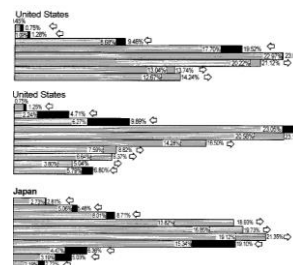


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INTRODUCING THE CONCEPT OF THE "GEOMETRIC STANDARD OF LIVING PREMISES" IN CREATING A MODEL OF ITS SUSTAINABLE DEVELOPMENT

WPROWADZENIE KONCEPCJI „GEOMETRYCZNEGO STANDARDU POMIESZCZENIA MIESZKALNEGO” W TWORZENIU MODELU JEGO ZRÓWNOWAŻONEGO ROZWOJU

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ABSTRACT

Most contemporary housing is characterized by increasing visual quality, but that has not stopped the short period of its existence of new ones and the growing number of empty or temporarily used apartments around the world. The article aims to propose using the concept of the "geometric standard of living premises" acquiring knowledge about the living conditions of modern households and their activities and behaviors in the existing premises of the state. As evidenced by the practice of its use in pilot environmental studies, its use can be fruitful in creating local models of stable geometric development of the environment.

Keywords: premises, housing, standard, household.

STRESZCZENIE

Większość współczesnego budownictwa mieszkaniowego charakteryzuje się coraz większą jakością wizualną, co jednak nie powstrzymuje krótkiego okresu istnienia nowych budynków i rosnącej liczby pustych lub tymczasowo użytkowanych mieszkań na całym świecie. Artykuł ma na celu zaproponowanie wykorzystania koncepcji „geometrycznego standardu pomieszczenia mieszkalnego” w celu zdobycia wiedzy o warunkach życia współczesnych domostw oraz ich działalności i zachowaniu w istniejącym pomieszczeniu państwa. Jak pokazuje praktyka jego stosowania w pilotażowych badaniach środowiskowych, wprowadzenie pojęcia może być owocne w tworzeniu lokalnych modeli stabilnego geometrycznego rozwoju środowiska.

Słowa kluczowe: pomieszczenie, mieszkanie, standard, domostwo.

1. INTRODUCING THE CONCEPT OF THE "GEOMETRIC STANDARD OF LIVING PREMISES" IN CREATING A MODEL OF ITS SUSTAINABLE DEVELOPMENT

Compared to the era of modernism, which preferred using mass-produced housing to meet the generalized needs of the average consumer, most contemporary postmodern housing is characterized by increasing visual quality. The richness of the forms of single-family houses and the diversity of the appearance of the facades of high-rise apartment buildings, which today resemble artistic sculptures and contemporary abstract paintings, has not stopped the growing decline in their quality, which is demonstrated by the short period of its existence of new ones and the growing number of empty or temporarily used apartments around the world. The architectural quality of the apartments under construction is primarily related to the problem of geometric stability of the premises of the state. It is believed that bringing the form, structure, and parameters of living premises closer to the dynamic spatial transformations in households' style, mode, and economic existence increases their quality. The geometric image of the apartment used today was created by architects at the beginning of the last century. Their presence in the local environment and constant contact with the inhabitants allowed for an individual and precise approach to the design of rooms that, due to their isolation from the surroundings and the difficulties associated with observing their internal functioning, needed such contact. Gradually, this bond between the architect and the environment became longer and longer. The need for rapid mass construction and the lack of information about the effects of such geometric transformations inhibited the parametric development of apartments in the direction of approximating them to the capabilities and needs of specific residents. New digital instruments, the appearance of which we owe to the current information revolution, can renew the designer's contact with reality. The article aims to propose using the concept of the "geometric standard of living premises" in interdisciplinary research-oriented acquiring knowledge about the living conditions of modern houses and their activities and behaviors in the existing premises of the state. As evidenced by the practice of its use in pilot environmental studies, its use can be fruitful in creating local models of stable geometric development of the environment.

2. MATERIALS AND METHODS

The study used traditional methods of analyzing official statistical information presented in annual reports, sample surveys, and guidelines for describing the geometry of living premises of private housing units in Japan and America. The choice of these two countries for the analysis is justified primarily by the use of similar methods for describing housing, as well as the completeness, and regularity of their carry-out. A similar study of the living conditions of the European population can only be carried out subject to the development of a universal concept of living premises for it.

3. THE SOCIAL ESSENCE OF THE HOUSING PROBLEM

The process of constant geometric transformation of living premises is today considered as one of the necessary means that allows the country's population to adapt to their place of residence, with the hope of acquiring better housing that provides a more prosperous, safe, and dignified life. Until the middle of the century before last, determining the boundaries of the size and structure of living premises was not a separate subject in scientific research. At that time most of the internal premises in newly constructed buildings which were oriented toward the accommodation of workers into episodic, irregular, and temporary industrial settlements had been transformed. The geometric image of their living premises was transformed from the traditional spatial concepts created by the culture of the Enlightenment about the quality of shape, scale, and style of housing (Booth, 1894; Kozerenko, 1928).

The new type of mass industrial production changed the economic structure of society, highlighting among numerous low-income social groups a small segment of the households with a sufficiently high level of financial capabilities, capable of purchasing more high-quality living premises with a new geometric shape and equipped with sophisticated engineering innovations, causing an unprecedented social gap in living conditions in the population. This gap intensified when at the end

of the XIX centuries, most of the rooms in the relatively small traditional residential buildings that make up the landscape of many European cities, which long time served as a convenient place of rental residence for several generations of urban households with an unchanged lifestyle which has been emerged in the Middle Ages yet, were in a short time crowded with a new wave of migrant from nearest villages who received the freedom of movement and lost their jobs with former land-owners.

The emergence of pockets of high-density living in cities with poorly developed engineering infrastructure has led to the spread of crime and morbidity. The current situation contributed to various political views seeking to correct the current situation, which was called the “housing problem”. Some radical ideologists proposed solving the problem by destroying private property; others relied on its total extension to all movable and immovable property (Engels, 1845). One can see the solution in the mass construction of small private estates, differing in the economic capabilities of the owners, others believed that all settlements in the country should live in apartment buildings, which the state should provide to different social groups. Le Corbusier's Marseille Unit and Frank Lloyd Wright's Kaufman House became icons of that's opposition spatial concepts of the last century.

The practical use of the idea of centralized economic management, which some Eastern European countries have tried to implement for several decades since the beginning of the XX century, led in the 90s of the last centuries to a departure from the policy of socialization of real estate in favor of the idea of total privatization. After three decades of developing the real estate market, these countries are faced with a “housing problem” again. Although the average living area per capita in these countries has increased, thanks to the slowdown in population growth, a significant proportion of living premises in these countries remained unoccupied during the year. At the same time, the structural frame of many reinforced concrete buildings of mass construction, the active construction of which took place in the middle of the last century, designed for a half-century service life, has significantly deteriorated, increasing the need for their restoration.

Even though statistical studies of the European housing stock do not yet have a unified methodological basis for its description, estimated data on the level of living conditions of their citizens are causes for concern. In the European Union, almost every sixth citizen (17.5%) lived in overcrowded housing, and more than half of the population (54.8%) continued to live in buildings represented by detached housing units (Eurostat, 2022). Many of them were built in the post-war years, with the geometric characteristics of living premises that proved ill-suited to modern lifestyles.

Countries that embarked on a policy of privatizing construction production and strengthening the housing market decades earlier than Eastern European countries also faced a “housing problem”. This time, the reason was periodic financial crises, which led to a decline in construction, which also increased the proportion of empty dwellings in them, giving rise to a constantly increasing distance between different living conditions of the population, and narrowing the availability of many households to the purchase the appropriate premises for them (Schwartz, Tsenkova, 2022). In the United States, the supply of new residential premises has declined since the transition to private construction in the early 1970s. In this country, where the average housing supply at the beginning of 2020 was about 100 square meters per person, not the entire population has a private room for sleep (United States Census Bureau, 2020).

The task of the housing problem at the beginning of the last century was to get rid of poor-quality construction by creating a single universal geometry of living quarters in all parts of the world, which might bring the global unification of the lifestyle. At the end of the century, that led to the formation of empty and abandoned buildings, slowed down economic growth, and unjustified exploitation of natural resources. The solution to the housing problem of the new millennium is increasingly connected with the creation of geometrically diverse residential premises with a long and stable lifespan, which could allow different social communities to develop their way of cultural adaptation to the dynamic development of the local environment.

One of the main reasons preventing the formation of a model of balanced development of living premises is the lack of a unified systematization of housing that would be able to represent all their diversity, which arose under the influence of natural and social changes. Although the description

of dwellings has always been a subject of public interest, systematic studies of this cultural phenomenon appeared only in the mid-19th century, thanks to the development of scientific anthropology, which discovered a huge variety of historical and territorial forms of living premises.

At the beginning of the last century, only some large European capitals had sufficient general information about the number of residential premises, their area, and the number of rooms (Kozerenko, 1928). The consequences of the First World War and the major financial crisis of the 1930s stimulated the carrying out of regular statistical descriptions of residential premises in economically developed countries (United States Census Bureau, 1975). Since the mid-twentieth century, American and Japanese statistics have used the concept of "housing unit or dwelling unit" as the most common form of housing, covering about 95% of all various forms of residence. The living premises (quarters) in such housing units are structurally separate parts of the buildings, usually consisting of several rooms with varying degrees of engineering equipment, with an entrance door that allows them to be isolated from general communications. If a person or group of persons (most often represented as families) could maintain such premises, then it was defined as "private households" (United States Census Bureau, 1940-2012; Statistics Bureau Ministry of Internal Affairs and Communications, 1940-2012). The introduction of these concepts in several population censuses made it possible to judge a significant improvement in the living conditions of the population, due to the correspondence of the number of apartments to the number of families. Most economically developed countries were able to achieve such a balance between the number of housing units and the number of private households in the mid-twentieth century.

It was believed that the proposed method of out cup the living conditions in the housing of different countries based on calculations of the number of housing units and private households would reveal the general picture of the living conditions of the population in them (UN, 1968; Conference, 2015; Page, Struyk, 1990). For states whose housing construction was formed under the influence of a historically stable geometric image of living premises, which arose based on the spread of global modern culture, this method of describing the living conditions of the population has taken root. However, in countries that have preserved a traditional wide socio-territorial diversity of housing forms, its use has proven difficult (USSR Housing Fund, 1928; Federal State Statistics Service, 2005). The governments of Eastern European countries believed that the quality of housing could be determined based on the calculation of the total area of living premises per capita of the country. This characteristic only demonstrated an increase in the number of apartments and hid the real inequality in the use of it, giving rise to the question of finding qualitative indicators of housing premises.

For modern countries, a holistic description of the dynamics of the geometric characteristics of living premises and the characteristics of their use by the population remains unknown, which does not allow them to be used to improve the quality of housing design. Therefore, more detailed statistical information collected in recent decades on the transformation of the geometry of living premises of the housing units in Japan and the United States allows only a first step to acquaintance with some general features of the modern development of housing, which could in the future become the basis for the formation of a general model of its sustainable development.

4. GEOMETRIC TRANSFORMATION OF LIVING PREMISES LOCATED IN THE HOUSING UNITS OF JAPAN AND USA ACCORDING TO POPULATION CENSUSES OF RECENT DECADES

Despite the uniqueness of the cultural and economic development of Japan and the United States, similar features in the geometric transformation of their living quarters can be found thanks to regular population censuses and inventories of possessions, which carry out from the middle of the XX century.

A slowdown in the growth of the number and size of living premises is a characteristic feature of the transformation of private housing units in both countries, despite differences in the definition of these concepts in conducting regular (every 5-10 years) statistical surveys (Fig. 1). Periodic financial crises associated with the peculiarities of the development of the real estate market and the

characteristics of the development of the economies have led to a decrease in the supply of new living premises in construction. The increase in the US population due to a more open migration policy compared to Japan did not significantly affect the pace of residential construction. The demographic factor associated with the gradual increase in the number of nuclear households continues to influence the formation of the need for new housing units.

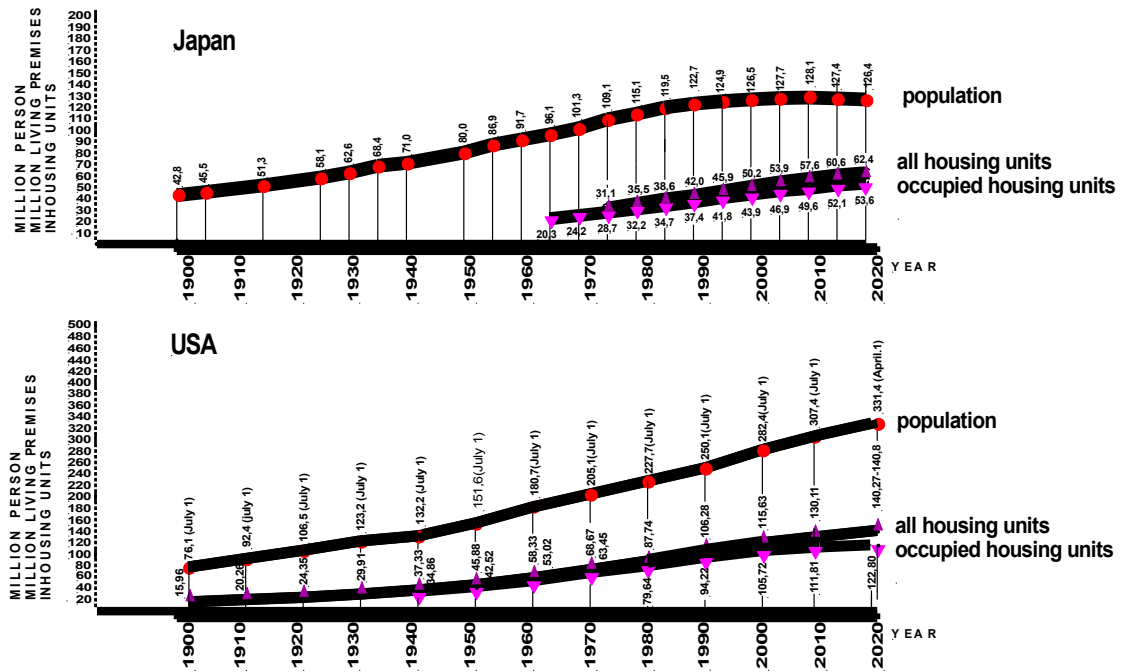


Fig. 1. Dynamics of Japanese and USA population and housing units based on data from statistical yearbooks. Source: Japan Statistical Yearbook, 1940-2022; Statistical Abstract of the United States, 1940-2012; 2020

The stability of demand and the peculiarities of urban planning policy that determine the allocation of plots for new construction have led to the development of more expensive forms of multi-story construction, which has affected the increase in the cost of housing and reduced the chances of improving living conditions. In Japan, over the past half-century (period 1958 – 2018), the share of detached dwelling units (estates and mansions) has decreased from 77.2% to 53.01%. In the United States, where detached housing units continue to be the main traditional form of household residence, their share has decreased over the last decade (period 2009–2019) from 68.4% to 64.1%. Although the proportion of stationary detached residential buildings located on owned land, consisting primarily of one multi-room dwelling unit, is declining, the complete disappearance of this form of housing is not expected in the coming decades.

The revolutionary ideas of modernist architectural visionaries, who argued that apartment buildings were the future, did not fully materialize. Even in Russia, where since the middle of the last century authorities have limited the construction of detached housing units, called individual residential buildings, they have not disappeared completely in the country's major cities. During the first all-Union population census (December 17, 1926), the former USSR found that 81.9% of all housing buildings belonged to private owners, whose households lived in single-family detached houses (USSR Housing Fund, 1928). At the beginning of the new millennium, after the privatization of all living premises, only 25.9% of the Russian population lived in homes of this type (Federal State Statistics Service, 2005)

With the change in housing policy in Eastern Europe undertaken in the last decade of the last century, which began to focus on the creation of a real estate market the proportion of the population living in detached houses might increase. The advantage of quick construction of such a house and

the possibility of less expensive reconstruction will maintain the demand for this geometric type of house, which is the main competition for multi-apartment housing. The war in Ukraine showed the vulnerability of high-rise construction when the impact of one bomb puts hundreds of apartments out of use. With the increase in territorial mobility of the population, the share of detached or stationary housing units will remain in the future.

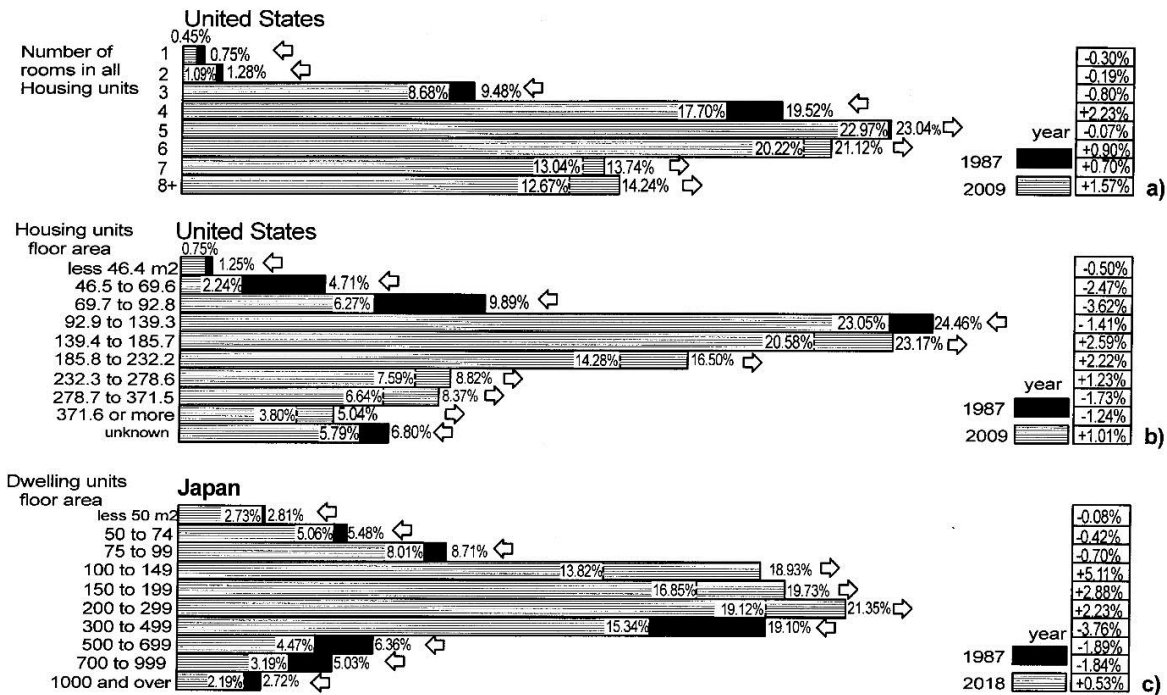


Fig. 2. The dynamic changes in the geometric structure of living premises in the housing units in the USA, and Japan during the last decade. Source: Japan Statistical Yearbook, 1940-2022; Statistical Abstract of the United States, 1940-2012, 2020

A gradual increase in the area and engineering equipment of living premises against the background of a moderate increase in the number of rooms in them can be traced among the entire set of private housing units in both countries.

In recent decades, changes in the US housing stock have been characterized by a steady increase in the average area and number of rooms among all types of private housing units. Between 1987 and 2009, the average number of rooms in the country's housing units increased from 5.3 to 5.6. The reason for these changes was the decrease in the number of small-room apartments. During this period, the share of residential premises with four or fewer rooms decreased from 31.0% to 27.3% (Fig. 2a). At the same time, the share of apartments with an area of less than 139.4 m² decreased from 40.3% to 32.3%, allowing many families to live in spacious dwellings (Fig. 2b). The increase in the average area and the number of rooms in residential premises was not affected by the average decrease around the plot, which during this period showed a tendency to decrease from 1578 to 1457 m² (United States Census Bureau, 1940-2012).

Although over the past twenty years (1988-2008) the average number of rooms in Japanese private housing units has decreased from 4.9 to 4.7, they have increased significantly in size. After the construction boom of the 80s, construction companies began to focus on the demand for apartments with fewer rooms, but with a larger area. During this time, the average floor area of all housing units in Japan almost doubled (from 50.6 m² to 94.1 m²), even though the average area of land on which detached housing units were located decreased (from 293 m² to 285 m²).

The share of large-area residential premises (more than 300 m²) over the past three decades has decreased in Japan from 33.21% to 25.19% (Fig. 2c). The sharp elimination of large-area housing units, which have traditionally been a sign of family well-being, is caused by a sharp increase in the costs associated with the maintenance of such real estate. In addition, plots of this size can easily be sold separately, which, given their location in the existing urban area and the rising average price, is of commercial interest.

In the USA, the share of large housing units (more than 278.7 m²), about 10.44% in 1987, increased in 2009 to 13.41%. Interest in acquiring large plots to construct residential premises with large areas remains relevant for many American investors. It can be assumed that large-scale dwellings will remain the activity subject for the next generation of American architects (Fig. 2b, 2c).

In addition to the trend of increasing spatial independence of the home, which is observed with increasing living space, American and Japanese homes are becoming more equipped, which also increases their spatial autonomy. More than half of all American homes occupied during the year (51%) had two or more bathrooms (United States Census Bureau, 1940-2012). In Japan in 2013, more than half of all bathrooms were equipped for independent use by older adults, and 16.2% were wheelchair accessible (Statistics Bureau Ministry of Internal Affairs and Communications, 1940-2012).

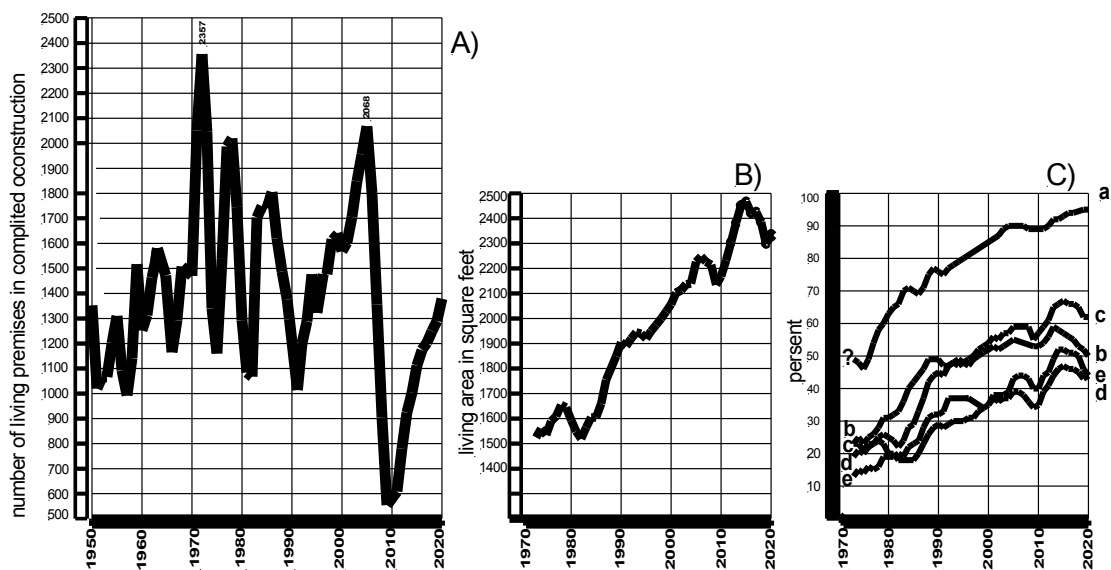


Fig. 3. The productivity of the housing sector and the geometric characteristics of housing units in new construction in the United States based on data from statistical yearbooks. A - The number of completed dwellings. B - The average floor area in built housing units. C - The share of housing units: a - equipped with air conditioners; b - located on two or more floors; c - more than 4 bedrooms; d - a floor area of more than 2400 sq. ft.; e - two or more bathrooms. Source: Japan Statistical Yearbook, 1940-2022; Statistical Abstract of the United States, 1940-2012, 2020

The increase in the geometric parameters of living premises in new construction also represents a characteristic trend in the quality evolution of the housing units, which is developing along the path of increasing the level of its spatial isolation from the surrounding natural and social environment, despite the decreasing the average number of people in the households. Although the process of reduction in family size observed in the middle of the last century, caused by a decrease in the birth rate and an increase in life expectancy, remains a characteristic phenomenon of modern demographic development, its activity has slowed down. At the beginning of the new millennium, about 60% of households in Japan and the United States consisted of one or two people. Together with households consisting of three or four people, they represented not only the main form

of modern shared accommodation but also continued to be the main clients of real estate agents seeking suitable residential premises in primary and secondary markets.

In the last century, the increase in the pace of housing construction was predetermined by each generation's desire to acquire their living premises, represented mainly by married couples. Nowadays, this desire is inherent in every adult. Only due to the presence of a fairly long period associated with parenting and a high level of mutual assistance and support between household members, the needs remain for the construction of new family living premises.

Today, in many countries, the annual increase in the number of living premises is happening due to new construction amounts to several percent of the total number of available housing units. The physical elimination of housing is carried out mainly through the demolition of dilapidated buildings, the share of which in the housing stock of countries is gradually decreasing. A change in the function of living premises, associated with the transformation into non-residential premises, or caused by the need to use non-residential premises as dwellings, also remains a relatively rare phenomenon. Only during periods of social or natural disasters does their share temporarily increase.

Despite cyclical changes in the need to transformation of living premises according to the circle of life households the market of new construction remains the main resource in improving their quality. Over the past century, in the United States, except for steady growth in new construction from 1991 to 2008, the housing construction sector of production has regularly experienced periods of recession and recovery in every decade.

The new crisis that occurred in 2008 was characterized by the lowest volume of housing construction since the Great Depression, which did not reduce the supply of living premises with increased geometric parameters (Fig. 3A). In the middle of the last century, construction companies, satisfied with the increased demand of buyers, were able to produce residential premises that met more average requirements, which was expressed in some unification of geometric parameters. However, during periods of economic crises, the number of clients decreased, which forced companies to target a narrower group of wealthy clients, offering them larger living spaces with more modern equipment.

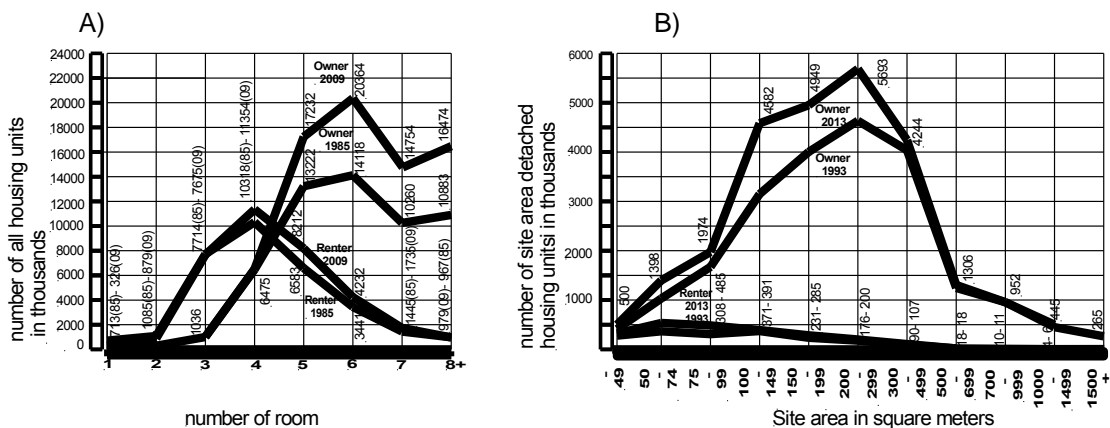


Fig. 4. Dynamics of the number of rooms in housing units of various forms of ownership in the United States - A, and the number of plots of various sizes in rented and owned dwellings in Japan – B. Source: Japan Statistical Yearbook, 1940-2022; Statistical Abstract of the United States, 1940-2012, 2020

In the USA, a series of economic crises forced construction companies to move away from the production of standard housing with narrow geometric parameters to more expanded and diversified living premises with a larger area, number of rooms, and equipment. Over the past fifty years, new American housing has increased its area by almost one and a half times (Fig. 3B). The number of homes with more bedrooms (4+) and bathrooms (2 or more) nearly tripled and accounted for nearly half of the homes built in the United States during this time (Fig. 3C).

The increase in the proportion of “dispersed living premises” is a relatively new phenomenon, generated by recent social transformations in society. Privatization policies and increased economic opportunity to purchase new living premises have allowed some households to own more, than one housing real estate. This permits the possibility of arranging a close-separated form of accommodation, often found among complex families (consisting of several generations or including one of the parents of a married couple). However, in addition to purchasing a vacation country house for a seasonal holiday, households also sought to use additional living premises for renting them out. This type of housing, which consists of several structurally separate living premises owned by one household, is commonly referred to as “dispersed housing tenure”.

The most common form of such premises found among East European households is often the result of home remodeling caused by the emergence of a young married couple who want to live close to their parents. It is also not uncommon for an apartment building to have several rented apartments next to the owner’s apartment. To meet the demand for such requirements, some architects proposed in apartments of high-rise housing the arrangement of living premises with several entrances with additional bathrooms. In their opinion, that allows the living premises divided and joined in the case of demographic or economic development of households, which began to be called “pass-through apartments” or “housing with a flexible layout” (Schroder, 1980).

The form of ownership also influences the choice of geometric parameters of living premises under construction and choosing among existing ones. In the United States, the share of households living in their own homes was about 46.7% at the beginning of the last century. The events of the First World War led to a decrease in this figure to 45.6%. After the country’s economic recovery in the 1920s, the share of owned homes increased to 47.8%. The Great Recession forced a significant portion of Americans back into public rental housing. In 1940, only 43.6% of the population lived in their own home (United States Census Bureau, 1975). After World War II, the share of own housing increased sharply, and the following several economic crises didn’t stop the slow growth of the share of own housing, which reached 68.9% in 2005. The last economic the United States crisis led to a reduction in the share of owned residential premises in 2019 to 64.1% (United States Census Bureau, 2019).

In Japan, which retained state-owned construction corporations, changes in the proportion of households living in their dwellings occurred with a smaller range of changes. The share of own housing in the country’s stock in the first post-war decade (1948-1958) gradually increased from 67% to 71.3%, but during the periods of the two subsequent major economic crises, it decreased, reaching 58.1% (1978) and 59 .8% (1993). Five-year housing inventories carried out after 2000 year revealed minor cyclical changes in the growth of the share of own housing, amounting to 61-62%, due to the presence of large companies providing housing for rent on the housing market.

The influence of ownership on the consumer qualities of living premises in the country’s housing stock and new construction can be traced to all types of housing. As evidenced by statistical analysis of the development of detached housing units in the United States, the average area, number of rooms, and equipment of living premises are increasing faster compared to rental ones (Fig. 4A). A similar situation is observed in Japan, where the dynamics of the size of plots for owned and rented individual housing differs significantly. (Fig. 4B).

The rise in housing prices remains the main obstacle to the necessary change of housing to meet the dynamics of the demands placed on them, determined by different stages of the household life cycle. Young people, with greater territorial mobility, are more likely to change their place of residence and are more likely to use smaller homes, compared with middle-aged households, which are characterized by stable living in larger living spaces that better suit their lifestyle. In old age, dispersed forms of living premises become more acceptable, connecting their housing with specialized rental housing located in special institutional institutions.

An increase in life expectancy, the development of communications, and a variety of forms of employment have changed the modern way of life of households, expanding the territorial area of their stay in the country’s residential premises. Already at the beginning of the 1980s, the number of additional and temporary dwellings in Europe accounted for almost a tenth of all occupied dwell-

ings. In some countries, such as the USA, Canada, and Australia, their share was higher (Durmanov, 1992). The desire to own or rent a second home, located at a considerable distance from the main place of residence (in the suburbs, in another city or country), was a reaction to dissatisfaction with the geometric quality of urban housing, which did not allow for rapid adaptation of the lifestyle of new citizens who moved to city apartments from less urban developed areas or countries.

The rise in so-called dispersed forms of housing (extra-owned or rented housing) has led to an increase in vacancies throughout the year. The share of such dwellings in the housing stock in Japan increased from 10.94% to 14.09%. (1988-2018). In the United States, it increased from 11.6% to 13.6% (1987 -2007), and then decreased to 11.6%, amounting to 15.6 million housing units in 2021. In addition to the fact that empty dwellings are mainly represented by residential premises located in older buildings, have a smaller area, and simplified engineering equipment, they perform a reserve role. During periods of economic downturns, they are a source of compensation for housing shortages and restrain the price rise.

Although Japan and the United States regularly collect information about the basic characteristics of homes and the people living in them, the data provided does not allow us to assess the quality of their lives. The question of how living quarters are distributed among modern social groups continues to remain poorly understood. If we take into account the hypothesis that the creation of artificial structures by people is based on the conscious convergence of their geometric image with the spatial way of life, then finding integral indicators of their quality becomes relevant for those countries that seek to develop a model of sustainable development to solve the "housing issue" (Durmanov, 1992).

5. GEOMETRIC STANDARD OF LIVING PREMISES

Two decades later, after the implementation of a policy of mass standard construction began in the mid-50s of the last century in several countries in Eastern Europe, about a thousand large construction plants were created focused on the construction of several types of prefabricated concrete buildings (mostly 5 floors) for all part of countries. It began to be realized that the housing problem could not be solved by the constantly reproducing one geometric image of an apartment. Already in the first years of occupancy of such apartments with a small area and a minimum set of engineering equipment, the negative social consequences of such a policy began to appear (an increase in the number of families who turned to the authorities with a request for relocation, unauthorized reconstruction, and re-equipment of premises, an increase in the number of complaints related to the behavior of residents, caused by the proximity of apartments, etc.). The current situation required a change in approach to solving the housing problem, which initiated the expansion of scientific research in the field of housing construction. In the early 70s, countries with centrally controlled economies began collecting sociological information about the living conditions of the population to create a balanced model of housing construction (Kartashova, 1974; 1982; 1985; Kruusvall, Heidmets, 1986; Kiyanenko, 1999).

The conducted studies showed that the main reason for household dissatisfaction with the parameters of residential premises is the discrepancy between their geometry to the everyday processes implemented in them (Durmanov, 1992). The geometric dimensions and shape of a mass apartment created based on spatial ideas about the life of households, which developed in the middle of the 19th century, did not meet the requirements of Soviet households of the middle of the last century. The desire to find a relationship between the characteristics of household activities and their demographic characteristics led to the study of the everyday processes they carry out in their homes. The collected factual material made it possible to formulate the concept of the "**functional areas**" of the process, which represented the composition of the parameters necessary for its implementation (Zvezdina, Blashkevich, 1978). Further practical application of this concept influenced the procedures for assessing the quality of housing at the design level and clarified construction laws and regulations.

The gradual formation of ideas about the spatial lifestyle of modern households coincided with the spread of new information technologies. However, the level of their development did not significantly improve the methods of collecting statistical information, which didn't make it possible to create a clearer and publicly accessible picture of the living conditions of the population while. Considering that the quality of residential premises can be determined based on the relationship between the geometric characteristics of housing units and the socio-demographic characteristics of households, represented by their size, financial status, type of household behavior, as well as cultural orientations, in the late 80s, the attention of researchers focused on the search for a **“geometric standard of living premises.”**

Its definition provided for an analysis of the spatial characteristics of the population's life activities based on the geometric properties of the premises in which they are implemented. The collection of such information involved obtaining data on the location and conditions of household processes, along with information reflecting the attitude of household members to their homes. The information obtained made it possible to identify the actual and desired level of spatial characteristics of the geometric image of living premises (isolation, independence, autonomy, etc.) and to assess the degree of its influence on the lifestyle of households. As a rule, during the life cycle, households go through various stages of development, characterized by a change in the spatial image of life activity, which leads to a change in its volume and structure, which served as the basis for identifying different geometric standards of living premises.

Initially, the standard of living premises was supposed to be determined by the composition of six main functional areas associated with sleep (1), rest (2), storage of clothes and household appliances (3), cooking (4), eating (5), and hygiene procedures (6). Based on data on the nature of household activity, and the household's needs for room parameters required at different stages of their life cycle, it was possible to establish **a minimum standard of living premises**. As further research showed, living in minimum-standard apartments could satisfy the needs of only a small group of households and for no more than a few years.

For the geometric organization of residential premises to allow for a more expanded range of life activities, the development of **medium and high geometric standards of living premises** began. It was proposed to determine them based on an analysis of the geometric properties of the premises, providing for the appearance of additional functional zones in them, which could increase the viability of such premises for a longer period (Liska, 1990). Further clarification quality of the living premises was developed in the direction of considering the engineering equipment of residential premises and their spatial organization.

According to this method, the minimum standard of such a living space for a private household consisting of one person living in a city apartment rented from the state, in which he could carry out the necessary life processes, was 30-35 m², allowing for compact and convenient placement modern engineering equipment (toilet, washbasin, bathroom) and the main furniture that it was being made up the bedroom, kitchen and living room. Living premises with a smaller area were classified as a lower standard, and premises with an area of 35-45 m², allowing a single person to arrange two living rooms, were classified as average. The high standard of living premises space provided for a person to live in a city apartment with an area of more than 45 m². This approach made it possible to consider the quality of living premises in the apartment as a relative socio-spatial phenomenon, in which its geometry, along with other properties of the room, depends on who uses it and how.

In Japan, which already introduced the concept of a geometric standard at the end of the 70s, assessment of the quality of living premises was based on the classification of housing according to **a minimum and target standard**. The definition of the Japanese standard was originally based on the size of a tatami, a traditional sleeping area for one person (about 1.65 m²). The minimum standard of residential premises, in addition to the necessary engineering equipment, provided for the presence of bedrooms and kitchens, depending on the number of households, their age, and gender. Typically, such rooms ranged in size from 4.5 to 6.0 tatami. By the target standard of living, the bedrooms and kitchens were expanded to 8 and 10 tatami mats, allowing for dining areas in the kitchen and study areas in the bedrooms. In addition, to classify residential premises as meeting

this standard, requirements were introduced to place a bed in a separate room from an early age for children and adults (Statistics Bureau Ministry of Internal Affairs and Communications, 1980).

The 1978 census showed that 9.5% of housing units in Japan belonged to under minimum standard of living premises, and 32.9% of all privately occupied living premises did not meet the target standard as a condition for long-term living. This meant that despite the high average housing supply in the country (about 20 m² of floor area of a housing unit per Japanese resident), which presupposes the presence of a private bedroom; a significant part of the population did not have one (Statistics Bureau Ministry of Internal Affairs and Communications, 1981).

The sharp increase of land area allocated by the state in the late 70s for private housing construction led to a decrease in prices for Japanese housing, which reduced the volume of new construction since its acquisition ceased to serve as a means of increasing their financial capital. However, the relocation of leading corporations abroad increased the income of some households that were able to purchase expensive real estate, which led to unreasonable demand for it, causing a sharp rise in prices. After the bubble burst in 1990, the Japanese housing sector entered a period of slow growth, necessitating a new, more accurate statistical method for assessing housing quality.

The introduction of new legislation in Japan, passed in the first decade of the new century, provided for new geometric standards. The minimum standard of living space per person in an apartment building was to be at least 25 m², and the target was 40 m². For two-person families living in such apartments, the minimum standard was 30 m² and the target was 55 m². For a single person living in a separate house of their own, the minimum standard of living space was determined to be 55 m², and for a family of two people, 75 m². Determinations of the geometric standard of residential premises for other types of households are supposed to be determined using specially developed formulas. This approach involved assessing the quality of the country's living premises and setting the goal of providing most of the Japanese population with high-quality living quarters of the target standard (Markaryan, 2013).

6. DISCUSSION

Living premises, as a dedicated part of the material environment, intended for various forms of living of people, is an integral condition of their life. It is designed to restore their vitality, based on the biological need for sleep, rest, family creation, and housekeeping. The mobile way of life characteristic of the early stages of tribal evolution of communities led to the emergence of the primary form of living quarters - "ephemeral dwellings", which were open or semi-open temporary sites, which are still preserved today by a small group of Aborigines and homeless people (Schoenauer, 2000; Severin, 1975).

During the formation of the first collective dwellings, and then city-states, stationary forms of residential premises, characterized by significant local geometric diversity, developed. With the advent of empires, two forms of use are distinguished. The first represents their own homes, the second focuses on various forms of providing housing in exchange for services performed by their tenants. Over the following millennia, the geometric characteristics of these types of buildings took on different sizes, shapes, and styles, trying to adapt to the changing lifestyle of households most effectively.

Initially, geometric changes in own or rented detached houses (villas) could be carried out using relatively simple methods. With the advent of multi-story and multi-room urban dwellings (insula), such adaptation proved difficult. Over the centuries, both forms have experienced geometric transformations, forming quite large and fairly stable territorial formations, represented by modern agglomerations or metropolises. The growth in the economic well-being of households and the development of information and transport communications have led to the possibility of households acquiring residential premises located in several residential buildings, often located at a considerable distance from each other. Increasing territorial mobility and the desire to view housing as capital is a characteristic phenomenon of the lifestyle of modern households, forcing architects to be more attentive to expanding the diversity of their forms (Piketty, 2014).

The profession of an architect was initially based on the desire to expand knowledge about the global and local properties of the place of residence. Since the advent of the widespread dissemination of visual information, which became global in the twentieth century, universal generalized patterns seemed sufficient to form universal ideas about what needs to be built. In conditions where the solution to urgent problems depends on specific environmental conditions, knowledge of local conditions for its implementation becomes of great importance.

Today, the solution to the “housing problem” is seen in the formation of a sustainable model of geometric development of residential premises, based on integrated indicators of housing provision for the population. One of the indicators describing the state of housing security can be the geometric standard of living premises, which allows us to establish a connection between the typological diversity of households and local types of housing. Discoveries in the field of additional design intelligence will be able to conduct such assessments with greater frequency and accuracy, which would help to come to a deeper understanding of the phenomenon of the evolution of environmental geometry.

7. CONCLUSIONS

1. Residential buildings similar in appearance can today be found on all continents. The industrialization of construction and the spread of mass culture, thanks to the emergence of new information technologies, contributed to the formation of a global geometric image of living premises. Generated by the consequences of two world wars, which contributed to the development of mass production technology, it successfully took hold in the professional consciousness, which accepted the postulate that an increase in the number of rooms and an increase in their floor area would solve the “housing problem.” Even the desire to individualize demand through the privatization of housing did not lead to the elimination of it. Recent statistical studies in two economically developed countries indicate the need to create a more advanced theoretical model of housing that meets the principles of sustainable development.

2. To understand the results of post-war housing policy, several countries began to describe the geometric characteristics of residential premises based on regular population censuses and housing inventories. The information obtained allowed them to assert that over the past decades, the number, size, and equipment of private living premises in housing units in Japan and the United States have gradually increased while the average size of the households living in them has decreased. Living premises continue to change their quality in the direction of creating increased spatial independence and autonomy.

Privatization of the housing sector initially increased the volume of new construction, but crises forced construction companies to focus on a small group of wealthier customers. Most of them began to consider residential premises as one of the ways to save their financial assets. Therefore, the decrease in the average size of households and financial crises did not significantly affect the principal trend of the development improvement of the quality of housing, but they changed the attitude towards it, which was manifested in a change in its structure. Small-sized housing and large estates began to gradually lose their inhabitants, increasing the proportion of empty dwellings. At the same time, increased mobility of the population led to an increase in temporarily empty dispersed residential premises, therefore statistical recording of housing possessions again became relevant, as was the case at the end of the 19th century.

3. In most European countries, statistical data on the population and its housing are collected separately and often at different times, which does not allow for judging the geometric transformations of living premises and adjusting the design process. Without the practical use of a universal indicator of the quality of accommodation of the European population, the housing problem is unlikely to be solved in Europe. The use of the geometric standard of living premises as an integral indicator characterizing the quality of living conditions of the population could become a tool for studying its historical or territorial evolution. The development of digital technologies will make it possible over time to obtain more accurate and faster information about the dynamics of geometric parameters and properties of housing at all its hierarchical levels, which will become the basis for creating

a dynamic model of sustainable development of housing construction, bringing us closer to a deeper understanding of the evolution of this phenomenon and an early global solution to the “housing problem”.

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AUTHOR'S NOTE

The decision to start research on the housing problem was made after learning about the actual living conditions of residents during participation in the general population census conducted in 1970 in Ukraine, where students of the Faculty of Architecture of the Lviv Polytechnic National University participated as interviewers. Sociological investigations of the newly built apartments began in 1974, starting with the study of the attitude of urban households to their living conditions in high-rise buildings, as well as analysing the opinions of members of three-generation families (grandchildren + children + parents) to the apartments. In the 1980s, he participated in large-scale housing studies devoted to assessing the socio-psychological impacts of living (changes in activity, behavior, contacts) of the different social and demographic groups of households located in regions with different levels of urbanization and climate. He also participated in the organization of the first auctions of building plots in Ukrainian cities.

He reported on the results of housing studies at international university conferences in Almaty, Belfast, Bialystok, Bydgoszcz, Camagüey, Delft, Düsseldorf, Graz, Havana, Ivano-Frankivsk, Kyiv, Lviv, Moscow, Newcastle upon Tyne, Orlando, Santa-Clara, Stockholm, Tallinn, Yerevan, Uppsala, and Warsaw. Implemented projects and consulting activities are located in Alanya, Camagüey, Como Baden-Baden, Lviv its region, Moscow and its region, Scarborough, VIDAUBAN. He is the author of 3 personal monographs, 15 collective monographs, 8 books, and more than 60 scientific

articles published in Ukrainian, Polish, Spanish, English, and Russian. Being a habilitated DS (since 1992), and titular professor (since 1995) in the present time, he occupies a professor position at Bydgoszcz University of Science and Technology.

O AUTORZE

Zamiar rozwiązania problemu mieszkaniowego był podjęty po zapoznaniu się z rzeczywistymi warunkami życia ludzi podczas udziału w powszechnym spisie ludności, przeprowadzonym w 1970 roku na Ukrainie, gdzie studenci Wydziału Architektury Politechniki Lwowskiej uczestniczyli w charakterze ankieterów. Badania socjologiczne nad jakością nowo zbudowanych mieszkań rozpoczęły w 1974 r., zaczynając od opinii miejskich domostw do warunków życia w wieżowcach, a także podczas analizy opinii rodzin, składających się z trzech pokoleń (wnuki + dzieci + rodzice) o ich mieszkaniach. W latach 80-ch. brał udział w szeroko zakrojonych badaniach miejskich apartamentów, poświęconych ocenie społeczno-psychologicznych skutków (zmiana aktywności, zachowania, kontaktów), które powodowało zamieszkanie różnorodnych domostw w standardowych pomieszczeniach, lokowanych w różnych urbanistycznych i klimatycznych obszarach. Uczestniczył w organizowaniu pierwszych aukcji działek budowlanych w ukraińskich miastach.

Przedstawiał wyniki badań na międzynarodowych konferencjach w miastach Almaty, Belfastu, Białymstoku, Bydgoszczy, Camagueju, Delftach, Dusseldorfu, Grazu, Hawanie, Iwano-Frankowsku, Kijowie, Lwowie, Moskwie, Newcastle nad rzeką Tyne, Orlando, Santa - Clare, Sztokholmie, Tallinnu, Erewanu, Uppsale oraz w Warszawie. Zrealizowane projekty i działalność doradcza zlokalizowane są w: Alanya; Camagüey; Como; Baden-Baden; Lwów i jego obwód; Moskwa i region; Scarborough; Viduban. Jest autorem 3 personalnych monografii, 15 monografii zbiorowych, 8 książek oraz ponad 60 artykułów naukowych opublikowanych w języku ukraińskim, polskim, hiszpańskim, angielskim, rosyjskim. Będąc doktorem habilitowanym (od 1992 r.) i profesorem tytularnym (od 1995 r.), obecnie zajmuje stanowisko profesora Politechniki Bydgoskiej.

ПРО АВТОРА

Намір вирішити проблему житла з'явився після ознайомлення з умовами проживання людей під час перепису населення України, який проводився у 1970 році, де студенти архітектурного факультету Львівської політехніки брали участь як інтерв'юєри. Соціологічні дослідження якості новозбудованих квартир розпочав у 1974 році, починаючи з вивчення ставлення міських домогосподарств до їх багатопверхових будинків, а також аналізуючи думки членів трьох поколінних родин (онуки + діти + батьки) про їх квартири. У 80-х роках брав участь у масштабних дослідженнях житла, присвячених оцінці соціально-психологічних наслідків проживання (зміна активності, поведінки, контактів) різних типів домогосподарств у типових квартирах, розташованих у різних за рівнем урбанізації та кліматом регіонах. Приймав участь в організації перших на Україні земельних аукціонів.

Доповідав про результати житлових досліджень на міжнародних конференціях у університетах Алмати, Белфасту Білостоку, Бидгощі, Камагуею, Делфтах, Дюссельдорфі, Грацу, Гавані, Івано-Франківську, Києві, Львіві, Москві, Ньюкасл-апон-Тайну, Орlando, Санта-Кларі, Стокгольмі, Таллінну, Єревані, Упсали та Варшаві. Реалізовані проекти та результати консалтингової діяльності розташовані в Аланії, Камагуею, Комо, Баден-Бадену, Львіві та області, Москві та області, Скарборо, Відобан. Автор, 3 персональних монографій, 15 колективних монографій, 8 книг, та понад 60 наукових статей і виданих українською, польською, іспанською, англійською та російською мовами. Сьогодні, будучи доктором наук (з 1992 р., за радянською класифікацією наукових ступенів) та званням професора (з 1995р., наданого Міністерством Вищої освіти України), займає посаду професора у Науково-технічному університеті міста Бидгощ.

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