



University campuses in Russia: architectural and urban development typology

Campus universitarios en Rusia: tipología arquitectónica y de desarrollo urbano

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ABSTRACT

The purpose of the present study is to develop a typology of university campuses reflecting all their diversity. The main attention is paid to the peculiarities of the location of the university campuses relative to the settlements, as well as their spatial planning arrangement. In general, depending on the spatial planning arrangement, three types of university campuses are defined and analyzed, namely, dispersed, dissected, and compact (local). The features of university complexes located in the metropolitan areas, largest, and large cities, as well as in medium and small cities, and outside of large settlements in the suburban area have been determined depending on the location of campuses relative to settlements. Besides, the authors have identified the ways of spatial planning development of existing university complexes and justified improving the spatial planning arrangement of university campuses. In general, four ways of the spatial development of existing universities are identified: purchasing facilities in the adjacent territory to expand the existing campus; placing the necessary additional facilities in the adjacent and other areas of the city, that is, integrating into the urban environment; creating an additional campus in a remote territory (often in the suburbs); and moving all or part of the university facilities to a new campus with a full-fledged infrastructure in another area of the city or suburb. The article provides examples of university campuses (complexes) in Russian cities for all the types considered, provided with the attached graphic schemes.

Keywords: Architectural and Urban Typology of Campuses; Architecture; Campus Location; Spatial Planning; University; Ways of Spatial Development.

RESUMEN

El objetivo del presente estudio es desarrollar una tipología de campus universitarios que refleje toda su diversidad. La atención principal se presta a las peculiaridades de la ubicación de los campus universitarios en relación con los asentamientos, así como a su disposición de planificación espacial. En general, dependiendo de la ordenación del ordenamiento territorial, se definen y analizan tres tipos de campus universitarios, a saber, dispersos, diseccionados y compactos (locales). Las características de los complejos universitarios ubicados en las áreas metropolitanas, ciudades más grandes y grandes, así como

en ciudades medianas y pequeñas, y fuera de los grandes asentamientos en el área suburbana se han determinado según la ubicación de los campus en relación con los asentamientos. Además, los autores han identificado las formas de desarrollo de la ordenación del territorio de los complejos universitarios existentes y han justificado la mejora de la ordenación del territorio de los campus universitarios. En general, se identifican cuatro formas de desarrollo espacial de las universidades existentes: compra de instalaciones en el territorio adyacente para ampliar el campus existente; colocar las instalaciones adicionales necesarias en las áreas adyacentes y otras de la ciudad, es decir, integrándose en el entorno urbano; crear un campus adicional en un territorio remoto (a menudo en los suburbios); y trasladar todas o parte de las instalaciones de la universidad a un nuevo campus con una infraestructura completa en otra zona de la ciudad o suburbio. El artículo proporciona ejemplos de campus universitarios (complejos) en ciudades rusas para todos los tipos considerados, provistos de los esquemas gráficos adjuntos.

Palabras claves: Tipología arquitectónica y urbana de campus; Arquitectura; Ubicación del campus; La ordenación del territorio; Universidad; Formas de desarrollo espacial.

1. INTRODUCTION

Scientific and technological progress, changing socio-economic conditions, the development of tools and methods in the field of science and education, the expansion of the functions of universities, and the growing needs of the university community require solving the issues of university campuses design and development.

The university campus is an architectural and urban development complex united by a common global function of science and education (Zobova, 2015). This concept often refers to a complex that is multifunctional in structure and self-sufficient in content, with clear spatial and compositional connections between objects (Popov, 2014). It can include educational, research, administrative, residential, leisure, sports facilities, as well as recreational areas (Popov, 2018; 2019). Some authors pay special attention to the leading function of the university campus (Dagdanova, 2015).

However, in recent years, the word *campus* has increasingly been understood as a complicated system of interaction between the architectural and urban environment and people – teachers, scientists, students, and other users (Herz, 2013; Neuman, 2013). The university develops as a place of knowledge sharing and can be both integrated into the city, or be a self-sufficient complex. It is not always possible to ensure that all the functions necessary for the university community are available within a single territory, and it is not always possible to even maintain pedestrian accessibility of all the facilities of the complex. Therefore, it can be noted that each university has campuses in one form or another, while their structure and spatial planning arrangement are different.

In different countries, universities have their peculiar characteristics of the spatial planning arrangement of campuses, which is explained by different historical prerequisites for their formation. Below, Russian university complexes are compared with the university campuses in Europe and North America to consider their distinctive features.

Universities in Europe and North America often have local campuses, which are represented by objects localized in a single territory. At that, in European countries, the campuses are usually situated in the city structure, while in North American countries they are located both in the urban structure and often outside of large settlements in the suburban area. The trend of creating local campuses with full-fledged infrastructure has also begun to be observed in Asian countries. Many world-class universities are associated with a special spatial planning arrangement of the territory, a comprehensive solution of the university campus, and its versatility.

Most universities in the Russian Federation have long development history. However, a significant part of the real estate was acquired in the second half of the 20th century. At that, the necessary additional objects were often located in the places where the urban development situation allowed, sometimes in the territory remote from the main buildings. Therefore, Russian university complexes are more often represented by a set of individual objects or groups located in different parts of the settlement or even outside of it. Even though some universities initially had a local campus, the location of real estate became distributed over time due to the need for expansion. However, such dispersed complexes should not be confused with the same type of campuses in other countries. The main difference lies in the scale of the dispersion of objects, which in Russia occupy much more area.

Currently, there are not many universities in the Russian Federation that have comprehensive urban development solution. Most universities no longer meet the requirements of the time (Shumik y Tyuryukhanova y Vasilyeva, 2012) and face expansion challenges. The university complex usually includes academic buildings, dormitories, a club, sometimes sports facilities, while the functional potential of the territory in most cases is not utilized fully (Popov, 2014). It is also worth noting that most of the existing universities do not have the necessary infrastructure and convenient transport links.

Issues related to the spatial development of existing complexes and the justification of optimal spatial planning arrangement of university campuses require consideration of the architectural and urban typology of university campuses and the study of the features of each campus type.

In the contemporary literature, two types of campuses are distinguished based on the spatial location. These are *inner-city* urban campuses, and the *greenfield* suburban campuses (Hoeger, 2007; Van Geenhuizen y Nijkamp, 2012). The city campus is conditionally divided into *gated in the city* and *integrated into the city* (Den Heijer y Magdaniel, 2018). The first campus model consists of a local complex, while the second model consists of multiple buildings distributed in an urban environment.

At present, the concerned topic seems to be studied insufficiently. The existing classifications do not fully reflect the variety of types of the spatial arrangement of universities that have developed over the centuries. When studying the issues of interaction between a university campus and a city, the influence of demographic, socio-economic, infrastructural, and other features of cities is not considered sufficiently. When considering the location of university facilities, campuses consisting of several local complexes are not distinguished into a particular type, and their features are not taken into account.

The purpose of the present article is to develop a typology of university campuses that would reflect all their diversity.

It is proposed to develop the architectural and urban typology of university campuses according to two criteria: location relative to settlements, and spatial planning arrangement. Thus, it will be possible to reflect both the degree of interaction of the campus with the external environment, as well as to determine the features of the relationships between university objects.

2. METHODOLOGY

The object of the present study is the university campuses (complexes).

The research subject is the peculiarities of the location of university campuses relative to settlements, as well as their spatial planning arrangement.

The study is based on the analysis of the spatial planning organization of the complexes of existing higher education institutions in the Russian Federation and the place of such complexes in the structure of settlements.

Research methods include system analysis, which allows us to consider various factors of formation and development of the object under study in their interrelation, and the method of complex multifactorial assessment of design solutions.

The article provides examples of university campuses (complexes) in Russian cities for all the types considered, provided with the attached graphic schemes.

3. RESULTS

3.1. Location features of the university campuses relative to settlements

Depending on the location relative to settlements, three types of university campuses can be distinguished: those located in the metropolitan areas, largest and large cities, as well as in medium and small cities, and outside of large settlements in the suburban area.

The first two types are united by the fact that they are located within the urban structure. The mutual influence of the university and the city is very significant: the socio-cultural characteristics of the city are important for the university located in this city. At the same time, the university, as a scientific and educational center, is important for the entire city (Gohari y Holsen, 2016). Such location has a rather important advantage, namely, the ability to use transport and engineering urban infrastructure, as well as social infrastructure (Danilina y Privezentseva, 2020). But there are also certain difficulties associated with high built-up density, low ecological indices of the environment, and lack of territorial reserves for the development.

Despite the similarity of the first and the second types, there are still several significant differences between them. Unlike universities located in the metropolitan areas, largest and large cities, universities located in medium and small cities often play an important city-forming role. This can be seen especially vividly in the countries of Europe and North America. Cities, such as Oxford (Oxford University), Cambridge (Cambridge University), Ithaca (Cornell University), Palo Alto (Stanford University), Princeton (Princeton University), and many others are almost completely subordinated to the dominant educational function. In the Russian Federation, such cities are rare. Besides, the certain difference is seen when comparing their spatial arrangement: in metropolitan areas, largest and large cities, the university facilities are more often located throughout the city, which is justified by their development history, while in medium and small cities, the university often has a local campus, or its buildings are located within walking distance.

Among the medium-sized and small cities, it is worth focusing on the above-mentioned cities of educational and scientific specialization. Sometimes, such specialization turns the entire city into a campus, completely subordinating its infrastructure to the appropriate tasks, and creating a special educational and scientific environment in the framework of the entire settlement (Popov, 2014).

The third type, unlike the first two, refers to campuses located outside the city territory. When located within a suburban area, the university usually has a local campus, which is explained by the ability to locate all the necessary facilities within a single territory. Such location is characterized by the following distinctive features: isolation of the territory, low built-up density, favorable environmental situation, and natural environment, as well as the presence of territorial reserves for development (Colding y Barthel, 2017). Such campuses arise both when new universities are established, or existing ones are moved to a

new campus. However, it should be borne in mind that in this case there is a need to provide the necessary social, transport, and engineering infrastructure.

3.2. Features of the spatial planning arrangement of university campuses

Generally, university campuses can be divided into three types depending on the spatial planning arrangement, namely, dispersed, dissected, and local.

Dispersed complexes are represented by a set of individual objects located throughout the city. This type of spatial planning arrangement is typical for universities that have long development history. As the existing university complex needed to be expanded, new facilities were created, which were often located in places where the current urban development situation allowed (Revington, *et al.* 2018).

At such a spatial planning arrangement, the urban environment in which the university facilities are located has a great influence. Depending on its diversity and amenities, the university community can either take advantage of the city's infrastructure or suffer from its lack of development.

Since most of the university complexes in Russian cities belong to this type, many examples can be given here but the authors focus on the following universities: Higher School of Economics University (Moscow), National University of Science and Technology Moscow Institute of Steel and Alloys (Moscow), Financial University under the Government of the Russian Federation (Moscow), St. Petersburg State University (St. Petersburg), National Research University of Information Technologies, Mechanics and Optics (St. Petersburg), and Rostov State University of Economics (Rostov-on-Don) (Figures 1, 2).

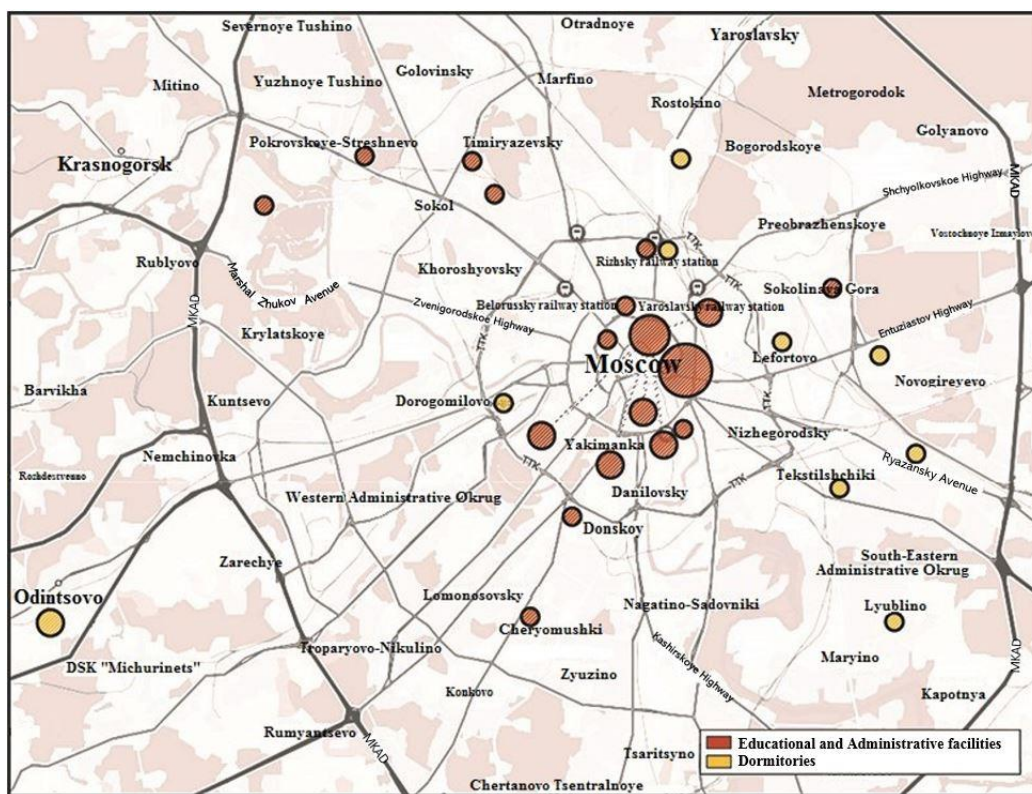


Figure 1. Location of the facilities of the Higher School of Economics University in Moscow

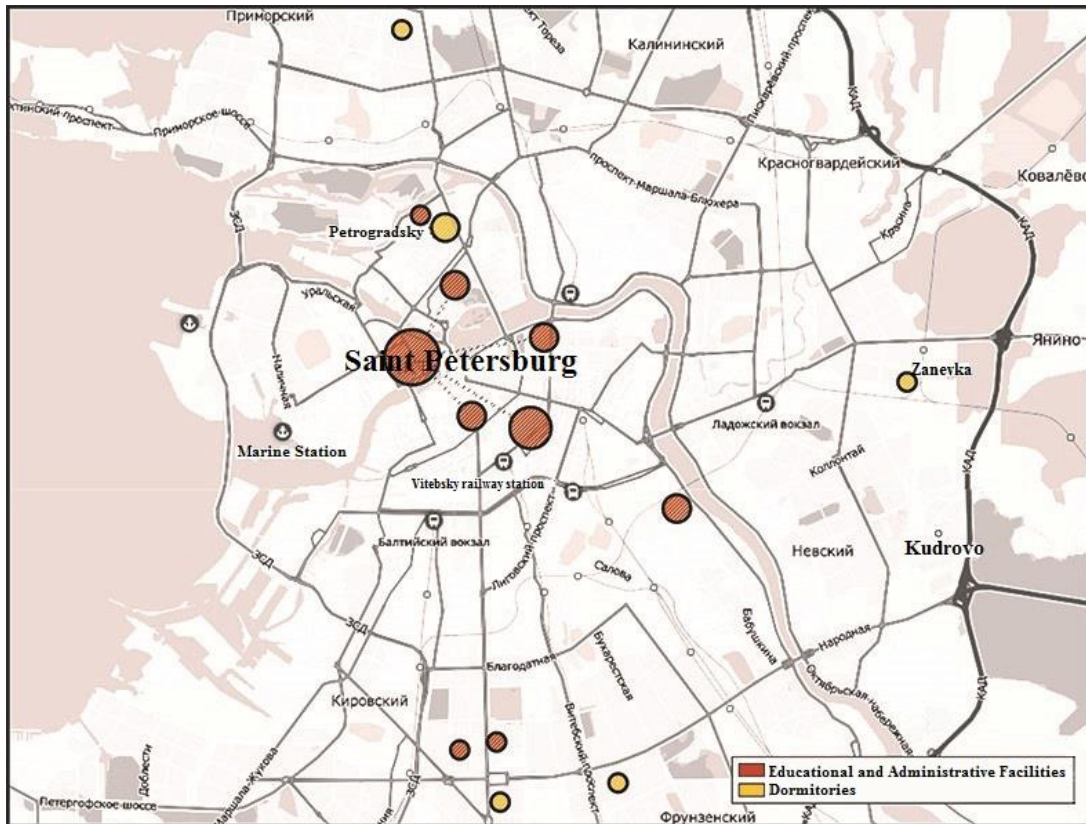


Figure 2. Location of the facilities of the National Research University of Information Technologies, Mechanics and Optics in St. Petersburg

Dissected complexes are represented by a set of groups of objects located in different parts of the city or even outside it. Such type of spatial planning arrangement can often be found at universities that were formed by combining several educational institutions with existing local campuses into a single educational institution, or the universities that initially had local campuses, usually located in a city, but over time, due to the need for expansion, created additional groups of objects in new territories (Pinheiro y Berg, 2017). In the first case, almost every group of objects contains both academic buildings and dormitories, which characterizes their autonomy during a certain period, while in the second case, it is usually possible to distinguish a central complex, usually consisting of academic buildings and dormitories, as well as groups of objects distributed throughout the city in the form of additional academic buildings or a student campus.

At such a spatial planning arrangement, the influence of the urban environment in which the university facilities are located is somewhat less than in the previous type. Firstly, each group has its infrastructure and is relatively autonomous, and secondly, the need to move between groups is lower than between individual objects.

The following Russian universities can be mentioned as an example: National Research Nuclear University (Moscow Engineering Physics Institute) (Moscow), Plekhanov Russian University of Economics (Moscow), Siberian Federal University (Krasnoyarsk), Belgorod State University (Belgorod), and Stavropol State Agrarian University (Stavropol) (Figures 3, 4).

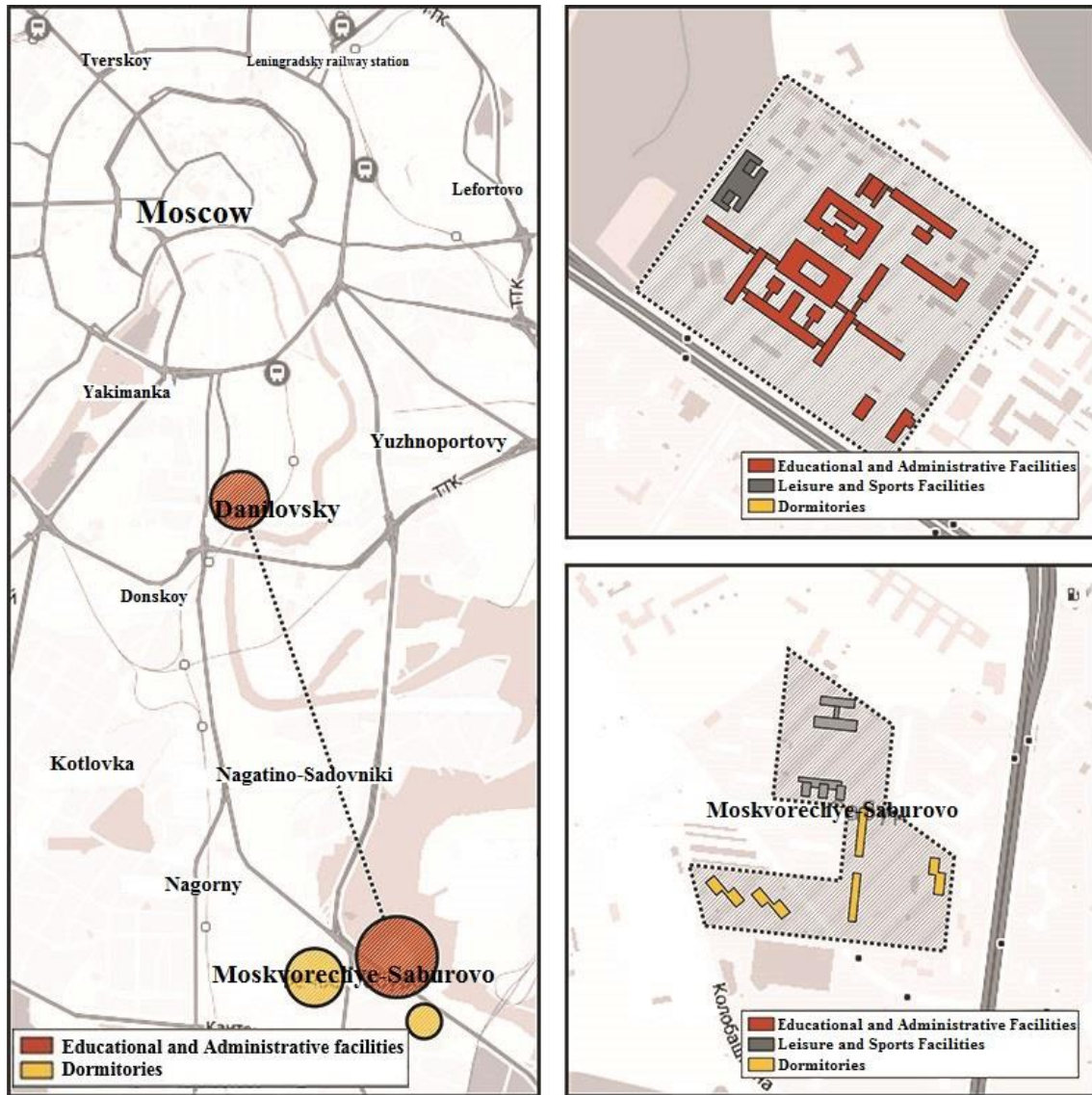


Figure 3. Location of the facilities of the National Research Nuclear University (Moscow Engineering Physics Institute) in Moscow

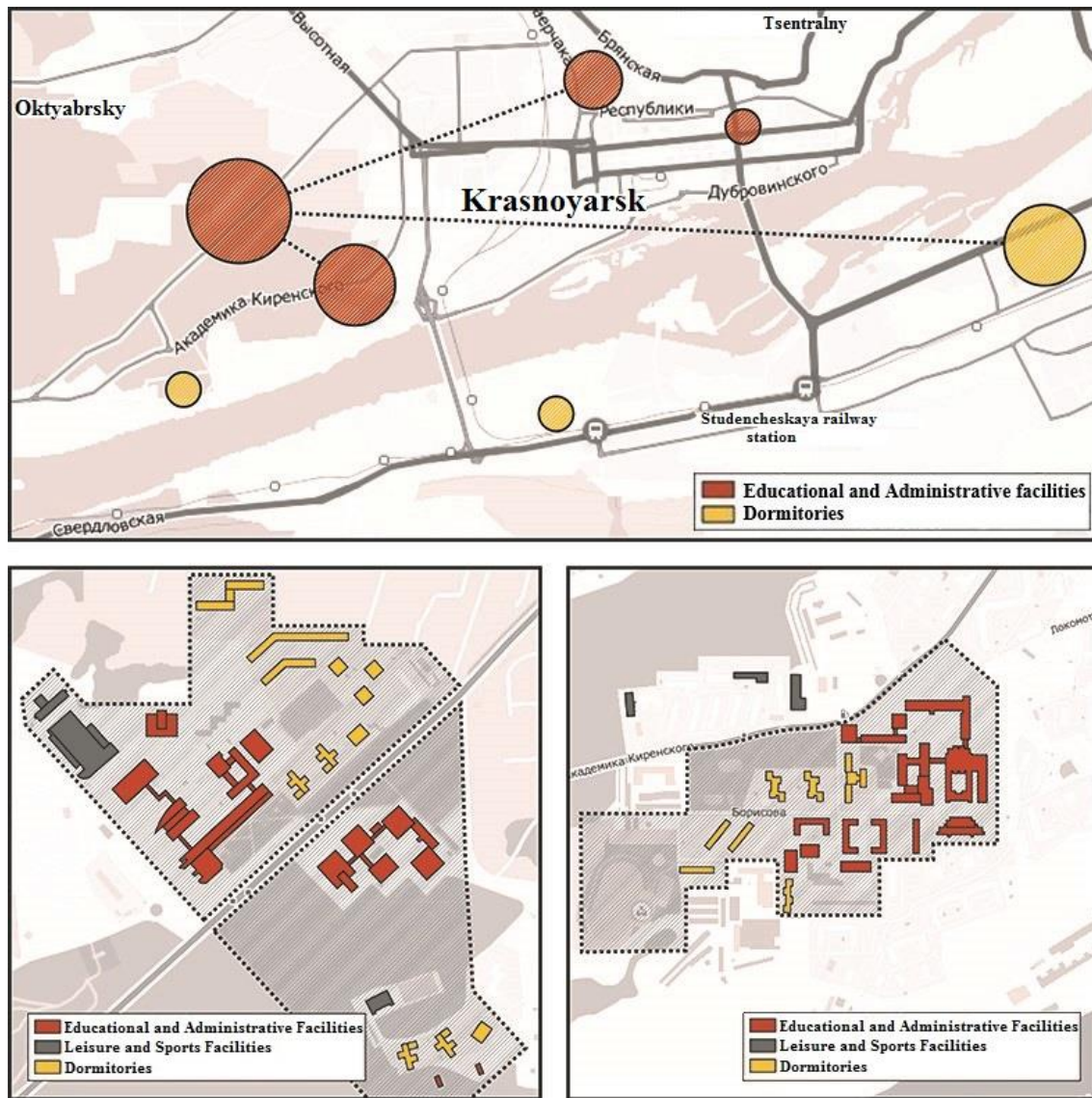


Figure 4. Location of the facilities of the Siberian Federal University in Krasnoyarsk

Local complexes are represented by objects that are localized within a single territory. This type of spatial planning arrangement is often observed at universities that were formed as a result of a one-time allocation of territorial and financial resources when implementing a large project, or at universities with an initially large reserve of territories for further development.

With such a spatial planning arrangement, the university has its infrastructure and a higher degree of autonomy compared to the previous types. Depending on the location in the city or suburban area, it has certain advantages and disadvantages.

The following Russian universities can be cited as an example: Russian State Agrarian University – Moscow Timiryazev Agricultural Academy (Moscow), Sergo Ordzhonikidze Russian State University for Geological Exploration (Moscow), National Research University Moscow State University of Civil Engineering (Moscow), Innopolis University (Innopolis is a satellite of Kazan), Kuban State Agrarian University named after I.T. Trubilin (Krasnodar), and Perm National Research Polytechnic University (Perm) (Figures 5, 6).

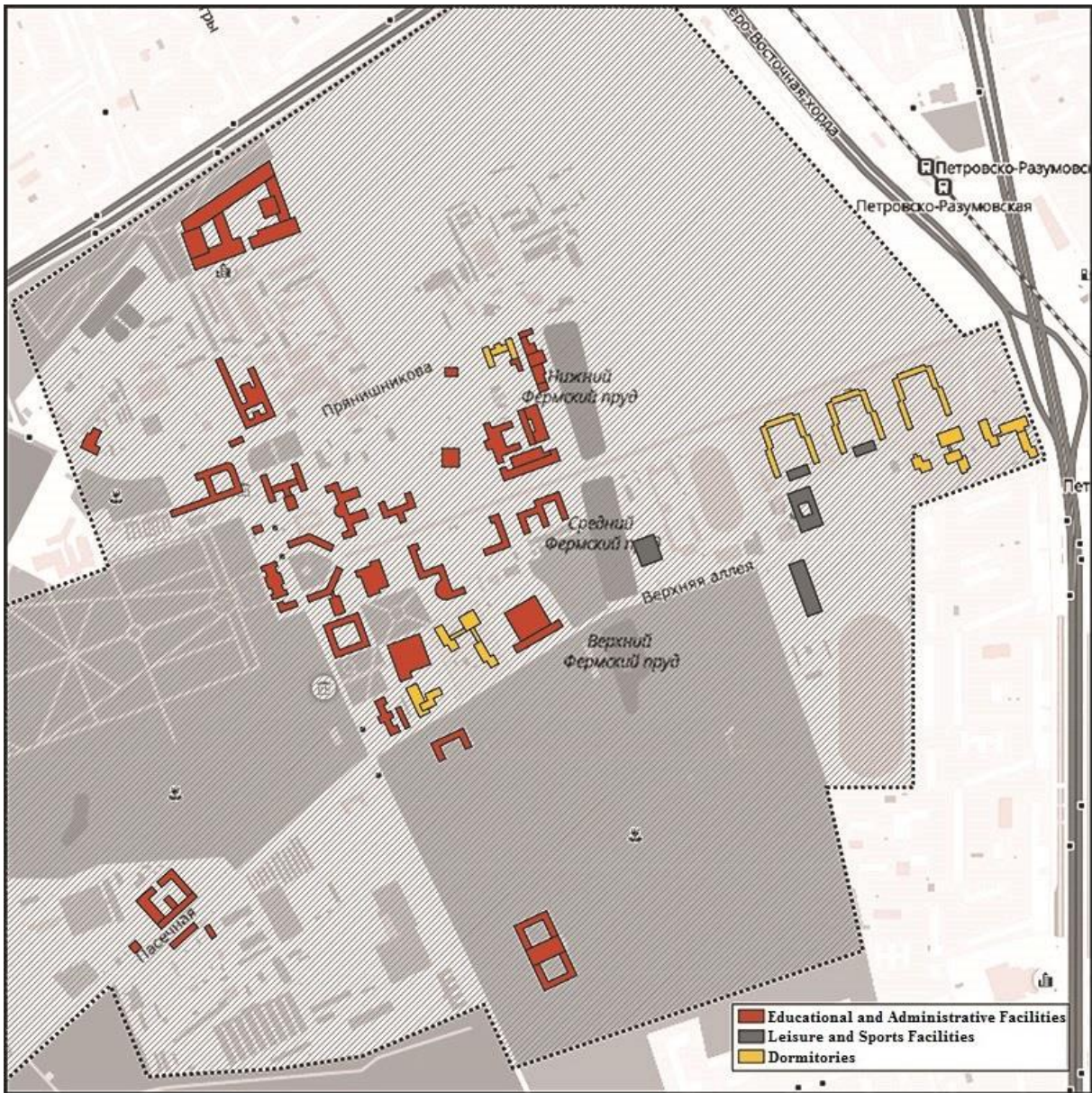


Figure 5. The campus of the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy

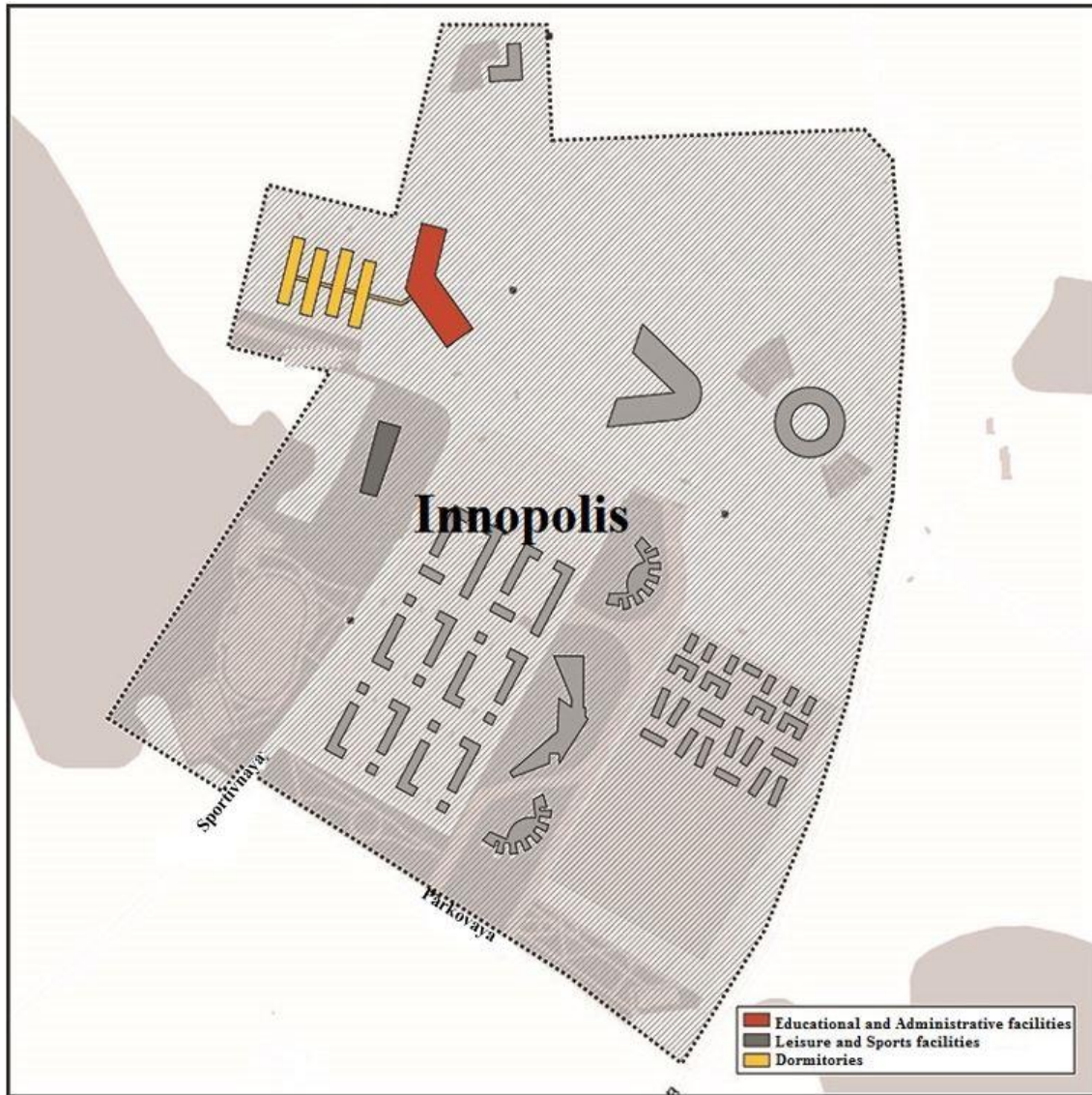


Figure 6. The campus of the Innopolis University in Innopolis near Kazan

The above-mentioned types of spatial planning arrangement of university campuses in their pure form can be found rarely. Much more often there is a certain mixture of features of different types, which occurs in the course of the natural growth of the university and, accordingly, its property complex.

4. DISCUSSION

It is important to consider two issues related to the topic of the present study: determining the spatial planning development path of existing complexes and substantiating the optimal spatial planning arrangement of university campuses.

Significant territorial reserves for development are often available only for campuses located in the suburbs. Universities that have different types of campuses face expansion challenges at some point in time (Starikov, 2011). The development path should be chosen individually for each university depending on the size of the property complex, spatial planning arrangement, location of the university in the

valuable historical buildings, and several other features (Hajrasouliha, 2017). But still, in general, four possible paths can be distinguished:

- purchasing facilities in the adjacent territory to expand the existing campus;
- placing the necessary additional facilities in the adjacent and other areas of the city, that is, integrating into the urban environment;
- creating an additional campus in a remote territory (often in the suburbs);
- moving all or part of the university facilities to a new campus with a full-fledged infrastructure in another area of the city or suburb.

The first three options are similar in that they allow creating the missing elements of infrastructure and preserving the existing real estate, which is important for universities with historical background. They allow preserving plots in prestigious city locations and valuable historical buildings, which are most often the main educational and administrative buildings, while acquiring the necessary additional infrastructure elements, which are most often service and leisure enterprises that meet the new requirements and needs of the university community.

There are also significant differences between these options.

The first option may be suitable for universities with a compact (local) campus since it allows maintaining the same spatial planning organization. However, it involves several difficulties associated with the acquisition of plots and objects in the area adjacent to the campus (Gelfond y Lapshin, 2020). This includes significant financial costs and conflicts of interest, as well as frequently occurring issues of urban planning and legal nature, which impose certain restrictions.

As an example, we can cite the conflict of interests that arose between the Moscow State University of Civil Engineering (Moscow) and the owner of a private house that ended up on the territory of the university and urban planning issues related to the preservation of the integral historical and architectural city environment that arose during the expansion of the Nizhny Novgorod State University of Architecture and Civil Engineering (Nizhny Novgorod).

The second option may be suitable for universities with a distributed or disaggregated campus, especially located in high-density urban environments. It involves searching for city objects, which can be repurposed. It is advisable to choose additional objects in good pedestrian accessibility from existing objects to form an integral environment of the university campus and ensure high connectivity of its buildings (Skalaban *et al.* 2021).

As an example, we can cite the concepts of the spatial development of the Higher School of Economics (Moscow) and St. Petersburg State University (St. Petersburg), which involve the creation of additional facilities in the central part of the city in good accessibility to existing facilities.

The third option may be suitable for universities that have a dismembered or compact (local) campus, which are unable to place the missing objects in the adjacent territories. It involves searching for a free area where one can place the necessary objects. It is desirable to create an additional campus with good transport accessibility from existing facilities so as not to greatly increase the time spent by the university community on moving between separate buildings (Den Heijer y Magdaniel, 2018).

An example is the campuses of the Far Eastern Federal University (Vladivostok) and the University of Information Technologies, Mechanics and Optics (St. Petersburg), located in suburban areas and including all the necessary infrastructure.

The fourth option may be suitable for universities with a distributed or disaggregated campus, as it improves the situation with the availability of individual buildings. However, it is associated with significant investments and involves the search for a site sufficient for the construction of facilities in one place and the creation of all the necessary infrastructure there (Kireeva, 2016).

Recently, at different levels, various options for moving the facilities of some Russian universities to new territories have been actively discussed. Among teachers and staff, it is a matter of concern that university departments move to remote areas in comparison with the usual and convenient locations.

The option of completely moving objects to new territories does not always find a solution, since often universities do not want to leave all their sites and objects in the city. Therefore, the option of partial movement of objects is also considered. In this case, a compact group of buildings is preserved, which is most often located in the central part of the city and is represented by the main educational buildings, the movement of some of the buildings scattered throughout the city, which are most often separate educational buildings and dormitories, to a new campus on a free territory and the creation in it of all the necessary additional facilities, such as service and leisure facilities.

As an example, we can cite the projects of the campuses of the Moscow Institute of Steel and Alloys (Moscow) and the Moscow Polytechnic University (Moscow), involving the relocation of all or part of the facilities to new territories, as well as projects of interuniversity campuses in Perm and Tomsk.

As for the choice of the optimal territorial location and spatial planning arrangement, the existing trend consists in creating compact campuses in the suburban area, both when constructing new universities and developing existing ones. However, it is quite difficult to state unequivocally that this type of spatial planning arrangement of campus is optimal. This issue requires more in-depth consideration in the framework of a particular study (Tymkiewicz y Winnicka-Jasłowska y Fross, 2018).

5. CONCLUSION

This article examines the features of the spatial planning arrangement of campuses in different countries, compares Russian university complexes with the campuses of universities in Europe and North America, as well as considers their distinctive features and historical prerequisites of their formation. It is noted that many world-class universities are associated with a special spatial planning arrangement of the territory, comprehensive solution of the university campus, and its versatility. Currently, there are not many universities in the Russian Federation that are characterized by a comprehensive urban development solution. At that, most universities face challenges in expanding. Issues related to the spatial development of existing complexes and the justification of the optimal spatial planning arrangement of university campuses require consideration of their architectural and urban typology and the study of the features of each campus type.

An architectural and urban development typology proposed in the course of the present work, as well as features of each of the selected campus types described, can be used in the design of new and development of existing university campuses. The typology is proposed based on two criteria: location of the campus relative to settlements, and spatial planning arrangement. In general, depending on the spatial planning arrangement, university campuses are divided into three types: dispersed, dissected, and local. Depending on the location relative to the settlements, three types of university campuses are distinguished: those

located in metropolitan areas, largest and large cities, as well as in medium and small cities, and outside of large settlements in the suburban area.

The authors have considered issues related to determining the spatial development path of existing complexes and substantiating the optimal spatial planning arrangement of university campuses. In general, four ways of the spatial development of existing universities are identified: purchasing facilities in the adjacent territory to expand the existing campus; placing the necessary additional facilities in the adjacent and other areas of the city, i.e., integrating into the urban environment; creating an additional campus in a remote territory (often in the suburbs); and moving all or part of the university facilities to a new campus with a full-fledged infrastructure in another area of the city or suburb.

Analysis of architectural and urban types of university campuses and their spatial development paths allows considering this process as successful and promising in general, and for the Russian Federation, in particular. This process involves creating compact campuses in the suburban area when constructing new universities or expanding existing university property complexes.

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