

Placement, construction and operation of local drainage systems on land plots provided for individual housing construction

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Abstract. The article highlights the problems of improving technical and legal regulation in the field of placement, construction and operation of decentralized drainage systems on land plots provided for individual housing construction. The authors point out the need to improve regulation in the field of organization and use of autonomous wastewater disposal systems within the framework of two main directions – organizational and technical and legal. As part of the organizational direction of problem solving, the authors point out the need to ensure the coordinated development of settlements by ensuring the design and construction of new central sewer networks and reconstruction of existing ones. Improvement in the technical and legal sphere is aimed at optimizing technical and legal norms, in terms of amendments to the current legislation and modernization of technical and legal norms - standards (sets of rules).

1 Introduction

Human activity constantly causes irreparable damage to the environment, and despite the high rates of scientific and technological progress, society cannot avoid a negative impact on nature. In the public interest, the State establishes mandatory environmental, sanitary and hygienic and technical requirements that must be observed and fulfilled by all person's subject to these standards [1].

Analysis of the current legislation has shown that there are no prohibitions in it and the obligation of subjects to place decentralized wastewater disposal systems is not established, therefore such systems can be placed on agricultural lands, on the lands of settlements, as well as on lands of other categories. It should be noted that local sewage treatment plants are most common on the lands of settlements and agricultural lands [2, 3].

Depending on the purposes of the use of the land, decentralized drainage systems can be placed temporarily, that is, for a certain period, when, for example, capital facilities are being

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built (apartment buildings, shopping complexes, etc.), or such structures are used permanently, for example, for individual use in territories that are removed from the central sewerage. The choice of a local sewage treatment plant (septic tank or biological treatment plant) used on land plots where there is no central drainage system is influenced by the following factors: the speed of effluent processing (purification); the volume of effluents that can be received by a local treatment facility; operating conditions of a local treatment facility (climatic and hydrogeological); the service life of a local treatment facility, which must correspond to the service life of an individual residential building; operating costs for a local treatment facility, which the owner of the land plot is ready to bear [4-6].

Environmental, technical and economic requirements should guide the selection of a local treatment facility.

To date, the main representatives of local wastewater treatment plants used for domestic wastewater treatment and produced by domestic industry are the following models: "UNILOS Astra", "UNILOS CYCLONE", "Tver", "Eurolos", "Biodeka", "Ecogrand", "Bioseptic", "Septic tank", "Eurobion", "Post-cleaning", "Termite", "Bars", "Ergobox", "Altabio", "Leader", "Kolovesi", LAMOS "Elephant", "Neptune", BIO, etc. In addition to models produced by domestic industry, models of local treatment facilities produced by foreign industry are also used: FAST® (Fixed Activated Sludge Treatment – Stationary Activated Wastewater Treatment, USA), ORM (Italy), Remosa (Spain), Vavin (Denmark), Topas (Czech Republic) and others.

Along with septic tanks and biological treatment stations, cesspools are used as an element of autonomous sewerage – a reinforced concrete, steel or stone container buried in the ground and serving for the accumulation and partial processing of wastewater. This element of sewerage is obsolete, but nevertheless still used in decentralized drainage systems: up to 22% on land for individual housing construction and up to 98% on land provided for gardening and gardening [7].

It is unacceptable to use cesspools as local sewage treatment plants, since these structures have a different mechanism of action, namely: cesspools can only be used as accumulators (accumulators) of household effluents (solid waste and (or) liquid products). In addition, the mandatory disposal of waste from the cesspool is important in the operation of such an element of a decentralized wastewater disposal system. Septic tanks also serve for the processing of bio-waste, where the processed products can meet sanitary requirements and can be used on land plots as water for irrigation, and sediment as fertilizer [8-9].

The reform of certain branches of the current legislation is necessary to optimize public relations, eliminate gaps and contradictions in regulatory legal acts. Every year, significant changes are made to the environmental, sanitary and technical regulation legislation, which are aimed at ensuring the safety of technical systems, preserving and rational use of components of the natural environment, improving the quality of the environment as an important environmental factor affecting human health.

Unfortunately, such changes do not affect the organization and use of decentralized wastewater disposal systems, although problems in this area have long needed legal regulation, as the number of land plots that are provided for individual housing construction, personal subsidiary farming, gardening is constantly increasing [10-11].

The purpose of the study: to improve regulation in the field of the use of local sewage treatment plants intended for the collection and purification of household effluents that are collected from land provided for individual housing construction, personal subsidiary farming and gardening.

2 Subject, tasks and methods

The subject of the study was the elements of a decentralized wastewater disposal system necessary for the collection and purification of household wastewater collected from land intended for individual housing construction, personal subsidiary farming and gardening.

The task statement is to improve regulation in the field of the use of local sewage treatment plants intended for the collection and purification of household effluents that are collected from land provided for individual housing construction, personal subsidiary farming and gardening.

Research methods. In the process of writing the article, general scientific and private scientific methods of scientific cognition were used, in particular, methods of analysis, synthesis, comparison and functional method.

3 Results and discussion

Many issues related to the design, construction and operation of autonomous wastewater disposal systems are not regulated in the current legislation, there are problems in the field of technical and legal regulation. The lack of technical standards for the construction and operation of autonomous wastewater disposal systems creates problems in the legal regulation of public relations in the field of decentralized wastewater disposal. Such problems, in particular, should include non-compliance with the requirements for the use and disposal of the liquid component obtained as a result of processing by local sewage treatment plants. Such rules are contained only in the recommendations that are given in the passports for these treatment facilities, while there are no regulations (norms and rules) approving such requirements. In this regard, there is a frequent violation of recommendations among users of local sewage treatment plants, and the absence of approved technical and legal norms leads to a violation of sanitary, epidemiological and environmental standards, excludes the possibility of effective technical and legal regulation in the field of organization of decentralized wastewater disposal systems.

Due to the fact that the Russian legislation on the use of local sewage treatment plants in low-rise construction is fragmentary, disputes arise between the owners of adjacent land plots about the legality of using local biological waste treatment systems. As a rule, the owners of neighboring land plots file lawsuits with demands to dismantle the septic tank. In support of their claims, they point out that the septic tank pollutes the environment and violates their constitutional rights, since the rules for location are not followed, the distance to houses and water supply facilities is not maintained, the rules for installing the structure are not followed, and there is also no proper care for the septic tank.

The fragmentary nature of technical standards for the construction and operation of decentralized wastewater disposal systems is primarily due to the lack of relevant research in this area necessary for the preparation and approval of regulations for the use of septic tanks and biological treatment plants.

Improvement of regulation in the field of organization and use of local wastewater disposal systems should be carried out within two directions – organizational and technical and legal.

As part of the organizational direction of problem solving, it is necessary to ensure the coordinated development of settlements by ensuring the design and construction of new central sewer networks and reconstruction of existing ones, which will reduce the number of local treatment facilities on land and prevent pollution of reservoirs and aquifers.

In the technical and legal sphere, the main direction in solving the problems of ensuring the safety of local treatment facilities is the development of requirements for the design,

construction and operation of decentralized wastewater disposal systems and their consolidation in regulatory legal acts of the federal level.

There is a great need to develop a special regulatory legal act that would regulate all issues related to the design, construction and operation of decentralized wastewater disposal systems, since the existing regulatory legal acts and regulatory documents do not provide proper legal regulation in this area.

In addition, the necessary changes could be made to the Federal Law "On Water Supply and Sanitation" and devote several articles to the settlement of issues of construction and operation of decentralized biological waste treatment systems, since there are separate mentions of such facilities in this regulatory legal act, for example, the definition of "local treatment facility" is fixed in Article 2.

It should be noted that at the moment attempts are being made to amend federal legislation regarding the settlement of some issues in the use of non-centralized wastewater disposal system. So, in particular, a group of deputies of the State Duma came up with a legislative initiative, who proposed the following amendments to the legislation on water supply and sanitation:

1) to consolidate the concept of "non-centralized drainage system" and regulate public relations related to its use;

As the developers of such a bill pointed out, at the moment there is a need to eliminate problems that are associated with the fact that "subscriber facilities do not have a connection (technological connection) to a centralized wastewater disposal system, but discharge wastewater into cesspools, septic tanks and other similar devices (structures) ... there is a risk of environmental pollution or violation legislation on the sanitary and epidemiological welfare of the population".

2) the concept of "liquid household waste" is replaced in the draft law by the concept of "wastewater discharged using a non-centralized wastewater disposal system";

3) the need to conclude contracts between subscribers who carry out wastewater disposal using such a system and a guaranteeing organization or other organization that has a wastewater disposal agreement with a guaranteeing organization and carries out the transportation of wastewater and its discharge into a centralized wastewater disposal system;

4) regulation of wastewater tariffs for the use of a decentralized wastewater disposal system.

5) include wastewater disposal (both in water bodies and in structures intended for receiving wastewater, for example, storage ponds, evaporation ponds, etc.) as part of the wastewater disposal process, as well as wastewater treatment using centralized or non-centralized wastewater disposal facilities (when carrying out this type of activity). At the same time, the Draft Law provides that various organizations can carry out various components of the wastewater disposal process using not the entire system as a whole, but its individual objects.

6) rain, thawed, infiltration, irrigation, drainage waters are included in the composition of waters received from subscribers in centralized drainage systems, regardless of whether the centralized drainage system is designed to receive such waters. At the same time, it is taken into account that wastewater can enter the centralized wastewater disposal system not only from subscribers, but also in other ways, for example, from public areas (squares, streets, parks, squares, etc.), with precipitation, from the soil.

7) the issues related to clarifying the consequences of violation by the subscriber of the established requirements for the composition and properties of wastewater discharged to centralized wastewater disposal systems are specified.

The draft law also contains other legislative amendments to clarify the issues of legal regulation of public relations in the use of local wastewater disposal systems.

The bill in question was considered in the first reading by deputies of the State Duma in 2020, and in 2021 the bill was withdrawn from consideration due to the withdrawal of the subject of the right of legislative initiative.

It should be noted that during the consideration of this bill, there were both positive and negative conclusions. Legislative assemblies of many subjects, in particular Yamalo-Nenets Autonomous Okrug, Amur Region, Kabardino-Balkarian Republic, Astrakhan Region, Karachay-Cherkess Republic supported the bill. Separate committees of the State Duma made comments and pointed out the need to finalize the submitted draft law.

In some regions, as well as on the territory of some municipalities, there are requirements for the construction and operation of local wastewater disposal systems. Borrowing the experience of developing and applying such regulatory legal acts would ensure effective law-making at the federal level in the shortest possible time. The adoption of the federal regulatory legal act ensured for all subjects of the Russian Federation the mandatory application of standards regarding the safe operation of local treatment facilities. In this regard, it is necessary to include articles in the Federal Law "On Water Supply and Sanitation" that would contain general provisions on local wastewater disposal systems, and in the specifying by-law rules for the construction and operation of a local treatment facility.

Therefore, in the regulatory legal act it is necessary:

- to consolidate the concept of a local sewage treatment plant and or a decentralized wastewater disposal system;
- determine which structures will be classified as local (decentralized);
- establish the basic requirements for their safe operation;
- to form a list of measures that must be carried out by the owner of such a facility to maintain sanitary and environmental safety, in particular (obtaining permission to put the facility into operation, monitoring the safe operation of the facility (self-monitoring), its mandatory registration, etc.);
- to consolidate the mechanism of state and municipal management, including the approval of the project and the issuance of authorized permit authorities, checking the functioning of a local sewage treatment plant, maintaining regional or municipal registers;
- to determine the types of legal liability for violation of safety requirements in the field of operation of local wastewater disposal systems.

It should be noted that in order to develop all the above-mentioned provisions of regulatory regulation, it is necessary for specialized organizations or research institutes to conduct appropriate technical, environmental and biomedical studies necessary for scientific confirmation of the requirements for the safe operation of a local treatment facility.

Since a local sewage treatment plant is a complex system, the specifics of its design, construction and operation, as well as decommissioning, depending on its type, must be fixed in the code of rules of SR 32.13330.2018. A set of rules. Sewage system. Outdoor networks and structures. SNaR 2.04.03-85, in particular, it is necessary:

1. Establish a ban on the use of local treatment facilities without biological treatment (without biological products), which will reduce the risk of the spread of harmful pathogenic microorganisms.

2. When using a septic tank as a local treatment facility, it is necessary to install a post-treatment system device. In addition, to provide technical and biochemical requirements for the after treatment system, its area and its location on the land.

3. To develop a quality control system for the liquid component obtained during the processing of domestic wastewater in a local treatment facility.

4. Allow the discharge of purified water into the drainage system with a mandatory increase in its capacity and introduce a ban on draining the untreated liquid component of the drain into drainage systems or into open storage reservoirs.

5. To exclude the exit of the drainage system from the operational state, include additional requirements for its operation, which would contain:

- standard service life (the period of normal operation of the system before major repairs);
- technical requirements aimed at increasing the volume of wastewater received;
- rules and frequency of preventive revision, cleaning and repair of the drainage system;
- to develop rules for the operation of drainage systems of closed and open types, fixed in territorial norms;
- requirements for the reconstruction of existing elements of the drainage system on land intended for low-rise construction, as well as rules for the newly erected drainage system.

The list of measures for the reconstruction of drainage systems should be given in territorial regulations (in territorial building codes), since the solution of such a problem depends on the individual prevailing conditions for the placement of such a system and cannot be the same for all regions of the Russian Federation.

6. To establish the norms of the useful volume of local treatment facilities depending on the number of users to eliminate overflow;

7. Perform biochemical laboratory studies of liquid products of processing of household waste, provided that chlorine-containing household chemicals are used. To establish norms of stock coefficients that increase the volume of use of biological products (biological additives), to exclude the death of living organisms of biological products in cases of the presence of chlorine-containing products in the drain.

An alternative to solving this problem can be the use of only household chemicals that do not contain chlorine, phosphates, phenol, surfactants, refined petroleum products. An example of such household chemicals is the products of the brands MWAY, Frosch, BioMio, Sonett, ECODOO, Ecover, Chistown, Mi & Co (MiKo), Sonett, Klar, Garden, Molecola, as well as baby powders with a low content of surfactants and the absence of phosphates: Our mother, Organic People, BURTI Baby, BABYLINE, Sodasan, Baby Bon, etc. Choosing such a solution option, it is necessary to establish a ban on the use of other household chemicals in the technical instructions (passports) for a local sewage treatment plant and in regional regulatory legal acts.

8. To develop requirements for the disposal of solid waste obtained as a result of the processing of household waste, as well as to define rules for the temporary disposal of solid waste, rules for the further use of solid waste in agriculture or their processing at special enterprises.

Taking into account foreign experience (for example, the experience used in the Republic of Belarus, Poland, the Czech Republic and other Eastern European countries) of planning territories for low-rise buildings and, based on the rational location of a local treatment facility, consider the possibility of placing it outside the land plot, i.e. to bring a decentralized drainage system to the adjacent land plot, on which the drainage system is located. Such a planning solution will allow unhindered unloading of solid waste into the vehicle and pouring of purified water into the drainage system. The implementation of such a solution can be carried out only in planned or reconstructed territories.

9. To develop requirements for the design of elements of a decentralized system (a local sewage treatment plant and a sewer outlet – a sewer pipe), which would exclude the leakage of wastewater from the system into the ground, as well as the ingress of wastewater into the local water supply system (into an aquifer or well).

Since local wastewater treatment plants are located in the places of residence of citizens, it seems necessary, in sanitary and epidemiological rules and regulations, to improve the

quality of domestic wastewater treatment in local wastewater treatment plants by increasing the degrees (levels) of wastewater treatment.

It should be noted that the territory of the Russian Federation has different natural and climatic conditions for the operation of structures, then there is a need to develop territorial building codes (TBC) for each subject of the Russian Federation. Territorial building codes should contain requirements for the operation of local drainage systems, depending on the water content of soils, their density, type of soil, etc. In particular, such rules are especially relevant when using septic tanks as a local treatment facility in flooded areas (the groundwater level is below 1.5 m). As a rule, such land plots are located in the lowlands – these are lands, mainly in the northern regions of the Russian Federation and are formed by draining wooded and swampy territories with subsequent provision to citizens for personal purposes.

Moreover, it is necessary to study the issue of the possible use of septic tanks in flooded areas and, based on the results obtained, develop design and technical recommendations on their use in these areas.

In the case of special natural conditions and the justified impossibility of using a septic tank in such territories, a ban on its use should be established in territorial building codes, and biological treatment plants should be recommended as a local treatment facility.

10. To provide for a ban on the use of septic tanks in water-resistant (clay and loamy) soils, or to provide for such use of a septic tank, which necessarily required the septic tank user to export accumulated sewage to special landfills or special reception points. To make changes to standards that would contain mandatory requirements, as well as rules for the device of a system for post-treatment of the liquid component of the drain after its processing in a septic tank, provided that the soils on the territory for individual housing construction consist of a draining type.

The fragmentary nature of technical standards for the construction (erection) and operation of decentralized wastewater disposal systems is primarily due to the lack of relevant research in this area necessary for the preparation and approval of regulations for the use of septic tanks and biological treatment plants. The rules for the use of septic tanks and biological treatment plants are contained only in the recommendations that are given in the passports for treatment facilities, while there are no regulations (norms and rules) approving such requirements. In this regard, there is a frequent violation of recommendations among users of local sewage treatment plants, and the absence of approved technical and legal norms leads to a violation of sanitary, epidemiological and environmental standards, excludes the possibility of effective technical and legal regulation in the field of organization of decentralized wastewater disposal systems.

It should be noted that the reform of technical and legal norms must be carried out taking into account natural and climatic conditions, since the placement and operation of decentralized wastewater disposal systems within specific natural conditions has specific features. In this connection, it is necessary to develop territorial building codes (TSN) for each subject of the Russian Federation. Territorial building codes should contain requirements for the operation of local drainage systems, depending on the water content of soils, their density, type of soil, etc. In particular, such rules are especially relevant when using septic tanks as a local treatment facility in flooded areas (the groundwater level is below 1.5 m). In the case of special natural conditions and the justified impossibility of using a septic tank in such territories, a ban on its use should be established in territorial building codes, and biological treatment plants should be recommended as a local treatment facility.

4 Conclusion

Thus, the improvement of regulation in the field of organization and use of local wastewater disposal systems should be carried out in two directions – organizational and technical and legal. As part of the organizational direction of solving problems, it is necessary to ensure the coordinated development of settlements by ensuring the design and construction of new central sewer networks and reconstruction of existing ones, which will reduce the number of local treatment facilities on land plots provided for individual housing construction.

In the technical and legal sphere, the main direction in solving the problems of ensuring the safety of local treatment facilities is the development of requirements for the design, construction, operation of decentralized wastewater disposal systems and their consolidation in regulatory legal acts of the federal and regional levels.

The reform of technical and legal norms in the field of design, construction and operation of decentralized wastewater disposal systems will ensure the elimination of gaps and contradictions in legislation, optimization in the regulation of public relations, safety of technical systems, conservation and rational use of components of the natural environment, improving the quality of the environment as an important environmental factor affecting human health.

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