ARCHITECTURAL STUDIES

Vol. 4, No. 1, 2018

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URBAN SPACE IN THE XXI CENTURY. THE ISSUES OF SCALE AND CHOICE

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Received: April 13, 2018 / Revised: April 28, 2018 / Accepted: May 4, 2018

Abstract. Having analysed some formative changes of the post-industrial society and practical experience of managing the urban development of a large city, we made an attempt to formulate the strategic principles for the effective definition of the optimal density of urban development in the long-term perspective (until the mid-twenty first century).

Key words: universal pedestrian accessibility, optimal density, “urban villages”.

1. Introduction

The population of the planet is rapidly urbanized (1,6 billion people in 1900, 7,4 billion people in 2017), concentrating around the main planetary centers of gravity, with the pace of this process being the highest for the largest urban agglomerations. The level of urbanization of the planet is 54.9 % of the population of the countries (as of 2017), the growth rate of the urban population makes up 1.84 % (estimate of the trend for 2015–2020) [3, 7, 11].

During the ЧЧ century, the concept of a large city, actually has changed its definition to a vast urbanized territory. With the further growth of the urban population, this definition may keep transforming, which does not necessarily mean territorial expansion, as it may seem at first glance.

This is due to the profound structural changes that have taken place over the past decades of the XX century, associated with the collapse of the industrial system of production, as the main factor in the economic and socio-cultural life of modern society.

2. Basic Theory Part

The reflection of the new socioeconomic system, despite its intensity and a large array of accumulated hypotheses and knowledge, did not create a vision of a new city of the future and concentrated mainly on segmental issues such as the environment, energy conservation, pedestrian accessibility, etc. Often, these individual phenomena, or even the methods of their combination, are represented as the “post-industrial” urbanism itself, although instrumentally all of them are usually designed for implementation through the same centralized mechanisms, financial and economic schemes created by the industrial system [6, 10, 28, 36].

Given the goals of this work, first of all, we are interested in the concept of the exact interpretation of the term “hyper-urbanization”, or other similar definitions that outline the phenomenon of the evolution of large cities of the modern era and their transformation into the super-large ones, with the population of more than 10 million inhabitants.

The basis of the question lies in the interdependence of the process of domination of urban lifestyle and the emergence of hyper cities. In other words, will the unequivocal world trend for the further growth of the

percentage of urban population and its numerical domination in the XXI century, in fact, occur due to, primarily (or predominantly) the development of over-large cities?

3. Results and Discussion

The analysis of the wide range of large urban formations, which in general correspond to the concept of hyper-city (Shanghai, Singapore, San Francisco, Los Angeles, Karachi, Chicago, Delhi, Kinshasa, etc.), proves the formation of a wide variety of living space, and other qualities, which serve as a gravitational field for the accumulation of the population. This is true in both the case of economically prosperous metropolises like Chicago and the case of large centers of the dveloping countries such as the Republic of Congo or Pakistan. Extremely large cities of the both types, give much better opportunities for realizing the existential needs of the individual than any other place in the country.

On the other hand, the structural transformation of the hyper-city, under the influence of post-industrial factors, changes its urban plane in the direction of forming self-sufficient zones of a close, ideally walking proximity, which converts it into a set of specific horizontal or vertical “urban villages” accumulated over the large territory and located next to each other. In this case, the question arises whether for the existence of such self-sufficient entities it is really necessary to include them into the hyper-city structure and what size of the overall structure is sufficient to ensure all levels of choice within each cluster?

Although the strategy of dense agglomeration of “urban villages”, as a new type of an urban plane formation in the post-industrial era, does not exist yet in the form of a generally accepted consensus, but the analysis suggests that there is a general tendency for such a self-organization of settlements. At the same time, the rather spontaneous nature of the emergence and implementation of ideas associated with the system of small self-sufficient housing clusters indicates the procedural differences between modernist models of management and design of the urban environment and horizontal initiatives that arise as a result of the activities of local communities. [3, 17].

It is worth concentrating on the main motivating basis of this type of urban structure, which is easy access to a large selection of life opportunities. In that case, both components of this dichotomy are inversely proportional, which means that the easier accessibility tends to as much choice as possible, and the biggest choice wants to be easiest to access. In this context, the new urbanistic reality forms itself, the process of which does not depend on the environment in which it occurs. In other words, the potential of dichotomy (accessibility-choice) is capable of transforming any already existing urban objectivity, which has developed in previous historical periods as a result of different conditions. The main instrument here is the market response mechanisms for the proposal, which increasingly acquires the structure of the “wide choice” and pushes transforming of the surrounding areas towards the relevant to it ("wide choice”) principle of mixed use [14].

Fig. 1. Marriage at Boryspil Airport, Kyiv [38]

Fig. 2. Market “Pivdennyi”, Lviv [29]

The contrast between the two methodological tendencies can be illustrated by the facts that the society uses some objects with purposes which are not related to the actual functions of the past economic formations, but were erected recently and in accordance with the actual needs of the city. An example of this development could be the use of the Boryspil airport in Kyiv as a hall for wedding ceremonies, which began in 2017 [38] in a

room that was expanded and modernized several years ago, or the experience of spontaneous post-Soviet markets that arose in the middle of 1990 and gradually turned into chaotic, but multi-functional areas such as, for example, the market "Pivdennyi" in Lviv [29]. Given the gradual, rather than the one-time nature of the formation, such structures evolved as a result of an immediate reaction to the constantly changing consumer demand, not limited to some distinguished sectoral frameworks. Therefore, in a sense, they have become the prototypes of mixed use and close access to various types of services from grocery and essential goods to education and sports [34].

In the modern city-planning theory, the fact of diversity in conditions of close concentration (density) is considered one of the main tasks of urban science of the XXI century, as discussed in various publications [12, 13, 16, 19, 20, 25, 30, 32,].

Thus, it can be noted that the contradictions which we are considering, are becoming even more obvious. The theory of the hyper-city of the post-industrial era, stretched for tens of kilometers, contradicts the trend towards the creation of diverse zones of pedestrian accessibility of a universal choice. Given that such zone is associated with such parameters as average walking speed of 4 km / h and the standard acceptable time needed to get to the public transport stop is 15 minutes, it can be assumed that the maximum diameter of such a zone should be 2000 meters [36].

Although due to the diffuse and heterogeneous nature of the contours of cities and the density of the boundary territories, it is difficult to speak about the accuracy of calculations, however, based on these relative values, we can speak of a conditional comparative schematics of existing urban planes with such clusters. For example, even in such a city as Lviv, which does not belong neither to the category of hyper cities, nor to millionaires, there should be about 25 clusters like this. Within the Lviv region, cities which actual size approximately coincides with the size of one cluster, can be, for example, Skole and Turka (however, without taking into account weakly populated peripheral territories).

As for such large cities of our time as Istanbul, the number of "urban villages" of pedestrian accessibility is around 160 there. Whereas in Cairo there are about 180, Mumbai and Rio de Janeiro (without satellites) there are 280, Lagos – 420, and in the area of Great Tokyo – more than 1700. Apparently, these figures are not always proportional to the population, which in some cities is more densely settled than in others: for example, in Istanbul, compared to Rio de Janeiro. In addition, the population can be calculated in correlation to different units of administrative structuring (municipality, prefecture, urban area, comprehension zone, etc.), which do not always express the same concept of the city.

However, the general parameters give an idea of the volume of the transformative perspective that arises when moving from one urban paradigm - modernist to another – post-industrial. Probable transformation, for example, of Tokyo in 1700 self-sufficient "urban villages" raises the question of the reflection of the city as a holistic phenomenon and ways of managing such structures (centralized or dispersed). Though the large size of the hyper-cities isolated some areas there, the pedestrian average traffic network, which covers commuting to work, recreation areas (parks, beaches, spectacles), home and shoping, integrated and combined the life of these areas into a common urban organism, which, consequently, needed centralized management. In the post-industrial community of "urban villages" or cluster of universal pedestrian accessibility which overlaps with the growth of local self-organization and vertical initiatives, it may raise the question of changing the functions of the city administration (since it is too early to talk about its complete disappearance).

Such functions, in particular, may include the maintenance of the operation of common infrastructure networks for all clusters, as well as providing opportunities for a wide variety of living space. Under the current conditions, the first kind of tasks can be attributed, for example, to the centralized supply of quality drinking water, which becomes one of the main values of urban studies of the XXI^{t} century, due to climate change and an increase in the global population. The second is the constant monitoring of the global choice, and transfering of this information to the level of clusters that create a new post-industrial city plane.

These considerations give ground to say that in the presence of such a center, the hyper-city, as a typological structure that involves excessive expansion of the urban system (tens of kilometers) and a population of more than 10 million, is not a compulsory or desirable condition for the existence of a post-industrial settlement. Obviously, such a center makes sense of its existence only if there is a certain structure from many clusters, however, the upper limit of their number does not necessarily have to reach Tokyo or Rio de Janeiro. Of course, this kind of post-industrial city theory can be completed only if the minimum number of "urban villages" is determined.

In this context, it should be noted that the area itself is not yet sufficient to determine the new urban structuring. It is also worthwhile to determine the optimal number of people who can be accommodated on such an area. In this connection, the issue of the category known in modern urban science as “optimal density” or “optimal compactness” comes to the fore. [17, 4, 8, 9, 5, 2, 30].

In all of these studies, density is defined as a necessary condition for reducing pollution (by reducing road traffic), increasing the level of physical health (due to increased pedestrian and cycling movements), social implementation (through communication in small local groups), energy and materials savings (through their sharing by different neighbors), etc.

At the same time, the legacy of late industrial urbanism, a characteristic feature of which was the significant growth of suburbs and suburban low-rise buildings, especially in extremely large and hyper cities, makes it difficult for the designers and managers to develop a comprehensive strategy for the transformation of the urban organism, logistics and tools of which are still difficult to imagine. Obviously, the consolidation of space will primarily be due to market mechanisms of the benefits of one style of living over another. However, in the most developed countries in which the industrial phase of development, and consequently the industrial character of urban development, proceeded the longest and most intensively, the existing density level is very low, especially in the cities of North America where it ranges from 1 000 to 2 500 persons per square kilometer [31] (while in Asian cities it ranges from 10.000 to 20.000 per square kilometer).

In such a situation, if we take on the substantiated assertion of the direct dependence of “optimal density” and “optimal constancy”, there is a need not only for the satisfaction of natural demand for living in the middle of the city, but also for the development of mechanisms that would non-violently encourage self-relocating the inhabitants of the late-industrial low-density suburbs back to the central regions. Under these circumstances, there is the problem of the quantitative parameters of “optimal density”, which should be based on the balance between the benefits of compact living and its comfort for each individual resident.

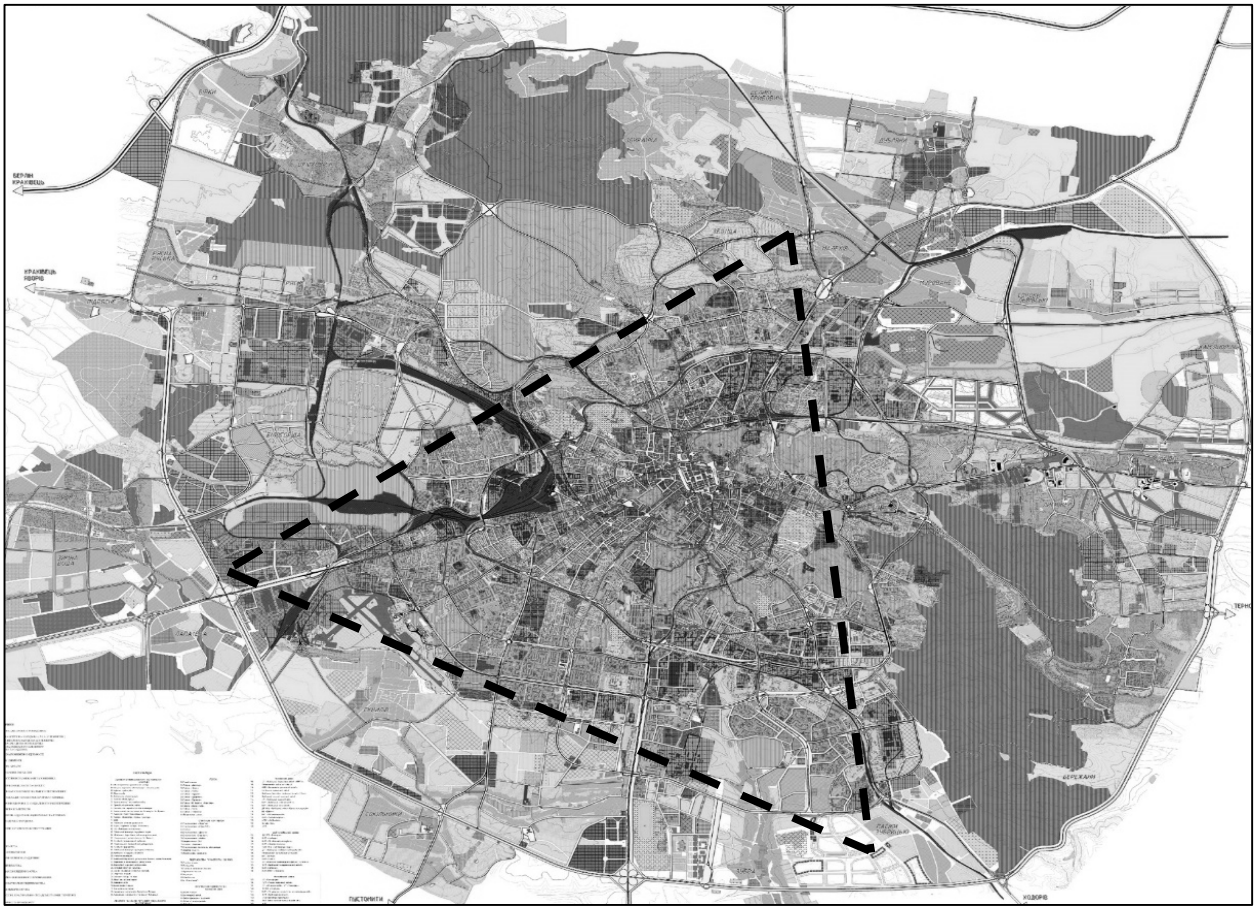

Fig. 3. Triangle the integral urban-residential array of Lviv

Based on the above mentioned, we shall analyze some parameters of Lviv in the context of formation of "optimal density". The area of Lviv is 110.43 square kilometers and the population figures for the year 2017 are 727 968 inhabitants (758 471 with Vynnyky, Rudno, Bryukhovychi) [47], thus it can be assumed that the city can be divided into approximately 35 local residential clusters with a diameter of 2 kilometers . Taking into account the indicators of the area and population, each of these clusters has an average density of 6561.5 people per square kilometer. Such parameters, in general, already correspond to indicators of optimal density (from 5,000 to 10,000 people per square kilometer).

At the same time, official data on the area of the city can not be taken as the final point of reference for such calculations. The administrative boundaries of the city are also the adjoining enclave territories of Ryasne, Rudno, Bryukhovichi and Vinniki, as well as forests (primarily Bryukhovitsky and Vynnykivskyi) and the territory of summer cottages. The dynamics of population changes within the administrative boundaries of Lviv suggests that the process of increasing the number of inhabitants in these suburbs and the reduction of it in the city itself continues. However, this is largely due to the inertia of the late modernist tendency of the outlined strengthening of the middle class, as well as the lack of sufficient proposals for quality housing in the central parts of the city. Further growth of suburban formations, however, no longer has an advantage over the inner-city array, as evidenced by the difference in the value and quality of the newly built dwelling. In fact, as of the end of the 2010s, the whole urbanized array of Lviv is approximately a triangular configuration of urban fabric with vertices facing the West, North and South with sides around 10–12 kilometers. This configuration slightly changes previous calculations. Except for the size of territory and population of Ryasne, the corresponding average density index grows to 7269 square kilometers, and within the framework of the triangle it may reach even up to 12.095 inhabitants (which already exceeds the maximum accepted limits of optimum density). Thus, depending on the method of calculating the territory, the average population per square kilometer is ~ 9700 people. As can be seen from these data, the exact accuracy of calculations of the density of the population of Lviv can not be achieved, but average values are closer to the upper limit of the optimal density of 10 000 inhabitants per 1 km square. According to such averaged picture, the estimated number of clusters should be about 30 units.

Given the relative novelty of raising the question of the interdependence of density and sustainability, it is difficult to talk about absolute figures relative to the desired population of one square kilometer, however, it is possible to give clear indications of when the density clearly ceases to be a blessing and becomes an urban problem. [22, 1, 24]. In particular, it is: a) lack of natural ventilation; b) lack of lighting; c) lack of confidentiality of the inhabitants (for example, the very close location of the windows of neighboring apartments); d) the effect of the "urban heat island" (the increase in the temperature of the air during the warm season in the middle of the city) [26, 39, 35, 34].

The search for an ideal of optimal density was carried out in a number of countries, but the center of the greatest innovations in the development of architectural and technical solutions to such space was Singapore, where there emerged immediately two high-density superblocks with a different planning concept: "Pinnacle" and "Interlace". In both cases, we can talk about a city-developing impulse that offers different ways of building up urban plane on the basis of the principle of "optimal density". The Quarter "Pinnacle" can be seen as a peculiar, transitional form between a typical for a modernist city multi-apartment residential building and planning- related experiments needed to achieve the living space of a wide variety of choices. Instead, Interlace is an attempt to create a fundamentally new typological model of a high density housing complex consisting of pools, green islands, public spaces and recreational areas. Relatively successful solution to a complex project task, which can give an idea of the quantitative indicators of the concept of "optimal density", based on such data as the number of square meters of the total area – 170 000, and the number of inhabitants – slightly more than 2500 (1400 apartments of different types).

Experiments of this kind are characteristic not only for a compact city-country like Singapore, which is lacks land resources. In Canada, there also was an experiment with high-quality dense buildings (False Creek in Vancouver). Unlike complexes in Singapore, "False Creek" occupies a central position in the city planning system of the southern waterfront of the West End. In addition, there they applied a mixed scheme of storey building, which combines different typological scenarios of development.

Fig. 3. Interlace Quarter in Singapore [21]

Fig. 4. "False Creek" district in Vancouver [39]

Based on this kind of practical experience, which showed the limits of the possible achievement of optimal density without loss of quality of residence, a certain consensus was established regarding the indicators of the desirable number of inhabitants resettled per unit area: 100–120 habitats per hectare, primarily in areas adjacent to the major transport routes, or in the end it is possible to bring the maximum figure of 10.000 inhabitants per square kilometer [15, 18, 27, 23].

According to these materials, the strategy of impulse development of a large city, in the conditions of the post-industrial economic structure, among its main tasks, should raise the problem of developing of such a design model of living space that would be able to encourage the settlement of a conventional unit of area defined by a radius of 1 kilometer, with the number of inhabitants, which would equal to about 30,000 people.

Cities like Milan, and especially Barcelona, have population density indicators of one square kilometer similar to those that appear in today's scientific debate around taxonomy of the post-industrial city. In modern studies, Barcelona is given as an example of the organization of a city-planning structure of optimal density, which at the expense of perimeter-quarterly construction with a height of 7–9 floors, at the same time provides both high density and high living comfort of residents who do not suffer from lack of light, ventilation, limited privacy, lack of green and recreational areas [23]. It should be noted that in this case, the highest possible density index of 10.000 inhabitants per square kilometer is taken as the basis.

4. Conclusions

– The perspective of the transformation of urban planes has been formulated in connection with the reduction of the influence of industrial factors of its development instead of which comes the specificity of highly informatized society. Its idea lies in the tendency of transforming the large functional areas of the industrial city into local residential clusters of pedestrian accessibility with a diameter of about 2 km. The aggregate of such clusters of universal pedestrian accessibility ("urban villages"), which overlaps with the growth of local self-organization and vertical initiatives, may be the justification for initiatives to partially review the functions of city management.

– The range of practical issues related to the category of optimal density as the key indicator of the XXI century city has been outlined. Examples of residential quarters such as Kowloon Walled City in Hong Kong, Pinnacle and Interlace in Singapore, False Creek in Vancouver, traced the evolution of individual urban constructions, which show the state of the actual debate around specific indicators of population per unit area . Based on life quality indicators that demonstrate these and other examples, the boundary and desirable indicators of optimal density and spatial patterns of its subjects were noted.

– It has been found that for urban settlements formed as a plane of local clusters of pedestrian accessibility to the possibilities of city choice (the number of goods, services, employment, etc. available in the city), density can be achieved either by the formation of quarterly development of average altitude (8–9 floors),

or combinations of multi-storey buildings with a predominance of high-rise buildings. The quantitative range of optimal density can be considered somewhere within 5,000 to 10,000 inhabitants per square kilometer.

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Андрій Павлів

МІСЬКИЙ ПРОСТІР У XXI СТОЛІТТІ. ПРОБЛЕМИ МАСШТАБУ ТА ВИБОРУ.

Анотація. *Опираючись на аналіз формаційних змін постіндустріального суспільства та практичний досвід управлінням урбаністичним розвитком великого міста, зроблено спробу сформувати стратегічні засади ефективного визначення оптимальної щільності містобудівного розвитку на перспективу до середини XXI століття.*

Поняття великого міста, протягом XX століття фактично змінило свій зміст і стало означати обширну урбанізовану територію. З подальшим зростання міського населення цей зміст може зазнати видозміни, що не обов'язково означає територіальну експансію, як це може видаватись на перший погляд.

Сформульовано перспективу трансформації містобудівної тканини у зв'язку із зменшенням впливу індустріальних факторів її розвитку, на зміну яким приходить специфіка високоінформатизованого суспільства. Вона полягає у тенденції перетворення великих функціональних зон промислового міста на локальні житлові кластери пішохідної доступності діаметром близько 2 км. Сукупність таких кластерів універсальної пішохідної доступності ("міських сіл"), на котру накладається ріст локальної самоорганізації та вертикальних ініціатив, може стати причиною ініціатив із часткового перегляду функцій загальноміського управління.

Окреслено коло практичних питань пов'язаних із категорією оптимальної щільності як ключового показника міста XXI століття. На прикладах таких житлових кварталів як "Kowloon Walled City" у Гонконгу, "Pinnacle" та "Interlace" у Сінгапурі, "False Creek" у Ванкувері та щільно урбанізованих житлових районів м. Львова простежено еволюцію окремих містобудівельних утворень, котрі демонструють стан актуальної дискусії навколо конкретних показників кількості населення на одиницю площі. На основі показників якості життя, котрі демонструють ці та інші приклади, було відзначено граничні та бажані показники оптимальної щільності та просторові моделі її предметизації.

Визначено, що для міського поселення, сформованого як тканина локальних кластерів пішохідної доступності до можливостей міського вибору (кількість благ, послуг, зайнятості тощо які доступні у місті), щільність може досягатись або за рахунок формування квартальної забудови середньої висотності (8–9 поверхів), або комбінаціями різноповерхових будівель із переважанням висотних. Кількісним діапазоном оптимальної щільності можна вважати показники, які коливаються від 5 000 до 10 000 мешканців на квадратний кілометр.

Ключові слова: *універсальна пішохідна доступність, оптимальна щільність, "міські села".*