and the level of agro technical care is determined. When analyzing the road network, the type and area of coverage (hard, soft, combined), tracks and sites on the object are determined. The calculation of the recreational load is carried out for different groups of the population (children, students; adults; pensioners) and for various uses of the territory - for recreation or transit traffic at different times of the day and days of the week. The number and technical and aesthetic condition of benches, urns, garden sculptures, flowerpots, fountains, bridges, playgrounds, lighting and decorative elements, etc. are determined. An important section of the environmental analysis is the assessment of road traffic impact (calculation of man-made and noise loads). The number of cars on all sides of the landscaping object is determined. The collection of material on the congestion of adjacent streets by vehicles is carried out at 7, 13, 21 hours. The intensity of movement of vehicles of different types is determined: cars, trucks, buses, trolleybuses, trams. At each calculated point, the technical characteristics of the street are assessed: street type (city street with one-sided buildings, embankments, overpasses, viaducts, high embankments, residential streets with one-sided buildings, notched roads, main streets and roads with multi-storey buildings on both sides, transport tunnels), the slope of the route and the meteorological parameters of the terrain: wind speed, air humidity. The data obtained make it possible to estimate the traffic load on the street and calculate the man-made (gas content) and noise loads.

The noise level is calculated by the graph analytical method [2] depending on the speed and quantity of freight and public transport in the flow, the flow density and its speed. Based on the results of the survey, an ecological passport is drawn up.

3. Results of research

The data obtained according to the above method allowed us to develop an ecological passport of the Yumnatov park in Krasnoyarsk. The materials obtained showed that sound loads exceed the noise discomfort by more than 20 dB, the level of gas pollution is higher than the standard indicators by 8 MPC, the vital state of plants at the facility is only 63%, sanitary and hygienic and aesthetic parameters of the state of woody plants have been established. Thus, the data obtained will make it possible to determine the level of quality of this object, identify indicators that do not meet regulatory requirements and outline planning, technological and environmental measures to improve the level of its quality in terms of environmental and aesthetic parameters.

The result of this stage of monitoring of landscaping objects is the provision of timely and reliable information to both institutions involved in urban planning and environmental activities and interested residents of the city.

4. Conclusion

An important stage in the "green" monitoring should be the assessment of territories, their suitability and feasibility for landscaping, as well as the characteristics of existing facilities and assessment of their
compliance with the requirements that apply to the plantings of this functional category. An important aspect of monitoring is the development of technologies for the exploitation of plant communities at various stages of growth and development, for maintaining their stability, for the restoration and reconstruction of landscaping facilities in the city.

5. References
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