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ACCESSIBILITY AND CONNECTIVITY AS THE KEY FACTORS OF THE MACRO-SPACE IN BUILT ENVIRONMENT

Abstract: *This article continues a series of publications on Cognitive Urbanism. The research is aimed at studying and classification of the built environment as an object of design. We must go beyond space-making to the making of places. The cognitive approach naturally leads us to the idea of the cultural landscape and the study of the traditions and rituals of everyday life. The essence of the study is related to the so-called "environmental behaviour" that is all types of social activity and interactions with the built environment. We suggest that the spatial structure of macro-space can be analyzed through the two key factors: the accessibility and connectivity of place. Accessibility can be measured by the time one needs to reach the Macro-space and the Connectivity - by the number of people that could be part of social life in the core area. Thus, Accessibility is an indicator of linear dimensions, physical boundaries and direction of links, and Connectivity is a derivative of the number of people, the density and the layout of settlement. The Types of macro-spaces that are compared are the Enclave, the Region, and the District. The article provides a conceptual framework for the recommendations on urban planning and design based on Accessibility as an indicator of linear dimensions, physical boundaries, and direction of links, and Connectivity as a derivative of the number of people, the density and the layout of settlement.*
Keywords: *cognitive urbanism, built environment, morphogenesis, macro-space, accessibility and connectivity.*

Introduction

The quest for the comfortable public space in Russian cities has awakened the theories of mental maps and environmental behavior (Lynch, 1960). People recognize the city according to their "mental map" (Bechtel, 2003). The mental maps are individual, but spatial ideas about the urban environment are universal and depend mostly on education and experience of people. Like in the modern geographic information systems (GIS), mental map are "linking" the meaning and value of the site to a point on the map. However, unlike in GIS, the senses and content of places vary according to the physical conditions, social context, and inclusion in a particular culture. The environmental behaviour in big cities modified very much according to the international cultural patterns and norms. Kevin Lynch showed the fabric of the pedestrian city based on mental mapping techniques. That was an essential input into the Topology of the Built Environment. Russian architect Vyacheslav Glazichev has translated the books of K. Linch and wrote together with A. Gutnov two books about the language of architecture and the world of architecture. This article explores the topology of urban macro-space with concern for the accessibility and connectivity of places in the city.

Let us define the Environmental Behaviour as a socio-spatial activity of a person or a group of people (Altman, 1980). This complex of actions includes a choice of motion and location, a selection of private screening and observation, the mode of social communication, and the use of the possibilities of the urban landscape. The models of environmental behaviour could help the urban design professionals and landscape architects to enhance the spatial structure of cities (Krasheninnikov, 2016).The generalized "metal map" could explain much to the town planners,

but the reliability of such a theoretical model is always questioned (Tolley, 2015). We must admit that in every model, some simplifications are inevitable. We had to identify the main features and temporarily disregard the second-rate factors such as local habits and the way of life, different interests of persons and groups, difference in attitudes depending on age, education, and background. These factors would be considered later on and can be added to the basic models. More important for an urban planner is the basic topology of settlements, the patterns that survive the test of time and cultural change.

The patterns of a sustainable urban structure are often found in areas with a traditional population, where several generations lived in the same place. Today, such settlements have become rare in number, but they are valued more and more as the places of resort and escape from globalization. The small towns that survived the industrial boom and then the postindustrial drainage nowadays possess a resource of living space of tremendous environmental potential. Unfortunately, the heritage quality of the small town is fragile and easy to lose with bad governance and empowered population. Formal renovation of the public space through pavements and greenery does not bring the wanted livability for streets and squares.

A methodology of macro-space

We can note the opposition between the two different approaches in studies of the built environment to understand, diagnose and provide therapy for the built environment: the city as "a cognitive phenomena", and the city as "a set of patterns that architects use" (Alexander and Center for Environmental Structure, 2002). The understanding of urban space cannot ignore Foucault's pioneering but confusing article "Of other space" (Foucault , 1964). The article describes three spatial systems: one with a single center, a system which he calls "emplacement"; a second is a binary system of flows and dialectics; the third is a network system of shifting relationships often between mobile actors and residents.

David Shane elaborated this theory adding the notions of enclaves and armature. Space syntax has also produced several important contributions to urban morphology, and is best represented by the work of Bill Hillier and Julienne Hanson from the Bartlett School of Planning at University College London (e.g. Hillier and Hanson, 1984; Hillier, 1996). The Moscow architect M. Savchenko wrote a book "Architecture as a Science" where he explained the co-relation between such elements of architectural space as tópos and locus. The "topos[1]" combines the system of loci bringing the sense of place. Macro-space as a topos of urban life is a "place" for various loci and flows of life. The "archetype" of a place includes the expected social activities of a person or a social group. The mental map of a city is built of archetypes in the context of relationships, functions, symbolic meaning, time, experience, and other parameters of a particular place. In referring to "locus" we would allude to any space having center and boundaries, while by referring to "flows" we allude to a place of transit. The macro-space, nevertheless, can combine elements of locus and flow and that brings a certain contradiction and tense in its spacious structure.

The two variables of environmental behaviour at the macro-level of the built environment

"The site is defined by relations of proximity between points or elements," said M. Foucault (Foucault), and we should add that the site is also characterized by the cohesion of people. An anthropological approach to the urban planning leads us to the idea of cognitive codes through which the brain "talks" with us about space (Cave, 1998). The British scientist B. Hillier found that "spatial layout in itself generates a field of a probabilistic encounter, with structural properties that vary with the syntax of the layout" (Hillier, 2007). The further study of this phenomenon, made in Moscow Institute of Architecture (State Academy) (Russia) suggests the

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[1] τόπος • (tópos) m - a place, location, locality.

classification of places by the two key factors: "ACCESSIBILITY" as a generalized characteristic of the spatial structure; and "CONNECTIVITY" as a generalized characteristic of social importance. According to the previous studies, we can summarise the following intervals of time and cohesion for the environmental complexes: walking time of 1-5, 5-10, 10-20 minutes; connectivity of 100-200, 300-500, 600-1000 people (Krasheninnikov, 2015, 421).

ACCESSIBILITY means the ability to reach the point. Accessibility can be measured in total time of moving "from door to door". The accessibility of the place is limited by the physical obstacles of space structure and personal perception of time. Some authors indicate that the time of walking affects cognitive skills and such aspects of environmental behaviour as, selectivity, meaningfulness, purposefulness, categorization, reflexivity, etc. (Golovin, 1998). The time spent on the way depends not only on the length and speed, but also on the inter-location of places, walls, and fences, on the configuration of the route and a direction of way. That is why the access time indirectly characterizes the structure of architectural space.

CONNECTIVITY means the cohesion of the possible participants in the local events. The concept of connectivity is widely used in economic geography to study and explain the phenomena of agglomerations. The intensity of pendulum migration and connectivity reveal the location of the central core, the first and secondary belts of the interconnected area. Similarly, you can observe the presence of the core and periphery in the small towns, separated neighbourhoods or historical settlements. In bigger cities the structure is more complex and not so evident: we should account not only residents but also all the day population, transit passengers, as well as the size of the city. As a result, an urban structure of a big city has several types of macro-spaces: the recognized *counties*; the closed and fenced *enclaves*; the interconnected and transit *regions*.

The Axiom of cognitive urbanism is that site accepts the sense of place and gains contextual properties through involvement in social practice. Foucault wrote that "We live inside a set of relations that delineates sites" (Foucault) and the social relations are the first to be mentioned when we talk about the public space of a city.

The connectivity and accessibility of the place are the key spatial factors that provide the involvement in local social practice. The interaction of these two variables set a field of possible types of "macro-spaces" in settlement. With the help of such a matrix, one can identify and study the present and the future patterns for the built environment.

The grounds for the three basic models of macro-space

Macro-space is a portion of the urban territory that embraces several places under conditions of pedestrian proximity, circulation, and identification. As a result of theoretical modeling, we came to three basic types of macro-space: the enclave, the region, and the district.

The Enclave is a location with rigid borders (walls, fences) and small dimensions of length and width that correlate with the distance of one-step access to any point inside the boundaries. An enclave is formed around the common yard of residential complexes, along a central plane in a small park.

The Region is a public space with a defined center and conditional boundaries regarded as limits of easy pedestrian accessibility. Examples of such a region are the areas around transport/transfer nodes, metro stations, university hubs and bus stadiums. The pedestrian routes form the linear stars-shape and ribbon spatial structures of the core public spaces.

The District is a recognized part of the city, limited by affordable pedestrian proximity. The district is usually named according to the heritage objects or events. External borders sometimes are not vividly expressed, and the core is a single place, but also the framework of public spaces bordering the iconic objects, such as temples, markets, grows, riverbanks, etc.

The combination of the three mentioned macro-spaces (enclaves, regions, and districts) gives us derivative models that explain the morphogenesis of elementary residential planning units (Kukina, 2018).

They are associated with the well recognized morphotypes: the islands of city blocks or microdistricts-quarters, the center oriented microdistricts-neighbourhoods or transit-oriented development model, downtown center as a small-size-city-core, linear pedestrian strips along the avenue, the medium-sized city as combination of districts, and metropolis as a network of cities. Basic patterns of macro-spaces can be elaborated in terms of zoning, dimensions, borders, and structure. The task for urban planners is to identify the location of "active core" and "armature" (Shane, 2005) of macro-spaces and to build a "frame" and "tissue" of urban fabric (Gutnov, 1992)

A separate topic of study may be the historical anthroposophy of the city, examining the benchmarks on the scales of time and connectivity. In this regard, it would be relevant and interesting to compare the limits of the population for the various urban forms, public spaces, and settlements. For example, the natural size of the clan and the areal of tribe, the number of citizens in the resilient town. That studies can explain the hidden strive and limits of cohesion in the man-made environment. The connectivity determines our attitude to the events, and, naturally, largely determines the possibility of personal involvement in social practice. The social practice brings the sense to the place and the structure of a place regulates social practice that provides the sense of identification for the site of urban landscape (Solso, 2001).

The method of connectivity assessment

R. Kavenski's drawing based on the publication "Frequency of walking distance from home to public transport for walking trips less than 2 km". Vertical axis - Number of walk trips, Horisontal axis – Walk distance, metres (Daniels, 2011).
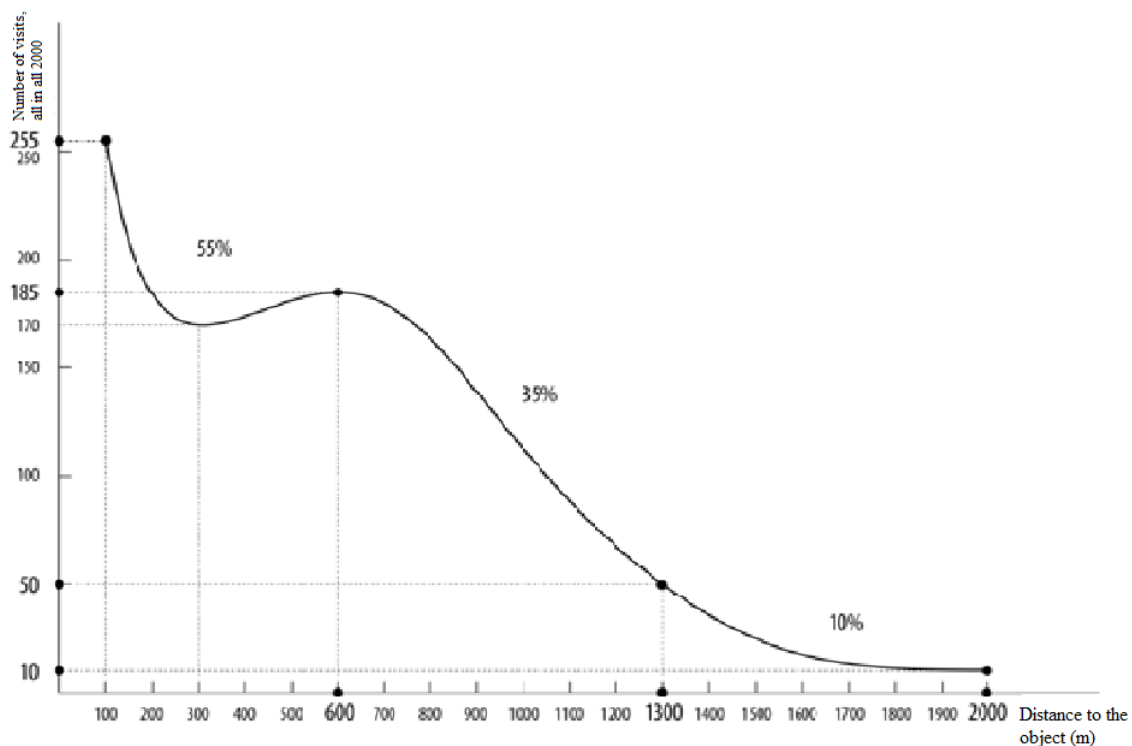

Figure1. The expected quantity of participants in local social practice

The number of people at a distance of affordable access sets the conditions for social interactions, which "warms up" the social rector of public spaces. In his book "Connectography" Parag Khanna argues that connectivity, or cohesion, is the key indicator of social success (Khanna, 2017). We can also make a preliminary assumption of social cohesion by dividing the urban area into macro-spaces. Based on the statistics of movement and displacements in the city,

starting from M. Davidovich, A. Jakshin, T. Govorenkova (Jakshin, 1979), and taking into account observations made in different places, we could take the following rule of a thumb about the role of distance and time in people's personal participation into the events. About 50 % of all the people happen to be around in 20 min distance are expected to take part in street life. About 30% of those in the range of 30 to 50 minutes should be considered as candidates. And 20% of all participants give the population of the whole other city.

If we assume that the cohesion is a quantity of people simultaneously participating in social practice we would assume that the number of people in the core area of macro-space would be 50-60% from the same macro-space, 30-40 % from the neighbouring macro-spaces (30-50-minute walk) and 10-20% from the other places at a distance of 1-1.5 hours.

The proposed method of macro-space connectivity is especially beneficial at the first steps of spatial planning and master plan design. We should be aware of the limitations of such prognoses. The landscape and geography of the territory, the density of housing and the road network, the effectiveness of bicycle traffic and public transport are all the altering factors for the accurate assumption.

The urban environment can be imagined as a canvas with coloured spots overlapping each other, spots of different sizes, shapes, and saturation. This spots correspond to the location of people and symbolize places. The places of different shapes and sizes correspond with informal (spontaneous) social groups. In the process of programming and modelling of the built environment, places can be easily represented by the coloured pieces of different sizes and shapes, corresponding to micro-, mezzo- or macro-spaces with allocated scenario of environmental behaviour and formal use.

This collage of places helps to develop the idea of comfortable public space. The implementation of such a model requires the architectural design and technical skills. Otherwise, the new urban environment will reproduce simplified functional templates.

Conclusion

The subject of this article was a systematization of macro-spaces of the built environment by the two key factors: accessibility and connectivity of places. The proposed models underlie the possible planning units of the city fabric. With the accumulation of empirical data, urban design increasingly goes to the structural and functional analysis of cities and begins to focus on the problems of the public space as an organization of urban life and environmental behaviour with the respect to the local character of the place.

The experimental design showed that the developed patterns of environmental complexes are useful both for structural and functional analysis and for making a project of urban plans.

Cognitive interpretation of socio-cultural and the spatial context of human settlements is aimed at the correction of urban design solutions, land-use planning, and the planning structure of settlements according to customs, traditions, and norms of environmental behaviour.

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