Gardening of the Urbanized Territories as a Factor of Implementation of the Concept of Their Sustainable Development

N V Korosteleva1, M V Korosteleva2
1Volgograd State Technical University Institute of Architecture and Construction 1 Akademicheskaya Street, 400074, Volgograd, Russia
2Volgograd Institute of Management, Branch of the Russian Presidential Academy of National Economy and Public Administration, 8 Gagarin Street, 400131, Volgograd, Russia

E-mail: korostelevanv@mail.ru

Abstract. In article the value of activity of municipal units is proved in the sphere of gardening of the urbanized territories as one of factors of implementation of the concept of their sustainable development. Importance of inclusion in the list of municipal powers of question of the organization of gardening of the territory of city districts for formation of the favorable urban environment and maintaining of its stable safe state is proved. The conclusion is drawn that plants actually are the main and single alternative to an anthropogenic landscape of a surrounding medium which is actively formed by the modern architecture. In this regard authors carried out the analysis of green fund in planning structure of the cities and regulatory requirements to its placement. On the basis of the carried-out analysis the system of indicators of environmental efficiency of activity of the municipal units in the sphere of city greening corresponding to signs of availability, measurability, compliance, sufficiency, complexity, reliability and comparability is offered.

1. Introduction
In the Strategy of environmental safety of the Russian Federation until 2025 is noted that the state of environment in the territory of the Russian Federation where the majority of the population of the country and production capacities are concentrated is estimated as ecologically unsuccessful. The special attention is required by a surrounding medium in the cities because of essential negative impact on it of the industrial facilities, transport, objects of power engineering and capital construction. At the same time the cities offer unique opportunities for the inhabitants for increase in income and providing broader access to education, to health and social services. These positive aspects of city life continue to induce people to moving and life in the city. In many respects for this reason select such self-contained term as «sustainable urban development» [1]. At the same time it is fairly noted that not only the economical geographical location, but also the urban environment act as the major factors significantly influencing social and economic development of the city [2]. And decrease in ecological and recreational value of the urbanized territory certainly and demonstrates decrease in its stability enough. Greening urbanized territories seems to be a significant factor in the implementation of the concept of their sustainable development. Proceeding from it, in the first part of
the present article the role and value of ecological factors during implementation of the concept of sustainable city development will be investigated; the second part of this research will be devoted to identification of value of city greening as factor of ensuring stability of the urbanized territory; in a third the question of measurability of activities of municipalities for formation and maintaining of green fund of the urbanized territories will be considered (on the example of Russia).

2. Ecological factors during implementation of the concept of sustainable city development

In published in 1987 the United Nations World Commission on Environment and Development the report «Our Common Future» noted that «sustainable development is such development at which requirements of the present are satisfied, but the ability of future generations to satisfy the requirements isn't threatened» [3]. The ecological component of stability of development acts as one of fundamental bases of the concept of sustainable development (along with economic and social) [4]. But, despite recognition of a significance of an ecological component of stability of development, a condition of the environment, especially in the urbanized territories: densely populated and industrially mastered, continues to remain critical. In Russia the urbanized territories represent, first of all, such municipal units as city districts. Also it is possible to carry city settlements and intracity areas formed within certain city districts to them. In the conditions of the huge territory of Russia, various climatic conditions, natural and resource potential, various level of anthropogenic loading and an ecological situation even in municipal units of one region ensuring sustainable development has to be solved as the complex task demanding interaction of the federal center, territorial subjects of the Russian Federation and local governments. Owing to this fact for the urbanized municipal units within ensuring stability of development it is necessary to adhere to so-called cluster approach to sustainable development [5]. It is based on recognition that sustainable development is possible to realize in practice by means of creation of so-called «clusters». More and more authors agree in opinion that the municipality can and has to act as such peculiar cluster [6-9].

The state of environment in the cities is defined by various factors caused not only natural processes, but also influence of the person who, creating itself on the basis of the environment not natural conditions of the existence, in many respects destroys a natural basis [10]. In spite of the fact that the purposes of upgrading of the surrounding urban environment are set at the state level, the cities with an adverse surrounding medium don't become less. It also caused an important role of ecological factors during implementation of the concept of sustainable city development.

The Russian Federation recognized need of serial transition to sustainable development. In 1996 the President of Russia issued the Decree «About the Concept of Transition of the Russian Federation to Sustainable Development». Ensuring sustainable development is defined as one of the principles of environmental protection in the Federal law of January 10, 2002 No. 7-FZ «About environmental protection». The term «sustainable development» is mentioned in the Russian legislation in relation to territories. The town-planning code of the Russian Federation defines it as «providing at exercise of town-planning activity of safety and the favorable conditions for activity of the person, restriction of negative impact of economic and other activity for a surrounding medium and ensuring protection and rational use of natural resources for the benefit of the today's and future generations».

3. Value of gardening as factor of ensuring stability of the urbanized territory

3.1. Green fund in planning structure of the cities: types and regulatory requirements to placement

The green fund of the city is a constituent of its natural complex. In Article 61 of the Federal law «About environmental protection» the green fund of city settlements is defined as set of territories in which forest and other plantings, including in green zones, the green space, and other planted trees and shrubs territories in borders of these settlements are located. It includes the planted trees and shrubs and forest territories of all categories and types forming the system of city greening within city line and also the planted trees and shrubs territories, forest territories beyond its limits if these territories
are transferred to the jurisdiction of local city government for ecological protection and the organization of a recreation of urban population.

The concept «green area» is enshrined in the Set of rules «Town planning. Planning and building of city and rural settlements» [11].

In the Order of the State Committee for Construction of the Russian Federation of 15.12.1999 No. 153 «About the approval of Rules of creation, protection and content of green plantings in the cities of the Russian Federation» are allocated three main categories of the planted trees and shrubs territories, each of which has the features in relation to civil circulation (the relations to property, sale, rent), to the modes of use and ways of managing:
- green areas for common use;
- green areas for limited use. These are the territories within inhabited or industrial zones calculated on use of certain groups of the population;
- green areas for special purposes: sanitary protection, water protection, protective and meliorative zones, cemeteries, plantings along automobile and the railroads, the nurseries, flower and hothouse farms, territories falling under operation of the Federal law «About Especially Protected Areas». Calculation of need for the planted trees and shrubs territories of this category is conducted taking into account their functional purpose [12].

Their education and use are made according to requirements of the normative documents defining an order of projection and operation of objects and their sanitary protection zones.

The current version of the Federal law «About environmental protection» establishes that for realization of the right of citizens to the favorable surrounding medium forest-park green belts can be created. Main functions of green belts consist formation in the cities of the favorable surrounding medium, improvement of an ecological situation of [13].

Sanitary and hygienic, improving and other useful functions in the cities are performed by the city forests referred by the Forest code of the Russian Federation [14] to category protective.

3.2. Influence of green zones on a condition of the urban environment

Green plantings are an integral part of town-planning structure of the city and the most important element of its ecological framework. They enter the life support system of the urbanized territories as the major sredoobrazuyushchy and sredozashchitny factor providing comfort and quality of the habitat of the person and as an obligatory and important element of a city landscape. Vegetation in the city is the important social stabilizing factor, reducing conflictness of the urban environment, and contributes to sustainable development of the settlement.

In the conditions of ecological trouble vegetable potential is one of effective factors of improvement of the habitat of the person. Green plantings perform sanitary and hygienic and psychophysiological functions: produce oxygen, assimilate carbonic acid, besiege dust, gaseous chemicals, microorganisms, radionuclides, soften climatic parameters, reduce intensity of a solar infrared radiation. According to long-term researches it is established that 1 hectare of plantings within an hour absorbs on average 8 kg of a carbon dioxide, reduces concentration of harmful air contaminants in the territory: sulfur dioxide from 0.27 to 0.08 mg/m3 (by 3.4 times), a hydrogen sulfide from 0.026 to 0.007 mg/m3 (by 3.7 times). The group of trees detains 21-86% of dust and for 19-44% reduces pollution of the air environment microorganisms. In one warm day of 1 hectare of the wood absorbs 280 kg of a carbon dioxide from air and allocates at the same time 220 kg of oxygen. Annually the same hectare of the wood detains on the leaves of 50-70 t. dust [15].

Green plantings favorably influence the noise mode of the territory: their arrangement between a source of noise and the inhabited environment reduces noise level on average by 5-25% (it differs depending on the used range of plants: single plants can reduce noise level by 4-7 dBA of [16]; landings of deciduous bushes and trees with dense krone 30-40 m wide – on a 17-23db. According to series of observations, upper branches of tree absorb 26% of the sound energy falling on them, reflect and disseminate 74% of [17]. Noise which source are city trams decreases by 14 tones of [18].
It is also possible to use green plantings as protection against negative impact of wind, so, according to the conducted researches, it was established that wind-shelter plantings can lower wind speed by 50-80% of [19]. Along with regulation of qualitative characteristics of the environment an important role decorative and planning and recreational functions of green plantings also influence. City greening is means of individualization and decoration of building that it is especially important for improvement of psychological state of the population.

4. The system of assessment of activities of municipalities for formation and maintaining of green fund of the urbanized territories

Need of tool assessment of activities of municipalities for ensuring sustainable development of territories demands formation of the corresponding indicators and the quantitative indices. In Russia the realization by bodies of the public power of the powers assigned to them is enabled by means of assessment of effectiveness of their activity. The indicators approved by the Decree of the Russian President of April 28, 2008 № 607 are applied to municipal units. At the level of local government activity of bodies of city districts and municipal districts is subject to such assessment, and as indexes for assessment of its effectiveness are used, generally economic and social criteria. Unfortunately, the mention of environmental problems and representation of the corresponding indicators in a nem is minimum. Considering questions of assessment of activities of municipalities for formation and maintaining of green zones in the cities, it should be noted that the Order of the State Committee for Construction of the Russian Federation of 15.12.1999 № 153 regulated the system of assessment of a condition of the planted trees and shrubs territories.

Assessment of a condition of the planted trees and shrubs territories is carried out or specialized institutions (if it is about public green plantings), or the organizations under which authority these territories, with the subsequent expert opinion on materials of inspection by qualified specialists are. At the same time the obligation for ensuring safety of green plantings is assigned to land users. Owing to this fact it is impossible to estimate only on their basis activities of local governments for formation and maintaining of green zones in the cities.

The federal legislation, fixing powers of local governments, to some extent allows to allocate a set of indicators which give the chance to estimate effectiveness of activities of local governments for providing an ecological component of sustainable development of the municipal unit. For definition and introduction of indicators of environmental efficiency it is possible to offer a small amount of the indicators based on the questions of local value assigned to municipal units.

Examples of indicators of effectiveness of activity of local bodies for formation and maintaining of green zones
- The total area of the planted trees and shrubs territories of general use - parks, forest parks, gardens, squares, boulevards, etc. (sq.m/persons)
- Municipal woods (area and % of the total area of the land plots which are owned by the municipal unit)
- Existence of especially protected natural territories of local value (the area and % of the total area of the land plots which are owned by the municipal unit)
- Recreational zones in rules of land use and building (the area and % of the total area of the land plots which are owned by the municipal unit)
- Water discharge on watering of green plantings (m3)
- Share of the expenses directed to gardening in the budget of the municipal unit (%)
- Time of availability of city and regional parks on public transport (without transport latency period) (min.)
- Sanitary protection zones of production and other objects as a part of territorial zones in which these objects are placed (the area and % of the total area of territorial zones in which these objects are placed)
- The area of gardening of sanitary protection zones of production and other objects (% to zone width)
- The area of gardening of sanitary protection zones of objects of transport, communication, utilities (% to the area of a zone)
- The sizes of the planted trees and shrubs public territories of resort areas (m² on one place in sanatorium-health-resort and improving institutions)

Considering that in Russia several types of the municipal units differing on the legal status are normatively allocated, these indicators can be both common for all, and specific to separate types of municipalities. It should be noted that classification of municipal units for assessment of information of rather ecological indexes can and has to be carried out not only proceeding from their type. A separate set of criteria can be developed for the municipal units located in borders of reserves and other especially protected natural territories [20, 21]. As such criterion, in particular, the quantitative index of the elicited facts of placement of capital construction projects on the land plot in OOPT borders (for example, national park), its functional or security zones which mode of special protection doesn't allow placement of such objects can act. In the largest, large and big cities, along with parks of city and regional value, it is necessary to provide specialized - children's, sports, exhibition, zoological and other parks, botanical gardens. Their existence and the size can be used as the indicator of ecological sustainability of the megalopolis too.

The indicators used for measurement of a contribution of local governments to ensuring sustainable development of the municipal unit have to allow to estimate this contribution, that is to be based on municipal powers and to consider consequences of the decisions made at the municipal level.

5. Conclusion

As a result of the conducted research of activity of municipal units in the sphere of gardening of the urbanized territories, it is possible to draw a natural conclusion that she acts as one of factors of implementation of the concept of their sustainable development. In work importance of inclusion in municipal powers of questions of the organization of improvement of the territory of the city district, including the organization of city greening is proved. The conclusion is drawn that plants actually are the main and single alternative to an anthropogenic landscape of a surrounding medium which is actively formed by the modern architecture. In this regard authors carried out the analysis of green fund in planning structure of the cities and regulatory requirements to its placement

For assessment of effectiveness and effectiveness of activities of local governments for realization of the powers assigned to them the system of indicators of assessment of environmental efficiency of the municipal unit is offered. These indicators allow to estimate a contribution of local bodies to ensuring ecological sustainability of municipality. In work a basic set of indicators for the municipal unit is offered. At the same time, it is emphasized that in a type of a variety of types of municipal units and, as a result, the questions of local value and also differences in target audience (a circle of interested parties) assigned to them to which gaged indicators have to be useful to a decision making in the concrete municipal unit this set has to consider the designated features.

References
[1] Shubenkov M V 2018 Sustainable development Challenges of the present Sustainable development International Scientific and Practical Conference (Moscow) pp 8-11
[2] Lappo G M 1997 Geography of cities (Moscow) p 480
[3] The Report of the World Commission on Environment and Development "Our Common Future" Official Records of the General Assembly forty-second Session supplement 25 (A/42/25) Retrieved from http://www.channelingreality.com/documents/brundtland_searchable.pdf
[4] IUCN World Declaration on the Environmental Rule of Law 1st world Congress on environmental law April 2016 (Rio de Janeiro, Brazil) Retrieved from https://www.iucn.org/sites/dev/files/content/documents/worlddecnvirlawmarch2017.russian.pdf
[5] Porter M E 1990 The competitive advantage of nations Harvard business review 68(2) pp 73-93
[6] Tetior A N 2013 Ecology of the urban environment (Moscow) p 352
[7] Davydova N S and Timofeev O N 2000 Sustainable development of the city. Questions of
development of strategy Municipal economy 4 pp 18-23
[8] Barsukov I E 2007 Innovative mechanisms of ensuring sustainable development of the large
city (on the example of Moscow) Extended abstract of candidate's thesis (Moscow) p 25
[9] Shevchuk L T 2013 Problems and prospects of development of small towns of the Carpathian
region Regional economy 1 pp 211-13
[10] Lisina N L 2018 Research of problems of legal environmental protection in cities:
methodological aspect Environmental law 4 pp 26-31
[11] Order of the Ministry of Construction and Housing and Communal Services of the Russian
Federation of 30.12.2016 N 1034/ pr "On approval of the building rules 42.13330» Building
regulations 2.07.01-89* Urban planning. Planning and development of urban and rural
settlements" Russian Newspaper 28
[12] Zhatikova M S and Korosteleva N V 2010 Town planning problems of Sarpinsky Island in the
Kirovsky District of the city of Volgograd The scientific potential of young scientists for the
innovative development of the building complex of the Lower Volga region: Int. Scientific and
Practical Conf. (Volgograd) pp 241-2
[13] Korosteleva M V and Korosteleva N V 2018 Forest-park green belts as environment-forming
element of the urbanized territories IOP Conf. Series: Materials Science and Engineering 451
012158
[14] The Forest Code of the Russian Federation of December 04, 2006 N 200-FZ The Collection of
the legislation of the Russian Federation 50 Art 5278
[15] Korosteleva N V and Bikmukhamedova R R 2016 The use of floodplain areas of small rivers
for recreational purposes on the example of the city of Volgograd Energy efficiency, resource
saving and environmental management in urban economy and construction: economics and
management: III Int. Scientific and Technical Conf. (Volgograd: Volgograd State University of
Architecture and Civil Engineering) pp 122-9
[16] Korosteleva N V 2003 Noise pollution problems of the large cities, actions for its decrease
Problem in construction, engineering support, improvement and ecology: Int, Scientific and
Practical Conf.-seminar (Morocco) pp 56-8
[17] Korosteleva N V 2008 Assessment of the noise regime of the Volgograd industrial areas and the
development of recommendations for creating optimal living conditions Annual scientific-
practical conf. of the faculty and students Volgograd State University of Architecture and Civil
Engineering 1 pp 95-9
[18] Rukovodstvo po otsenke i regulirovaniyu vetrovogo rezhiba zhiloy zastroyki Guidance on the
assessment and regulation of the wind regime of residential development Central Research
Institute of Urban Planning Gosgrazhdanstroya (Moscow: TSNIP gradostroitel'stva Gosgrazhdanstroya) p 60
[19] Korosteleva N V 2017 Factors affecting the noise mode of highways: the degree of negative
impact and ways to minimize it Bulletin of the Volgograd State University of Architecture and
Civil Engineering. Series: Building and Architecture 49(68) pp 178-88
[20] The federal law of the Russian Federation of March 14, 1995 N 33-FZ "About especially pro-
tected natural territories" Russian Newspaper 57
[21] Ovcharuk V, Solovev D B 2019 Features of Registration of Acoustic Signals in Multichannel
Acoustic-Emission Systems 2019 International Science and Technology Conference
"EastConf", International Conference on. [Online]. Available: http://dx.doi.org/10.1109/EastConf.2019.8725383