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MODERNIZATION OF COMMUNAL INFRASTRUCTURE OF URBAN AGGLOMERATIONS

The features of modernization of communal infrastructure within urban agglomerations have been studied. The problems of the functioning of the communal infrastructure of large cities and agglomerations are identified and systematized and the expediency of solving them through modernization has been determined. When implementing the projects to modernize the communal infrastructure, it has been suggested to take into account the experience of foreign agglomerations, level of organization of cooperation between territorial communities in Ukrainian urban agglomerations and advantages of using the mechanisms of public-private partnership.

Keywords: urban agglomerations, communal infrastructure, modernization, cooperation of territorial communities, public-private partnership.

Providing the vital activity of a certain territory and meeting the needs of its population and business in communal services depend to a large extent on the functioning of the technologically and organizationally connected production facilities and properties which are the parts of the communal infrastructure. The urbanization processes heavily burden the communal infrastructure, therefore its proper functioning and progressive development in the territories of large cities, megapolices and urban agglomerations require special approaches of technical and technological, organizational and economic nature. This is especially true for the municipal infrastructure of large urban agglomerations, playing an important role in the Ukrainian economy, since the significant volumes of products and services are produced in those territories, and there is a high concentration of physical, labour and investment resources* [1]. This is consistent with the urgent task of developing the territories, which consists in the development and implementation of integrated management programs for existing infrastructure facilities, the construction of new facilities in accordance with existing needs by using both proprietary and borrowed funds, which is declared in the National Strategy of Regional Development for the period until 2020**. Ukrainian urban agglomerations are characterized by economic opportunities associated with obtaining

* Territorial development in Ukraine: development of agglomerations and subregions / U.S. Agency for International Development (USAID) under the Project "Local Investments and National Competitiveness". Available at: http://2.auc.org.ua/sites/all/sites/default/files/files/Subregional_Structures_Development_2012.pdf.

** On Approval of the State Strategy for Regional Development for the period up to 2020: Resolution of the Cabinet of Ministers of Ukraine dated 6.08.2014 № 385. Available at: <http://zakon4.rada.gov.ua/laws/show/385-2014-n>.

the agglomeration effect, which is especially evident in the processes of functioning and development of industrial, social, business and communal infrastructures, as well as the organizational features which must be taken into account when making and implementing management decisions for their development, which determines the purpose and objectives of this research.

Thus, the **purpose of this article** is to develop the proposals for the modernization of the municipal infrastructure of the national urban agglomerations, taking into account the problems of its functioning.

According to the Ministry of Regional Development, Building and Housing and Communal Services of Ukraine (hereinafter referred to as the Ministry of Regional Development), currently the communal infrastructure with 1.56 million facilities is 1/3 of the country's fixed assets and is in a critical condition *. The general level of the fixed assets depreciation exceeds 60%, and the equipment (boilers and pumps) is energy consuming. The length of Ukrainian water supply networks are 180 951 km (only 9% of it are not in disrepair, while their working service is less than 25 years), the length of the sewerage networks is 51 397 km (the wear level of which exceeds 60%, so that in some cities, the network wastage reaches 70-80%). A difficult situation is also observed in the heat economy: there are 21,2 thousand boiler houses in Ukraine, with 50,600 operating boilers, the length of the country's heat supply network exceeds 20 000 km, 12 700 km of which are in a critical condition, and 60% of the heat networks need repair [2, p. 310]. Almost 90% of multistorey houses in Ukraine need thermal modernization**. Using the dysfunctional, outdated and physically worn out equipment and networks leads to an increase in the nonproductive consumption of energy, water and heat, and a decreasing services quality while the cost of production and supply is increasing.

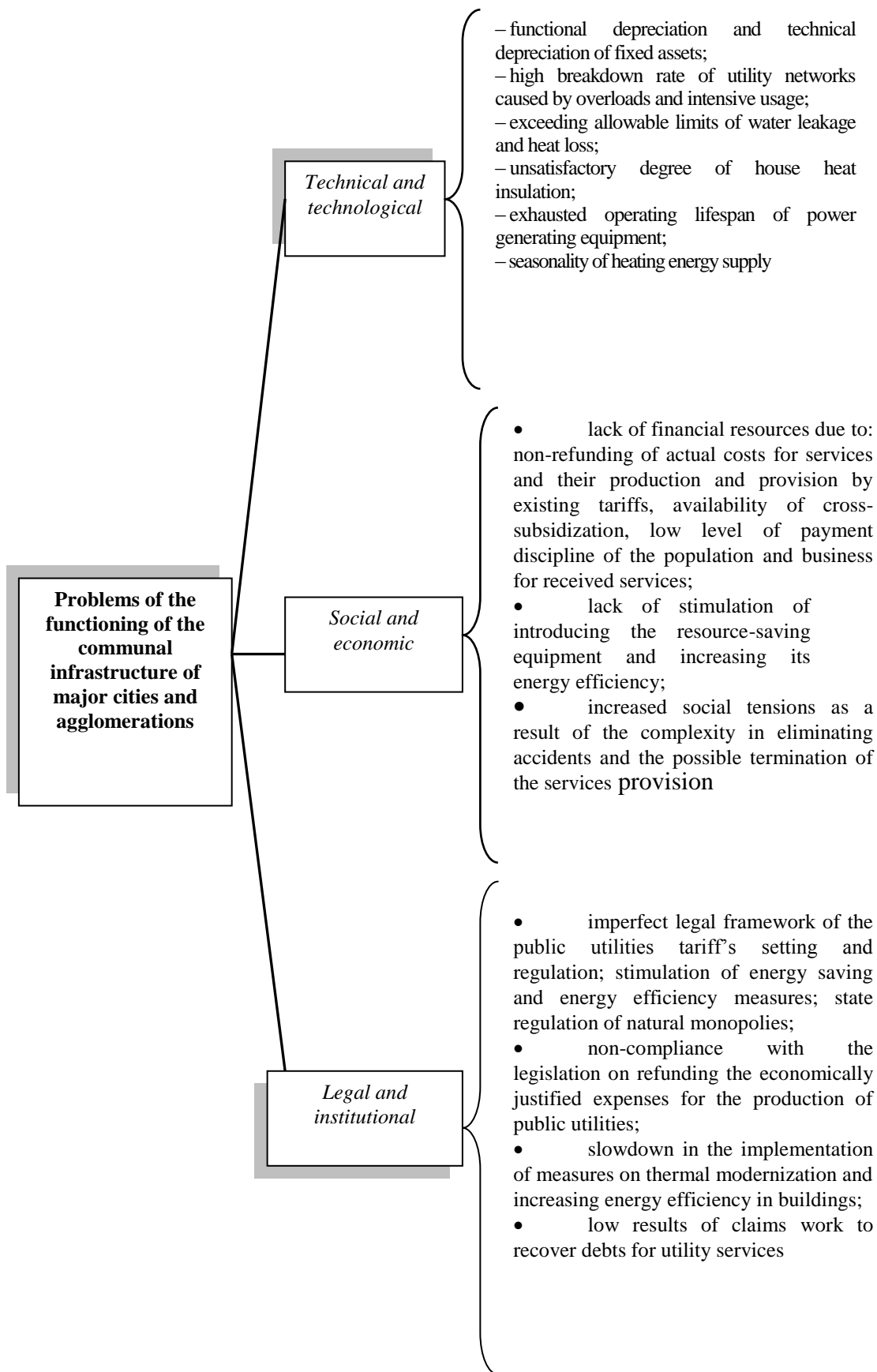
Studying the data from official websites of the Ministry of Regional Development and major cities and small towns (territorial communities) which make up urban agglomerations, on the state of communal infrastructure made it possible to identify and arrange the main problems of its functioning and development into three blocks, the essence of which is disclosed in the figure. Overcoming these problems is facilitated by the use of appropriate mechanisms aimed at creating and upgrading the municipal infrastructure facilities in urban agglomerations. The mentioned mechanisms include the measures of technical and technological revamping taking into account foreign experience, overcoming the shortage of funds for their implementation and improving the legal support

The technical and technological revamp includes the development and implementation of projects for the replacement and restoration of the water-, heat-, energy- and gas-supply utility networks, the introduction of resource-saving technologies. At the same time, it is expedient to take into account the foreign experience of the world's leading urban agglomerations *** [3], concerning technical and technological revamp of the facilities of the communal infrastructure.

* Kruhlyak E. *The strategy of housing development needs to be developed in four main directions*. Available at: <http://www.minregion.gov.ua/press/news/strategiyu-rozvitku-zhkg-potribno-rozroblyati-za-chotirma-osnovnimi-napryamkami-eduard-kruglyak/>.

** Official web-site of the Ministry of Regional Development, Building and Housing and Communal Services of Ukraine. *About 90% of high-rise buildings in Ukraine require thermal modernization*. Available at: <http://www.minregion.gov.ua/press/news/v-ukrayini-blizko-90-bagatopoverhivok-potrebuyut-termomodernizatsiyi/>.

*** Energy and Urban Innovation. – London : World Energy Council, 2010. – 183 p. Available at: http://www.worldenergy.org/wp-content/uploads/2012/10/PUB_Energy_and_urban_innovation_2010_WEC.pdf.



Systemizing the problems of the functioning of the communal infrastructure of major cities and agglomerations

It should be noted that most attention is currently being paid to energy saving and energy efficiency projects. In the most developed urban agglomerations with built "intelligent" systems, the integrated management platforms * with a feedback to infrastructure subsystems and which cause a continuous infrastructure efficiency increase, engaging all interested parties in this process in real time via developed communications network. Such integrated platforms are implemented in the urban agglomerations of Spain and Brazil, which reduces the utility infrastructure's energy consumption by 35-40% and air pollution by 20-25%.

The use of foreign experience in modernizing municipal infrastructure by domestic urban agglomerations is possible on the basis of taking into account their organizational peculiarities and financing of relevant projects. Therefore, it is expedient to distinguish the processes of modernization of the communal infrastructures: located in the settlements which make up an urban agglomeration, and located outside or in the territory of more than two settlements. This is caused by the fact that, despite the actual existence of urban agglomerations in Ukraine, the use of this term in the practice of law enforcement is impossible due to the lack of a special law on urban agglomerations and the necessary articles in the current legislative acts regulating relevant processes. Therefore, the organization of measures of modernizing the communal infrastructure of existing domestic urban agglomerations is carried out by territorial communities operating in their territory, on the principles of cooperation and partnership. According to the current legislation, the cooperation and partnership are regulated by the Laws of Ukraine: "On local self-government in Ukraine" dated 21.05.1997 №280/97-BP, "On cooperation of territorial communities" dated 17.06.2014 №1508-VII, "On voluntary consolidation of territorial communities" dated 5.02.2015 №157-VIII.

The most acceptable form of cooperation of territorial communities within the urban agglomerations for the modernization of communal infrastructure is the development and implementation of a short-term project. For its implementation, the own funds of municipal enterprises (the components of the service tariff, including profit and depreciation), which belong to the utility infrastructure, are used. Currently, these funds cannot be recognized as the main source of financing for such projects due to the unprofitable activity of the vast majority of municipal enterprises. In order to broaden the options for using the investment component of the tariff as an inherent source for financing the projects of the communal infrastructure modernization, it is advisable to use a methodical approach to structuring the utility tariffs for municipal enterprises on the basis of optimizing the expenditures by the criterion of maximizing current income. Besides, there is a need to improve current statutory regulations in terms of strengthening control over the targeted use of the investment component of tariffs for the needs of innovative development (including the introduction of energy-saving technologies, modernization and replacement of fixed assets, infrastructure networks) and increasing the responsibility of the management of the public utility companies for their non-compliance, defiance and violation of the laws. Thus, it is necessary to introduce the appropriate changes to the Art. 31 of the Law of Ukraine "On housing and public utility services" dated 24.06.2004 №1875-IV (revised and expanded), Art. 6 of the Law of Ukraine "On government regulation in the sphere of public utility services" dated 9.07.2010 №2479-VI (revised and expanded), paras. 11 and 23 of para. 4 of the Decree of the President of

* *Ibid.*

Ukraine “On the approval of the Regulation on the National Commission exercising government regulation in the sphere of energy and public utility services” dated 10.09.2014 №715/2014, as well as to the Resolution of the Cabinet of Ministers of Ukraine “On ensuring a unified approach to the formation of tariffs for housing and utility services” dated 01.06.2011 №869 (revised and expanded). In addition, it is expedient to consider and adopt the draft statute “On housing and public utility services” (registered number 1581- д), which has an energy-efficient focus (creates the conditions for the development of competition in the market of related services, encouraging the enterprises to implement measures for energy conservation and energy efficiency, for saving the resources expenditure and reducing the cost of services).

At the present time, considering the insufficiency of the public utilities’ own funds for implementing the projects for modernizing the infrastructure of urban agglomerations, diversification of funding sources is necessary. It involves the financing from the state and local development budgets, as well as attracting residential funds (condominium associations, housing cooperatives) and private investors on the principles of public-private partnership (PPP). Let us consider the possibilities of using these sources of financing.

Today, the public funds are used primarily to support 367 voluntarily consolidated territorial communities (CTCs), which were created during 2015-2016 in concordance with the local government and financial decentralization reform*. Thus, due to the latter, the private revenues of the CTCs budgets in 2016 increased more than 3 times compared to 2015 (by 2.3 billion UAH - from 1 billion UAH to 3.3 billion UAH) **. In 2016, according to the Ministry of Regional Development***, the financial support received by consolidated communities for the development of infrastructure facilities amounted to almost 1.2 billion UAH, which enabled them to implement 1.5 thousand development projects. Also 2017 includes the support in the amount of 3.5 billion UAH from the State Regional Development Fund, and the transfers from the state budget for local budgets for the implementation of measures for the socio-economic development of certain territories in the amount of 4 billion UAH ****.

The use of private investors’ funds on the PPP principles, as foreign experience and domestic practice show, is the most promising source of financing projects for the communal infrastructure modernization. The PPP projects in the sphere of providing the housing and communal services are successfully implemented, of which: 2/3 is aimed at providing urban amenities, every 6th is aimed at the modernization of water supply

* Nehoda V. *17% of the communities consolidated, we expect the next year to be decisive in this process.* Available at: <http://www.minregion.gov.ua/press/news/17-gromad-ob-yednalisya-ochikuyemoshho-nastupniy-rik-stane-virishalnim-u-tsomu-protsezi-v-yacheslav-negoda/>.

** Official web-site of the Ministry of Regional Development, Building and Housing and Communal Services of Ukraine. *Decentralization: performance of local budget revenues for 2016.* 4–5 pp. Available at: http://www.minregion.gov.ua/wp-content/uploads/2017/02/MinReg_FEB-2017-mini-1.pdf.

*** Official web-site of the Ministry of Regional Development, Building and Housing and Communal Services of Ukraine. *48.4 billion UAH to local budgets and 2.3 billion UAH to the budgets of the CTCs - the results of financial decentralization for 2016.* Available at: <http://www.minregion.gov.ua/press/news/48-4-mlrd-grn-do-mistsevih-byudzhativ-i-2-3-mlrd-grn-dobyudzhativ-otg-rezultati-finansovoyi-detsentralizatsiyi-za-2016-rik/>.

**** Official web-site of the Ministry of Regional Development, Building and Housing and Communal Services of Ukraine *Decentralization: performance of local budget revenues for 2016.* 3, 32 pp. Available at: http://www.minregion.gov.ua/wp-content/uploads/2017/02/MinReg_FEB-2017-mini-1.pdf.

systems, and every 10th is aimed at the development of transport infrastructure*.

The project, implemented on the PPP principles, assumes the satisfaction of certain interests of partners, is based on their experience and knowledge and is provided by means of appropriate allocation of resources and risks, responsibility and benefits. The interest of the business in providing the living conditions for its own personnel in the territory of its presence facilitates the involvement of private investors on the PPP principles. The possibility of obtaining a synergistic effect by combining state economic instruments (the use of incentive and support mechanisms) and the opportunities of the private business (the latest technologies and innovations), should be recognized to be the advantages of using PPPs, and the disadvantages would be the distribution of costs and potential risks, the balance of economic interests and responsibilities among participants of the investment cooperation.

Domestic experts are quite actively discussing the need to improve Ukrainian legislation on PPP [4; 5; 6]. Almost all authors suggest harmonizing the legislative acts regulating the relations of partners in the process of implementing PPP projects, minimizing administrative barriers and risks, eliminating disparities and contradictions in the existing legal framework. The Law of Ukraine “On amendments to certain Laws of Ukraine on eliminating regulatory barriers for the development of public-private partnerships and promoting investments in Ukraine” dated 24.1.2015 №817-VIII, resolved the issues relating to the distinctions between PPP projects and other forms of projects, to the use of land for PPP implementation, the state support of the projects, the analysis of the project’s effectiveness, additional guarantees for private investors, conclusion of contracts in various sectors of the economy **. The PPP legislation should be supplemented with information on the specification of the forms of partnership implementation and decision-making procedures, as well as on specifying the rules for pooling and using resources by project participants. Therefore, to implement projects of modernizing the municipal infrastructure of urban agglomerations, it is necessary to improve the relevant regulatory and legal support, which is summarized in the following table.

Areas for legislation improvements, which promote the implementation of the projects of modernizing the municipal infrastructure of urban agglomerations

Statutes	Key points of improvement
The Law of Ukraine “On cooperation of territorial communities” dd. 17.06.2014 № 1508-VII	Creating a basis for terminological certainty and legally legitimizing urban agglomerations
The Law of Ukraine “On government regulation in the sphere of public utility services” dated 9.07.2010 №2479-VI (revised and expanded); the Decree of the President of Ukraine “On the approval of the Regulation on the National Commission exercising government regulation	Strengthening the state control over the targeted use of investment-based components of tariffs for the needs of the innovative development of enterprises (in accordance with approved investment programs), as well as increasing the responsibility of the public utilities’ management

* Official web-site of the Ministry of Economic Development and Trade of Ukraine. *Reference on the results of the PPP implementations (2016)*. Available at: <http://www.me.gov.ua/Documents/Print?lang=uk-UA&id=ed00a2ba-480a-4979-84eb-d610a/>.

** On amendments to certain Laws of Ukraine on eliminating regulatory barriers for the development of public-private partnerships and promoting investments in Ukraine: Law of Ukraine dd. 24.11.2015 № 817-VIII. Available at: <http://zakon0.rada.gov.ua/laws/show/817-19/print1452604230502603>.

in the sphere of energy and public utility services” dd. 10.09.2014 №715/2014	for defiance and (or) non-compliance and violation of laws
The Law of Ukraine “On housing and public utility services” dd. 24.06.2004 №1875-IV (revised and expanded); the Resolution of the Cabinet of Ministers of Ukraine “On ensuring a unified approach to the formation of tariffs for housing and utility services” dd. 01.06.2011 № 869 (revised and expanded)	Introducing effective tariff-setting methods for each individual type of housing and public utility services, which would create the prerequisites for the transition to the principle of covering economically justified expenditures, promoting the avoidance of the cross-subsidization in housing and public utility services, encouraging the energy efficiency and efficient use of resources saving in essential services
The Law of Ukraine “On public-private partnership” dd. 1.07.2010 № 2404-VI	Elaborating on the forms of the partnership implementation, regulating the procedures of making and coordinating decisions, defining rules of resource combinations

Conclusions

Analysis of the world experience in the functioning of large cities and agglomerations* [7] allows us to report a fairly short payback period for the municipal infrastructure development projects in urbanized areas, due to significant economies of scale, i.e. the agglomeration effect. High population density causes a decrease in the unitary cost of providing utility services per unit of service area, and also contributes to the improvement of the financial performance of the public utility companies, due to a significant increase in charges for consumed services. However, the researchers of the issues of the so-called “optimal city”* [7] revealed a tendency to decrease the efficiency of the communal infrastructure’s functioning, provided that the “populousness” threshold (population of the urban area) exceeds a certain threshold value.

Consequently, the connection between the functioning of the communal infrastructure and the urbanization process has a dual focus. Thus, at the initial stage of the urban agglomeration development, the efficiency of the communal infrastructure’s functioning is growing due to the agglomeration effect, and with further development, when the “populousness” exceeds the threshold value, the positive influence of the agglomeration effect is negated by the negative consequences of agglomeration (including technological overload, oversaturation and excessive complexity of utility networks, which lead to premature depreciation of the equipment, and to increasing probability of accidents, malfunctions in the provision of utility services and its quality reduction).

Both organizational features of urban agglomerations and the correlation of positive and negative consequences of agglomeration are necessarily to be taken into account, when using the proposed approaches to solving problems of communal infrastructure through the implementation of appropriate modernization projects based on the diversification of sources of their financing and improving legal support.

* Territorial development in Ukraine: development of agglomerations and subregions / U.S. Agency for International Development (USAID) under the Project “Local Investments and National Competitiveness”. Available at: http://2.auc.org.ua/sites/all/sites/default/files/files/Subregional_Structures_Development_2012.pdf

** A Guidebook on Public-Private Partnership in Infrastructure. – Bangkok : Economic and Social Commission Asia and the Pacific, 2011. – 76 p.

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